

<b>Amended Administrative Record Index of Final Permit</b>			
<b>Muskegon Development Company, MI-035-2R-0034, Holcomb 1-22</b>			
<i>(*these documents are located within the permit folder)</i>			
<b>Doc.#</b>	<b>Name</b>	<b>Subject</b>	<b>Date</b>
1A	U.S. EPA-Region 5	<b>Review of Geographic Factors and EJ Screen Data for Holcomb 1-22 well site</b>	8/9/2016
1	Muskegon Development Company	<b>*Permit Application, received August 11, 2016</b>	8/9/2016
2	U.S. EPA-Region 5	<b>UIC Permit Application Completeness Review Checklist</b>	8/19/2016
3	U.S. EPA-Region 5	<b>*Completeness letter sent to permittee</b>	10/13/2016
4	U.S. EPA-Region 5	<b>*Request for Third Party Estimate of Plugging &amp; Abandonment Costs</b>	10/13/2016
5	Muskegon Development Company	*Permit additional information (reply with 3rd party P&A cost estimate), dated 10/19/16	10/26/2016
6	U.S. EPA-Region 5	<b>*Fact Sheet/Statement Of Basis for issuance of UIC permit</b>	10/28/2016
7	U.S. EPA-Region 5	<b>Draft permit MI-035-2R-0034</b>	10/28/2016
<b>Documents cited for Statement of Basis:</b>			
8	Muskegon Development Company	*List of residents within 1/4 mile radius Area Of Review	8/9/2016
9	Muskegon Development Company	*Base of Underground Source Of Drinking Water	8/9/2016
10	Muskegon Development Company	*Depth of injection zone (Dundee Formation and confining zone (Bell Shale) - Att. G	8/9/2016
11	U.S. EPA-Region 5	*Construction requirements & internal technical review	9/16/2016
12	Muskegon Development Company	*Injection fluid and daily volume	8/9/2016
13	U.S. EPA-Region 5	*Maximum injection pressure (calculated by EPA)	9/16/2016
14	U.S. EPA-Region 5	*Monitoring and reporting requirements (Permit Attachment A)	9/30/2016
15	Muskegon Development Company	*Plugging & Abandonment Plan (Permit Attachment B)	8/9/2016
16	Muskegon Development Company	*Financial assurance of ability to plug and abandon well	8/9/2016
<b>Supporting documents for the draft permit:</b>			
17	U.S. EPA-Region 5	*Internal Technical Review Sheet	8/26/2016
18	U.S. EPA-Region 5	*Internal well construction analysis and diagram	9/16/2016
19	Muskegon Development Company	Endangered Species Act compliance report (included with permit application)	6/13/2016
20	U.S. EPA-Region 5	*Internal review of Endangered Species Act compliance (memo to file)	9/22/2016
21	Western Michigan University	Michigan Hydrologic Atlas, Part I (Hydrology for UIC in Michigan)	1981
22	U.S. EPA-Region 5	*National Historical Preservation Act impact of well project (memo to file)	7/26/2016
23	U.S. EPA-Region 5	*Seismic risk impact regarding well project (memo to file)	9/28/2016
24	Michigan Dept. of Env. Quality	GeoWebFace maps and well reports of wells within the Area of Review	9/28/2016
25	U.S. EPA-Region 5	Draft Permit transmittal letter to Muskegon Development Company	2/10/2017
26	U.S. EPA-Region 5	Updated Fact Sheet, February 2017	2/10/2017
27	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to ACHP	2/10/2017
28	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to MDNR, Forest Resources Div.	2/10/2017
29	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to MDNR, Fisheries Division	2/10/2017
30	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to MDNR, Wildlife Division	2/10/2017
31	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to Michigan SHPO	2/10/2017

32	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to U.S. Fish & Wildlife Service	2/10/2017	
33	U.S. EPA-Region 5	Transmittal letter: Public Notice and Comment Period, to Harrison District Library	2/10/2017	
34	Lilly Simmons	Transmittal letter: Public Notice and Comment Period, to Michigan DEQ (e-mail)	2/10/2017	
35	Lilly Simmons & Bill Tong	Certificate of Service and Mailing List for Public Notice and Fact Sheet	2/10/2017	
36	U.S. EPA-Region 5	Hearing & Public Comment Advertisement sent to Clare County Review	6/20/2017	
37	U.S. EPA-Region 5	Updated Fact Sheet, June 2017	6/20/2017	
38	U.S. EPA-Region 5	Second comment period notification letter, sent to Office of Fed. Agency Prog., ACHP	6/21/2017	
39	U.S. EPA-Region 5	Second comment period notification letter, sent to U.S. Fish & Wildlife Service	6/21/2017	
40	U.S. EPA-Region 5	Second comment period notification letter, sent to Michigan SHPO	6/21/2017	
41	U.S. EPA-Region 5	Second comment period notification letter, sent to Michigan DNR, Forestry Resources	6/21/2017	
42	U.S. EPA-Region 5	Second comment period notification letter, sent to Michigan DNR, Wildlife Division	6/21/2017	
43	U.S. EPA-Region 5	Second comment period notification letter, sent to Michigan DNR, Fisheries Division	6/21/2017	
44	U.S. EPA-Region 5	Second comment period notification letter, sent to Harrison District Library	6/21/2017	
45	U.S. EPA-Region 5	Certificate of Service and Mailing List for second comment period notification	6/21/2017	
46	U.S. EPA-Region 5	EPA advertisement of Public Hearing, Clare Country Review, June 23, 2017, Page 3B	6/21/2017	
47	U.S. EPA-Region 5	Attendance sheet for July 25, 2017 EPA public hearing at Clare High School	7/25/2017	
48	Clare County Review	Article by Pat Maurer, "Injection well raises concerns" about July 25 public hearing	7/27/2017	
49	U.S. EPA-Region 5	EPA Notification letter of extension of comment period to August 18, 2017	7/27/2017	
50	Bill Tong & Lilly Simmons	Certificate of Service and Mailing List for extension of public comment to 8/18/17	7/28/2017	
51	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, to ACHP	7/28/2017	
52	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, to USFWS	7/28/2017	
53	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, to MDNR Forestry	7/28/2017	
54	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, MDNR Wildlife	7/28/2017	
55	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, MDNR Fisheries	7/28/2017	
56	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, Michigan SHPO	7/28/2017	
57	U.S. EPA-Region 5	Notification of extension of comment period to August 18, 2017, Harrison Dist. Library	7/28/2017	
58	Jane Rose Reporting	Official Transcript of July 25, 2017 Public Hearing on Draft Permit for Holcomb 1-22 Well	8/8/2017	
59	U.S. EPA-Region 5	Chronological compilation of All Verbatim (Raw) Comments & Draft Responses (60 pg.)	3/12/2018	
60	U.S. EPA-Region 5	Final Response to Comments on Draft Permit for Holcomb 1-22 Well (18 pg.)	6/20/2018	
		<b>Email Comments on Draft Permit</b>		
	<b>From</b>	<b>Subject</b>	<b>Date Received</b>	<b>Size</b>
61	Kirby North Ancona	FW: UIC Class II Public Notice: MI-035-2R-0034	2/12/2017 0:00	236 KB
62	Tong, William	FW: UIC public notice per 124.10e MI-035-2R-0034	2/14/2017 0:00	9 KB
63	Jeffery Loman	Comments on Proposed Class II Permit MI-035-2R-0034 (Holcomb 1-22, Permit # MI-035-2R-0034)	2/27/2017 0:00	40 KB
64	Wes Raymond	comments re: permit MI-035-2R-0034	3/15/2017 0:00	39 KB
65	Kirby North Ancona	Holcomb1-22 well permit issues	7/17/2017 0:00	192 KB
66	Sheryl Judd	Public Comment: Proposed injection well in Clare County	7/26/2017 0:00	69 KB
67	Deb Sherrod	Public Comment: Proposed Injection Well in Clare County	7/27/2017	70 KB
68	Stephanie Terpening	Clare county, MI injection well comment	7/27/2017	71 KB

69	Wayne Terpening	Holcomb #1-22 Injection Well Permit Application MI-035-2R-0034	7/27/2017 0:00	68 KB
70	Rep. Jason Wentworth (District 97)	RE: Clare county, MI injection well comment MI-035-2R-0034	7/27/2017 0:00	84 KB
71	Leigh Clarke	Letter for Public Comment Regarding Proposed Underground Injection Permit, Holcomb	7/27/2017 0:00	252 KB
72	Sue Rees	Please do NOT vote for the injection well in Dodge City in Clare County	7/31/2017 0:00	60 KB
73	Sue Rees	Injection in Dodge city	7/31/2017 0:00	63 KB
74	Rebecca Terpening	Public Notice: Public Hearing for Draft Class II Permit MI-035-2R-0034	8/1/2017 0:00	63 KB
75	Tong, William	Transcriptions of post-hearing handwritten comments (includes PDF scans of original doc	8/7/2017 0:00	1 MB
76	Snooks	public comment regarding Holcomb 1-22 injection well	8/8/2017 0:00	49 KB
77	R5-R1605@epa.gov	PDF scan of post card comment from Matthew Stephenson	8/10/2017 0:00	300 KB
78	Linda Secco	Townline and Athey Hamilton Township, mi	8/10/2017	48 KB
79	R5-R1605@epa.gov	PDF scan of post card comment from Michael and Diane Prior	8/11/2017	1 MB
80	terrymic@charter.net	Holcomb 1-22 well	8/14/2017	45 KB
81	Bryan Cummings	Objection Holcomb #1-22 well	8/15/2017	69 KB
82	Andrew Verhage	Holcomb 1-22 well MI-035-2R-0034	8/15/2017	56 KB
83	Rick Fanslau	Holcomb 1-22 well,#MI-035-2R-0034	8/17/2017	46 KB
84	gxcube@verizon.net	Fwd: Holcomb 1-22 well, #MI-035-2R-0034	8/17/2017	52 KB
85	Emerson Addison	Holcomb 1-22 well, #MI-035-2R-0034	8/18/2017	125 KB
86	Letha Raymond	Public Comment - Permit Number: MI-035-2R-0034. Holcomb 1-22 well, Hamilton Twp, C	8/18/2017	184 KB
87	Martin Johnson	Re: Holcomb 1-22 well, #MI-035-2R-0034	8/18/2017	49 KB
88	Stephanie Terpening	Holcomb 1-22 well, #MI-035-2R-0034	8/18/2017	58 KB
89	LuAnne Kozma	RE: Holcomb 1-22 weel, #MI035-2R-0034	8/18/2017	209 KB
90	Paul J. Mooradian	Holcomb Well	8/19/2017	52 KB
		<b>Additional Supporting Documents Cited in Appeal Response</b>		
<b>Doc.#</b>	<b>Author</b>	<b>Subject</b>	<b>Date</b>	
91	U.S. EPA-Region 5	Final Permit MI-035-2R-0034 (appealed to EAB on August 10, 2018)	7/3/2018	
92	Executive Order 12898, 59FR 7629	Federal Action to Address Environmental Justice in Minority & Low-Income Populations	2/16/1994	
93	Anthony Ingraffea	Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction	1/1/2016	
94	Abraham Lustgarten, ProPublica	Injection Wells: The Poison Beneath Us	6/21/2012	
95	U.S. EPA	What is EJSscreen? ( <a href="https://www.epa.gov/ejscreen/what-ejscreen">https://www.epa.gov/ejscreen/what-ejscreen</a> )		
96	U.S. EPA-Region 5	Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Co.(Permit No. MI-035-2R-0034), Holcomb 1-22 Well	7/3/2018	
97	U.S. EPA-Region 5	Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Co.(Permit No. MI-035-2R-0034), Holcomb 1-22 Well	9/26/2019	
98	U.S. EPA-Region 5	Final Permit MI-035-2R-0034 (re-issued)	9/26/2019	
		<i>William K. Tong</i>	Sept. 26, 2019	
		Permit Writer	Date Signed	



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**REGION 5**  
 77 WEST JACKSON BOULEVARD  
 CHICAGO, IL 60604-3590

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**UNDERGROUND INJECTION CONTROL PERMIT: CLASS II**

Permit Number: MI-035-2R-0034

Facility Name: Holcomb 1-22

Pursuant to the provisions of the Safe Drinking Water Act, as amended 42 U.S.C. §§ 300f et seq., (commonly known as the SDWA) and implementing regulations promulgated by the U.S. Environmental Protection Agency at Parts 124, 144, 146, and 147 of Title 40 of the Code of Federal Regulations (40 C.F.R.),

**Muskegon Development Company of Mount Pleasant, Michigan**

is hereby authorized to convert and operate an injection well located in Michigan, Clare County, T19N, R3W, Section 22, NW 1/4 Section, for injection into the Richfield Formation of the Detroit River Group at depths between 4948 and 5010 feet, upon the express condition that the permittee meet the restrictions set forth herein. Injection shall not commence until the operator has received authorization in accordance with Part I(E)(10) of this permit.

The injection shall be limited to fresh water for enhanced oil recovery from production wells owned or operated by Muskegon Development Company.

All references to Title 40 of the Code of Federal Regulations are to all regulations that are in effect on the date that this permit is effective. All terms used in this permit shall have the meaning set forth in the SDWA and implementing regulations at 40 C.F.R. Parts 124, 144, 146, and 147.

This permit shall become effective on AUG 27 2018 and shall remain in full force and effect during the operating life of the well, unless this permit is otherwise revoked and reissued, terminated or modified pursuant to 40 C.F.R. §§ 144.39, 144.40, and 144.41. This permit shall also remain in effect upon delegation of primary enforcement responsibility to the State of Michigan, unless that State chooses to adopt this permit as a State permit. The permit will expire in one (1) year if the permittee fails to commence construction, unless a written request for an extension of this one (1) year period has been approved by the Director. The permittee may request an expiration date sooner than the one (1) year period, provided no construction on the well has commenced. This permit will be reviewed at least every five (5) years from the effective date specified above.

Signed and dated: 7/3/18

Linda Holst

Linda Holst  
 Acting Division Director,  
 Water Division

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## **PART I**

### **GENERAL PERMIT COMPLIANCE**

#### **A. EFFECT OF PERMIT**

The permittee is allowed to engage in underground injection in accordance with the conditions of this permit. The underground injection activity, otherwise authorized by this permit or rule, shall not allow 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 pursuant to 40 C.F.R. Part 142 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit or otherwise authorized by permit or rule is prohibited. Issuance of this permit does not convey 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 regulations. Compliance with the terms of this permit does not constitute a defense to any action brought under Section 1431 of the Safe Drinking Water Act (SDWA), or any other law governing protection of public health or the environment.

#### **B. PERMIT ACTIONS**

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 C.F.R. §§ 144.39, 144.40, and 144.41. The filing of a request for a permit modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition.

#### **C. 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.

#### **D. CONFIDENTIALITY**

In accordance with 40 C.F.R. Part 2 and § 144.5, any information submitted to EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in 40 C.F.R. Part 2 (Public Information). Claims of confidentiality for the following information will be denied:

- (1) The name and address of the permittee; and,
- (2) Information which deals with the existence, absence or level of contaminants in drinking water.

**E. 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 non-compliance is authorized by an emergency permit pursuant to 40 C.F.R. § 144.34. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance or modification.

2. **Penalties for Violations of Permit Conditions**

Any person who operates this well in violation of permit conditions is subject to civil penalties, fines, and other enforcement action under the SDWA and may be subject to such actions under the Resource Conservation and Recovery Act. Any person who willfully violates a permit condition is subject to criminal prosecution.

3. **Need to Halt or Reduce Activity not a Defense**

It shall not be a defense for a permittee in an enforcement action to state 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. **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.

6. **Duty to Provide Information**

The permittee shall furnish to the Director, by the date specified by the Director, 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 by this permit to be retained.

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. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
- b. Have access to and copy, at reasonable times, any records that must be retained under the conditions of this permit;
- c. Inspect, at reasonable times, any facilities, equipment (including monitoring equipment), practices, or operations, regulated or required under this permit; and
- d. Sample or monitor the injected fluids, at reasonable times, for the purposes of assuring permit compliance, or as otherwise authorized by the SDWA, at any location.

8. **Records**

- a. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all records required by this permit, for a period of at least three (3) years from the date of the sample, measurement or report. The permittee shall also maintain records of all data required to complete this permit application and any supplemental information submitted under 40 C.F.R. §§ 144.31 and 144.51. These periods may be extended by request of the Director at any time by written notice to the permittee.
- b. The permittee shall retain records concerning the nature and composition of all injected fluids until three (3) years after the completion of plugging and abandonment in accordance with the plugging and abandonment plan, contained in Part III(B) of this permit. The owner or operator shall continue to retain the records after the three (3) year retention period unless he delivers the records to the Regional Administrator or obtains



written approval from the Regional Administrator to discard the records.

- c. Records of monitoring information shall include:
- (i) The date, exact place, and the time of sampling or measurements;
  - (ii) The individual(s) who performed the sampling or measurements;
  - (iii) A precise description of both sampling methodology and the handling of samples;
  - (iv) The date(s) analyses were performed;
  - (v) The individual(s) who performed the analyses;
  - (vi) The analytical techniques or methods used; and,
  - (vii) The results of such analyses.

9. **Notification Requirements**

- a. **Planned Changes** - The permittee shall notify and obtain the Director's approval at least thirty (30) days prior to any planned physical alterations or additions to the permitted facility, or changes in the injection fluids. Within ten (10) days prior to injection, an analysis of new injection fluids shall be submitted to the Director for approval in accordance with Parts II(B)(2) and II(B)(3) of this permit.
- b. **Anticipated Noncompliance** - The permittee shall give at least thirty (30) days advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c. **Transfer of Permits** - This permit is not transferable to any person except after notice is sent to the Director at least thirty (30) days prior to transfer and the requirements of 40 C.F.R. § 144.38 have been met. 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 SDWA.
- d. **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 to the Director no later than thirty (30) days following each schedule date.

e. **Twenty-Four Hour Reporting**

- (i) The permittee shall report to the Director any noncompliance which may endanger health or the environment. This information shall be provided orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall include the following information:
  - (a) Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or,
  - (b) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.
- (ii) A written submission shall also be provided as soon as possible but no later than five (5) days from 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 recurrence of the noncompliance.

f. **Other Noncompliance** - All other instances of noncompliance shall be reported at the time when monthly reports are submitted under Part II(B)(3)(a) of this permit. 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 recurrence of the noncompliance.

g. **Other Information** - If or when the permittee becomes aware that the permittee failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit such facts or corrected information in accordance with 40 C.F.R. § 144.51(I)(8).

h. **Report on Permit Review** - Within thirty (30) days of receipt of the final issued permit, the permittee shall report to the Director that the permittee has read and is personally familiar with all terms and conditions of this permit.

10. **Commencing Injection**

The permittee shall not commence injection into any newly drilled or converted well until:

- a. Formation data and injection fluid analysis have been submitted in accordance with Parts II(A)(6) and II(B)(2), respectively;
- b. A report on any logs and tests required under Parts II(A)(5) and III(D) of this permit has been submitted;
- c. Mechanical integrity of the well has been demonstrated in accordance with Part I(E)(17);
- d. Any required corrective action has been performed in accordance with Parts I(E)(16) and III(C); and,
- e. Construction is complete and the permittee has submitted to the Permit Writer, by certified mail with return receipt requested, a notice of completion of construction using EPA Form 7520-10 and either:
  - (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, within thirteen (13) days of the date of the Director's receipt of the report required above, notice from the Director of his or her intent to inspect or otherwise review the new injection well, in which case prior inspection or review is waived and the permittee may commence injection.

11. **Signatory Requirements**

All reports required by this permit and other information requested by the Director shall be signed and certified according to 40 C.F.R. § 144.32.

12. **Notice of Plugging and Abandonment**

The permittee shall notify the Director at least forty-five (45) days before conversion or abandonment of the well.

13. **Plugging and Abandonment**

The permittee shall plug and abandon the well as provided in the plugging and abandonment plan contained in Part III(B) of this permit. Plugging shall occur as soon as practicable after operation ceases but not later than two (2) years

thereafter. During the period of non-operation, the well must be tested to ensure that it maintains mechanical integrity, unless the permittee fulfills the other requirements under 40 C.F.R. § 144.52(a)(6), prior to expiration of the two (2) year period. The permittee shall notify the Director of plugging and abandonment in accordance with the reporting procedures in Part I(E)(12) of this permit.

14. **Financial Responsibility**

The permittee shall maintain financial responsibility and resources to plug and abandon the underground injection well in accordance with 40 C.F.R. § 144.52(a)(7) as provided in Attachment R of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The permittee shall not substitute an alternative demonstration of financial responsibility from that which the Director has approved, unless the permittee has previously submitted evidence of that alternative demonstration to the Director and the Director has notified the permittee in writing that the alternative demonstration of financial responsibility is acceptable. The financial responsibility mechanism shall be updated periodically, upon request of the Director, except when Financial Statement Coverage is used as the financial mechanism, this coverage must be updated on an annual basis.

15. **Insolvency**

- a. In the event of the bankruptcy of the trustee or issuing institution of the financial mechanism, or a suspension or revocation of the authority of the trustee institution to act as trustee or the institution issuing the financial mechanism to issue such an instrument, the permittee must submit an alternative demonstration of financial responsibility acceptable to the Director within sixty (60) days after such event. Failure to do so will result in the termination of this permit pursuant to 40 C.F.R. § 144.40(a)(1).
- b. An owner or operator must also notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor of a corporate guarantee must make such a notification if he/she is named as debtor, as required under the terms of the guarantee.

16. **Corrective Action**

The permittee shall shut in the injection well whenever he/she or EPA determines that operation thereof may be causing upward fluid migration through the well bore of any improperly plugged or unplugged well in the area of review and shall take such steps as he/she can to properly plug the offending well(s). Any

operation of the well which may cause upward fluid migration from an improperly plugged or unplugged well will be considered a violation of this permit. If the permittee or the EPA determines that the permitted well is not in compliance with 40 C.F.R. § 146.8, the permittee will immediately shut in the well until such time as appropriate repairs can be effected and written approval to resume injection is given by the Director. In addition, the permittee shall not commence injection until any and all corrective action has been taken in accordance with any plan contained in Part III(C) of this permit and the requirements in Part I(E)(10) of this permit have been met.

17. **Mechanical Integrity**

- a. The permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8.
- b. A demonstration of mechanical integrity, in accordance with 40 C.F.R. § 146.8, shall be performed at least every five (5) years from the date of the last approved demonstration. The permittee shall notify the Director of his/her intent to demonstrate mechanical integrity at least thirty (30) days prior to such demonstration.
- c. The permittee shall demonstrate the mechanical integrity of the well by pressure testing whenever:
  - (i) the tubing is removed from the well or replaced;
  - (ii) the packer is reset; or,
  - (iii) a loss of mechanical integrity occurs. Operation shall cease whenever one of the aforementioned conditions occurs and not resume until the Director gives approval to recommence injection.
- d. The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.
- e. The permittee shall cause all gauges used in mechanical integrity demonstrations to be calibrated prior to the demonstration.
- f. The permittee shall cease injection if a loss of mechanical integrity occurs or is discovered during a test, or a loss of mechanical integrity as defined by 40 C.F.R. § 146.8 becomes evident during operation. Operations shall not be resumed until the Director gives approval to recommence injection.
- g. The permittee shall notify the Director of the loss of mechanical integrity, in accordance with the reporting procedures in Parts II(B)(3)(d) and

I(E)(9)(e) of this permit.

- h. The permittee shall report the result of a satisfactory mechanical integrity demonstration as provided in Part II(B)(3)(d) of this permit, except the first such result after Permit issuance, which shall be sent to the Permit Writer.

18. **Restriction on Injected Substances**

The permittee shall be restricted to the injection of fluids brought to the surface in connection with oil or natural gas production or those fluids used in the enhancement of oil and gas production as specified in 40 C.F.R. § 146.5(b). Further, no fluids other than those from sources noted in the administrative record for this permit and approved by the Director shall be injected.

## PART II

### WELL SPECIFIC CONDITIONS FOR UNDERGROUND INJECTION CONTROL PERMITS

#### A. CONSTRUCTION REQUIREMENTS

1. **Siting**

Notwithstanding any other provision of this permit, the injection well shall inject only 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 the review.

2. **Casing and Cementing**

Injection wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement to be used in the construction of the well shall be as contained in Attachments L and M of the permit application corresponding to this permit action which is hereby incorporated by reference as if they appeared fully set forth herein.

3. **Tubing and Packer Specifications**

Injection shall only take place through tubing with a packer set in the long string casing within or below the nearest cemented and impermeable confining system immediately above the injection zone. Tubing and packer specifications shall be as represented in engineering drawings contained in Attachments L and M of the permit application corresponding to this permit action which are hereby incorporated by reference as if they appeared fully set forth herein. Any proposed changes shall be submitted by the permittee in accordance with Part I(E)(9)(a) and (b) of this permit.

4. **Wellhead Specifications**

For every injection well, the operator shall provide a female fitting, with a cutoff valve, to the tubing at the wellhead, so that the amount of injection pressure being used may be measured by a representative of EPA by attaching a gauge having a male fitting.

5. **Logs and Tests**

Upon approval of the surface casing and cementation records by the Director, any logs and tests noted in Part III of this permit shall be performed, unless already provided. Prior to commencement of injection, the permittee shall submit a descriptive report prepared by a knowledgeable log analyst interpreting the results of those logs and tests to the Director for approval along with the notice of

completion required in Part I(E)(10) of this permit.

6. **Formation Data**

If not already provided, the permittee shall determine or calculate the following information concerning the injection formation and submit it to the Director for review and approval, prior to operation:

- a. Formation fluid pressure;
- b. Fracture pressure; and,
- c. Physical and chemical characteristics of the formation.

7. **Prohibition of Unauthorized Injection**

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

**B. OPERATING, MONITORING AND REPORTING REQUIREMENTS**

1. **Operating Requirements**

- a. Beginning on the effective date of this permit, the permittee is authorized to operate the injection well, subject to the limitations and monitoring requirements set forth herein. The injection pressure and injected fluid shall be limited and monitored as specified in Parts I(E)(18) and III(A) of this permit.
- b. Injection at a pressure which initiates fractures in the confining zone or causes the movement of injection or formation fluids into or between underground sources of drinking water is prohibited.
- c. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.
- d. The annulus between the tubing and the long string casing shall be filled with a liquid designed to inhibit corrosion. The annulus liquid will be monitored in accordance with Parts II(B)(2)(d) and II(B)(3)(b) of this permit. Any specific annulus requirements are contained in Part III(A) of this permit.



2. **Monitoring Requirements**

- a. Samples and measurements, taken for the purpose of monitoring as required in Part II(B)(3), shall be representative of the monitored activity. Grab samples shall be used to obtain a representative sample of the fluid to be analyzed. Part III(A) of this permit describes the sampling location and required parameters for injection fluid analysis. The permittee shall identify the types of tests and methods used to generate the monitoring data. The monitoring program shall conform to the one described in Part III(A) of this permit.
- b. **Analytical Methods** - Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of 40 C.F.R. § 136.3 or in Appendix III of 40 C.F.R. Part 261 or by other methods that have been approved by the Director.
- c. **Injection Fluid Analysis** - The nature of the injection fluids shall be monitored as specified in Part III(A) of this permit. An initial analysis of the injection fluid is contained in Attachment H of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The Director may, by written notice require the permittee to sample and analyze the injected fluid at any time.
- d. **Injection Pressure, Annulus Pressure, Annulus Liquid Loss, Flow Rate and Cumulative Volume** - Injection pressure, annulus pressure, flow rate and cumulative volume shall be recorded at least weekly and shall be reported monthly as specified in Part III(A) of this permit. Annulus liquid loss shall be recorded at least quarterly and shall be reported in accordance with the provisions of Part II(B)(3)(b), as the volume of liquid added to the annulus to keep it filled in accordance with Part II(B)(1)(d). All gauges used in monitoring shall be calibrated in accordance with Part I(E)(17)(e) of this permit.

3. **Reporting Requirements**

Copies of the monitoring results and all other reports shall be submitted to the Director at the following address:

**U.S. Environmental Protection Agency  
Region 5  
77 West Jackson Boulevard (WP-16J)  
Chicago, Illinois 60604-3590  
Attn: UIC Section, Permits Branch**

- a. **Monthly Reports** - Monitoring results obtained during each week shall be recorded on a form which has been signed and certified according to 40 C.F.R. § 144.32. The first report shall be postmarked no later than the 10th day of the month after authorization to inject has been granted. Thereafter, forms shall be submitted at the end of each month and shall be postmarked no later than the 10th day of the month following the reporting period. This report shall include the weekly measurements of injection pressure, annulus pressure, flow rate and cumulative volume as required in Parts II(B)(2)(d) and III(A) of this permit.
- b. **Quarterly Reports** - Monitoring results obtained each quarter shall include the measurement of annulus liquid loss as required in Parts II(B)(2)(d) and III(A) of this permit. Reports shall be submitted at the end of each quarter and shall be postmarked no later than the 10th day of the first month of the following quarter.
- c. **Annual Reports** - Monitoring results obtained each year shall include the measurements of injected fluid characteristics as required in Part III(A) of this permit. Reports shall be submitted at the end of each anniversary year and shall be postmarked no later than the 10th day of the first month of the following year.
- d. **Reports on Well Tests, Workovers, and Plugging and Abandonment** - The applicant shall provide the Director with the following reports and test results within sixty (60) days of completion of the activity:
  - (i) Mechanical integrity tests, except tests which the well fails in which case twenty-four (24) hour reporting under Part I(9)(e) is applicable;
  - (ii) Logging or other test data;
  - (iii) Well workovers (using EPA Form 7520-12); and
  - (iv) Plugging and abandonment.

**PART III**

**SPECIAL CONDITIONS**

These special conditions include, but are not limited to plans for maintaining correct operating procedures, monitoring conditions and reporting, as required by 40 C.F.R. Parts 144 and 146. These plans are described in detail in the permittee's application for a permit, and the permittee is required to adhere to these plans as approved by the Director, as follows:

- A. OPERATING, MONITORING AND REPORTING REQUIREMENTS (ATTACHED)
- B. PLUGGING AND ABANDONMENT PLAN (ATTACHED)
- C. CORRECTIVE ACTION PLAN (ATTACHED)



**OPERATING, MONITORING AND REPORTING REQUIREMENTS**

Characteristic	Limitation	Minimum Monitoring Requirements		Minimum Reporting Requirements
		Frequency	Type	Frequency
*Injection Pressure	3238 psig (maximum)	weekly		monthly
Annulus Pressure		weekly		monthly
Flow Rate		weekly		monthly
Cumulative Volume		weekly		monthly
Annulus Liquid Loss		quarterly		quarterly
**Chemical Composition of Injection Fluid		annually	grab	annually

**SAMPLING LOCATION:** The sample location is at the well head

\*The limitation on wellhead pressure serves to prevent confining-formation fracturing. This limitation was calculated using the following formula:  $[\{1.112 \text{ psi/ft} - (0.433 \text{ psi/ft})(\text{specific gravity})\} \times \text{depth}] - 14.7 \text{ psi}$ . The maximum injection pressure is dependent upon depth and specific gravity of the injected fluid. The Richfield Formation of the Detroit River Group at 4948 feet was used as the depth and a specific gravity of 1.05 was used for the injected fluid. The fracture gradient of 1.112 psi/ft was determined from an acid-fracture job from a nearby well.

\*\*Chemical composition analysis shall include, but not be limited to, the following: Sodium, Calcium, Magnesium, Barium, Total Iron, Chloride, Sulfate, Carbonate, Bicarbonate, Sulfide, Total Dissolved Solids, pH, Resistivity (ohm-meters @ 75°F), and Specific Gravity.





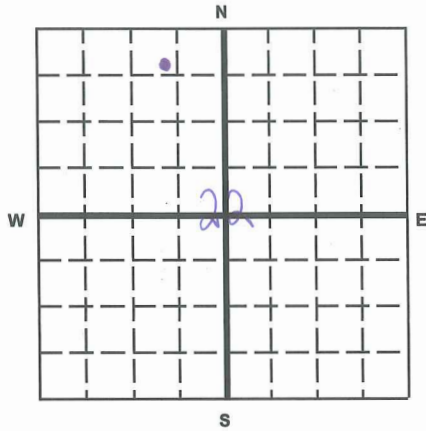
United States Environmental Protection Agency  
Washington, DC 20460

**PLUGGING AND ABANDONMENT PLAN**

Name and Address of Facility  
Holcomb 1-22  
Smith Creek Field

Name and Address of Owner/Operator  
Muskegon Development Company  
1425 South Mission Road, Mt. Pleasant, MI, 48858

Locate Well and Outline Unit on  
Section Plat - 640 Acres



State Michigan County Clare Permit Number 59345

Surface Location Description  
1/4 of NW 1/4 of NE 1/4 of NW 1/4 of Section 22 Township 19N Range 3W

Locate well in two directions from nearest lines of quarter section and drilling unit  
Surface  
Location 490 ft. frm (N/S) N Line of quarter section  
and 182 ft. from (E/W) W Line of quarter section.

TYPE OF AUTHORIZATION  
 Individual Permit  
 Area Permit  
 Rule  
Number of Wells 1  
Lease Name Holcomb

WELL ACTIVITY  
 CLASS I  
 CLASS II  
 Brine Disposal  
 Enhanced Recovery  
 Hydrocarbon Storage  
 CLASS III  
Well Number 1-22

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
9 5/8"	36		792'	12 1/4"
7"	23		1432'	8 3/4"
4.5"	11.6"		2037'	6 1/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- The Balance Method
- The Dump Bailer Method
- The Two-Plug Method
- Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	4.5"	4.5", 7"	7", 8 3/4"	9 5/8"			
Depth to Bottom of Tubing or Drill Pipe (ft)	4898'	3214'	2700'	892'			
Sacks of Cement To Be Used (each plug)	5	35	65	335			
Slurry Volume To Be Pumped (cu. ft.)	5.90	41.30	76.70	395.30			
Calculated Top of Plug (ft.)	4848'	3014'	2500'	Surface			
Measured Top of Plug (if tagged ft.)	C.I.B.P.						
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6	15.6			
Type Cement or Other Material (Class III)	Class A	Class A	Class A	Class A			

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
4948'	4954'	3164'	Assumed Free Point for 4.5"
4966'	4976'	2650'	Calculated Free Point for 7"
4990'	5000'		
5004'	5010'		

Estimated Cost to Plug Wells  
\$27,800

**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. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print) Signature Date Signed  
William C. Myler, Jr., President *William Myler* 8/8/16

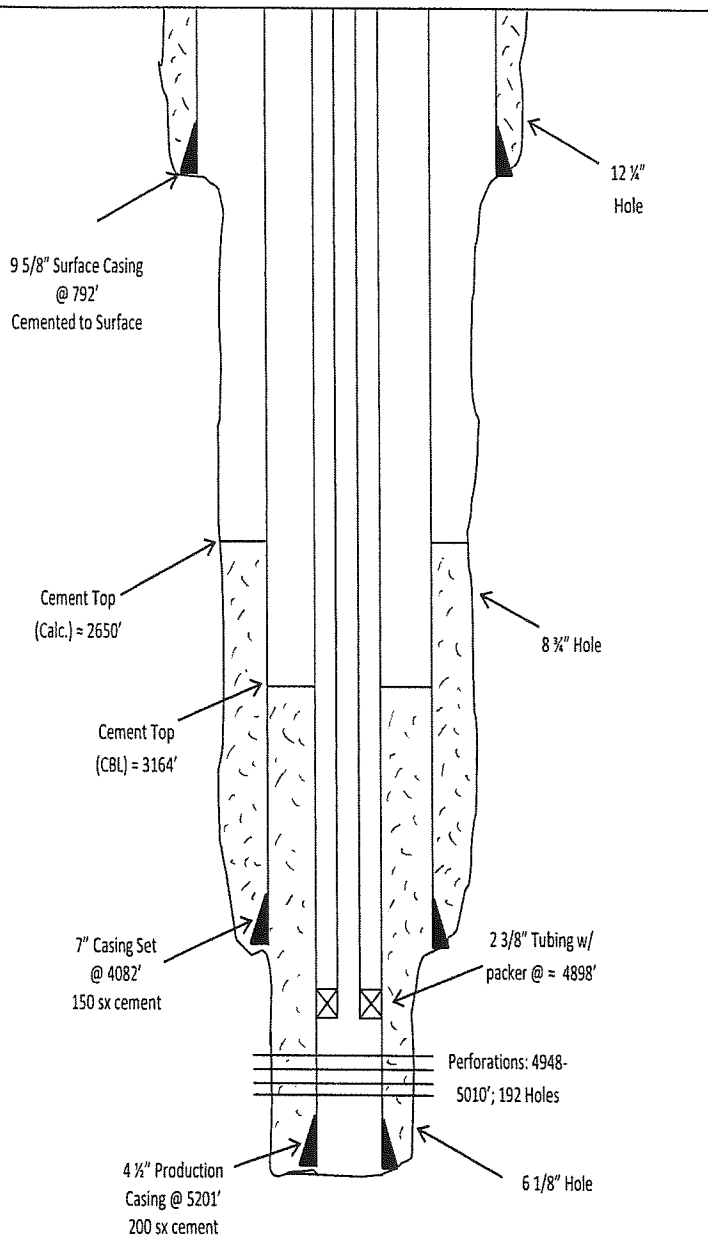




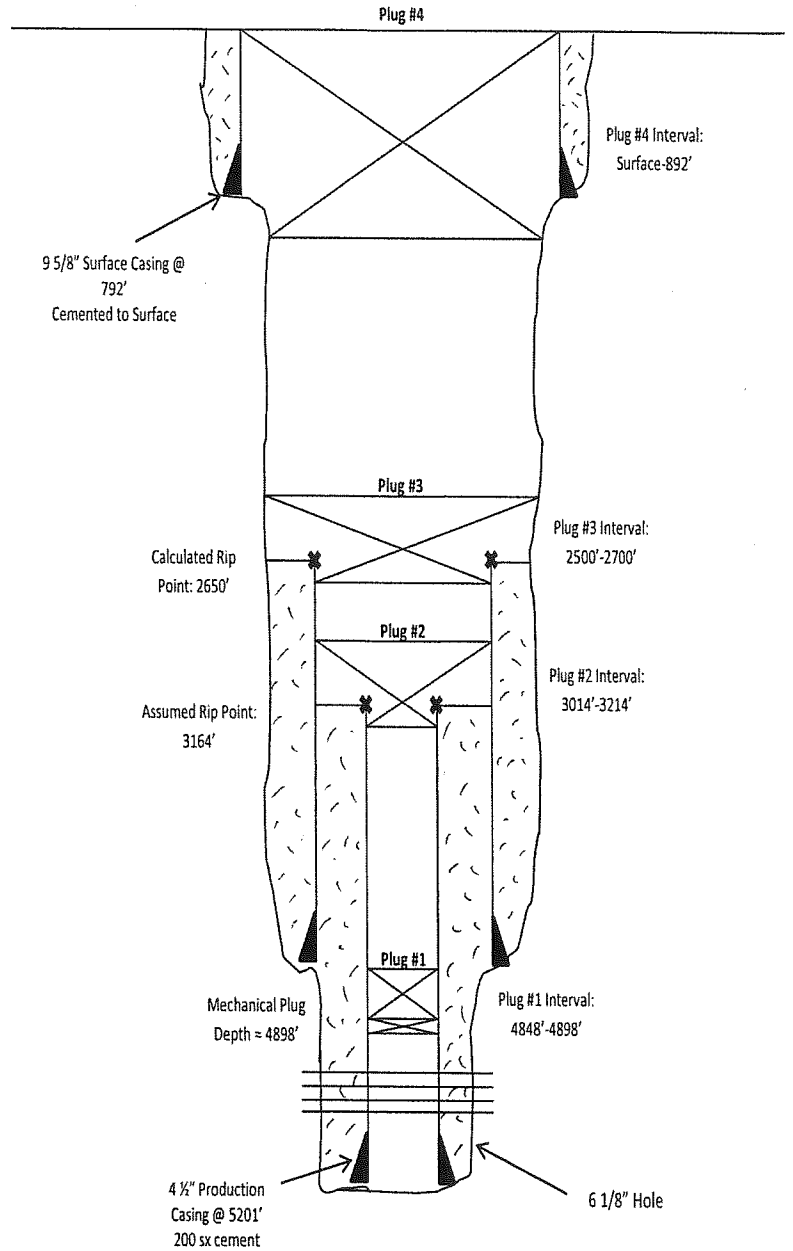
WELL CONSTRUCTION

Holcomb 1-22

Permit # 59345



PLUGGING &  
ABANDONMENT  
PLAN



RECEIVED

AUG 11 2015

WATERBURY  
REGION 5



**CORRECTIVE ACTION PLAN**

**No corrective action is required at this time.**

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# Presidential Documents

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**Title 3—****Executive Order 12898 of February 11, 1994****The President****Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations**

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

**Section 1-1. Implementation.**

**1-101. Agency Responsibilities.** To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

**1-102. Creation of an Interagency Working Group on Environmental Justice.**

(a) Within 3 months of the date of this order, the Administrator of the Environmental Protection Agency ("Administrator") or the Administrator's designee shall convene an interagency Federal Working Group on Environmental Justice ("Working Group"). The Working Group shall comprise the heads of the following executive agencies and offices, or their designees: (a) Department of Defense; (b) Department of Health and Human Services; (c) Department of Housing and Urban Development; (d) Department of Labor; (e) Department of Agriculture; (f) Department of Transportation; (g) Department of Justice; (h) Department of the Interior; (i) Department of Commerce; (j) Department of Energy; (k) Environmental Protection Agency; (l) Office of Management and Budget; (m) Office of Science and Technology Policy; (n) Office of the Deputy Assistant to the President for Environmental Policy; (o) Office of the Assistant to the President for Domestic Policy; (p) National Economic Council; (q) Council of Economic Advisers; and (r) such other Government officials as the President may designate. The Working Group shall report to the President through the Deputy Assistant to the President for Environmental Policy and the Assistant to the President for Domestic Policy.

(b) The Working Group shall: (1) provide guidance to Federal agencies on criteria for identifying disproportionately high and adverse human health or environmental effects on minority populations and low-income populations;

(2) coordinate with, provide guidance to, and serve as a clearinghouse for, each Federal agency as it develops an environmental justice strategy as required by section 1-103 of this order, in order to ensure that the administration, interpretation and enforcement of programs, activities and policies are undertaken in a consistent manner;

(3) assist in coordinating research by, and stimulating cooperation among, the Environmental Protection Agency, the Department of Health and Human Services, the Department of Housing and Urban Development, and other agencies conducting research or other activities in accordance with section 3-3 of this order;

(4) assist in coordinating data collection, required by this order;

(5) examine existing data and studies on environmental justice;

(6) hold public meetings as required in section 5-502(d) of this order; and

(7) develop interagency model projects on environmental justice that evidence cooperation among Federal agencies.

**1-103. *Development of Agency Strategies.*** (a) Except as provided in section 6-605 of this order, each Federal agency shall develop an agency-wide environmental justice strategy, as set forth in subsections (b)-(e) of this section that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The environmental justice strategy shall list programs, policies, planning and public participation processes, enforcement, and/or rulemakings related to human health or the environment that should be revised to, at a minimum: (1) promote enforcement of all health and environmental statutes in areas with minority populations and low-income populations; (2) ensure greater public participation; (3) improve research and data collection relating to the health of and environment of minority populations and low-income populations; and (4) identify differential patterns of consumption of natural resources among minority populations and low-income populations. In addition, the environmental justice strategy shall include, where appropriate, a timetable for undertaking identified revisions and consideration of economic and social implications of the revisions.

(b) Within 4 months of the date of this order, each Federal agency shall identify an internal administrative process for developing its environmental justice strategy, and shall inform the Working Group of the process.

(c) Within 6 months of the date of this order, each Federal agency shall provide the Working Group with an outline of its proposed environmental justice strategy.

(d) Within 10 months of the date of this order, each Federal agency shall provide the Working Group with its proposed environmental justice strategy.

(e) Within 12 months of the date of this order, each Federal agency shall finalize its environmental justice strategy and provide a copy and written description of its strategy to the Working Group. During the 12 month period from the date of this order, each Federal agency, as part of its environmental justice strategy, shall identify several specific projects that can be promptly undertaken to address particular concerns identified during the development of the proposed environmental justice strategy, and a schedule for implementing those projects.

(f) Within 24 months of the date of this order, each Federal agency shall report to the Working Group on its progress in implementing its agency-wide environmental justice strategy.

(g) Federal agencies shall provide additional periodic reports to the Working Group as requested by the Working Group.

**1-104. *Reports to the President.*** Within 14 months of the date of this order, the Working Group shall submit to the President, through the Office of the Deputy Assistant to the President for Environmental Policy and the Office of the Assistant to the President for Domestic Policy, a report that describes the implementation of this order, and includes the final environmental justice strategies described in section 1-103(e) of this order.

**Sec. 2-2. *Federal Agency Responsibilities for Federal Programs.*** Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin.

**Sec. 3-3. Research, Data Collection, and Analysis.**

**3-301. Human Health and Environmental Research and Analysis.** (a) Environmental human health research, whenever practicable and appropriate, shall include diverse segments of the population in epidemiological and clinical studies, including segments at high risk from environmental hazards, such as minority populations, low-income populations and workers who may be exposed to substantial environmental hazards.

(b) Environmental human health analyses, whenever practicable and appropriate, shall identify multiple and cumulative exposures.

(c) Federal agencies shall provide minority populations and low-income populations the opportunity to comment on the development and design of research strategies undertaken pursuant to this order.

**3-302. Human Health and Environmental Data Collection and Analysis.** To the extent permitted by existing law, including the Privacy Act, as amended (5 U.S.C. section 552a): (a) each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information assessing and comparing environmental and human health risks borne by populations identified by race, national origin, or income. To the extent practical and appropriate, Federal agencies shall use this information to determine whether their programs, policies, and activities have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations;

(b) In connection with the development and implementation of agency strategies in section 1-103 of this order, each Federal agency, whenever practicable and appropriate, shall collect, maintain and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations, when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action. Such information shall be made available to the public, unless prohibited by law; and

(c) Each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding Federal facilities that are: (1) subject to the reporting requirements under the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. section 11001-11050 as mandated in Executive Order No. 12856; and (2) expected to have a substantial environmental, human health, or economic effect on surrounding populations. Such information shall be made available to the public, unless prohibited by law.

(d) In carrying out the responsibilities in this section, each Federal agency, whenever practicable and appropriate, shall share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among Federal agencies and with State, local, and tribal governments.

**Sec. 4-4. Subsistence Consumption of Fish and Wildlife.**

**4-401. Consumption Patterns.** In order to assist in identifying the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, Federal agencies, whenever practicable and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. Federal agencies shall communicate to the public the risks of those consumption patterns.

**4-402. Guidance.** Federal agencies, whenever practicable and appropriate, shall work in a coordinated manner to publish guidance reflecting the latest scientific information available concerning methods for evaluating the human health risks associated with the consumption of pollutant-bearing fish or

wildlife. Agencies shall consider such guidance in developing their policies and rules.

**Sec. 5-5. *Public Participation and Access to Information.*** (a) The public may submit recommendations to Federal agencies relating to the incorporation of environmental justice principles into Federal agency programs or policies. Each Federal agency shall convey such recommendations to the Working Group.

(b) Each Federal agency may, whenever practicable and appropriate, translate crucial public documents, notices, and hearings relating to human health or the environment for limited English speaking populations.

(c) Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public.

(d) The Working Group shall hold public meetings, as appropriate, for the purpose of fact-finding, receiving public comments, and conducting inquiries concerning environmental justice. The Working Group shall prepare for public review a summary of the comments and recommendations discussed at the public meetings.

**Sec. 6-6. *General Provisions.***

**6-601. *Responsibility for Agency Implementation.*** The head of each Federal agency shall be responsible for ensuring compliance with this order. Each Federal agency shall conduct internal reviews and take such other steps as may be necessary to monitor compliance with this order.

**6-602. *Executive Order No. 12250.*** This Executive order is intended to supplement but not supersede Executive Order No. 12250, which requires consistent and effective implementation of various laws prohibiting discriminatory practices in programs receiving Federal financial assistance. Nothing herein shall limit the effect or mandate of Executive Order No. 12250.

**6-603. *Executive Order No. 12875.*** This Executive order is not intended to limit the effect or mandate of Executive Order No. 12875.

**6-604. *Scope.*** For purposes of this order, Federal agency means any agency on the Working Group, and such other agencies as may be designated by the President, that conducts any Federal program or activity that substantially affects human health or the environment. Independent agencies are requested to comply with the provisions of this order.

**6-605. *Petitions for Exemptions.*** The head of a Federal agency may petition the President for an exemption from the requirements of this order on the grounds that all or some of the petitioning agency's programs or activities should not be subject to the requirements of this order.

**6-606. *Native American Programs.*** Each Federal agency responsibility set forth under this order shall apply equally to Native American programs. In addition, the Department of the Interior, in coordination with the Working Group, and, after consultation with tribal leaders, shall coordinate steps to be taken pursuant to this order that address Federally-recognized Indian Tribes.

**6-607. *Costs.*** Unless otherwise provided by law, Federal agencies shall assume the financial costs of complying with this order.

**6-608. *General.*** Federal agencies shall implement this order consistent with, and to the extent permitted by, existing law.

**6-609. *Judicial Review.*** This order is intended only to improve the internal management of the executive branch and is not intended to, nor does it create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any person. This order shall not be construed to create any right to judicial review involving the compliance or noncompliance

of the United States, its agencies, its officers, or any other person with this order.

*William J. Clinton*

THE WHITE HOUSE,  
*February 11, 1994.*





**FLUID MIGRATION MECHANISMS DUE TO  
FAULTY WELL DESIGN AND/OR CONSTRUCTION:  
AN OVERVIEW AND RECENT EXPERIENCES IN THE  
PENNSYLVANIA MARCELLUS PLAY**

**BY**

**ANTHONY R. INGRAFFEA, PH.D., P.E.**

**JANUARY, 2013**

**1.0 INTRODUCTION: LOSS OF WELL STRUCTURAL INTEGRITY**

An overall description of mechanisms by which oil and gas wells can develop gas and other fluid leaks can be found in Dusseault *et al.* (2000). These mechanisms can be exacerbated with repeated pressurization of the casing, with open-annulus sections along the casing, and with high gas pressures encountering curing cement or entering such open-hole sections. All of these exacerbating factors lead to more rapid occurrence and upward growth of circumferential fractures, essentially disbonding, in the rock-cement and /or the cement-casing interface.

A schematic depiction of the phenomenon of gas, or additional fluid, migration upwards along a wellbore is presented in Figure 1a, for the simplest case of bypass by disbonding along the surface casing. Figure 2 is a close-up schematic showing other possible fluid pathways. Additional layers of casing and attendant cement interfaces, present in the defective wells in question, do not eliminate these phenomenon; they may, in fact, increase its likelihood. Figure 3 is a snapshot of yet another situation in which an intermediate casing annulus is left uncemented, but open to a shallow gas source.

These phenomena are not rare in the oil and gas industry. Data on failure rates for cement jobs leading to sustained casing pressure and possible fluid migration into USDW can be found, for example, in Figure 4 from Brufatto *et al.* (2003), who state:

“Since the earliest gas wells, uncontrolled migration of hydrocarbons to the surface has challenged the oil and gas industry...many of today’s wells are at risk. Failure to isolate sources of hydrocarbon either early in the well-construction process or long after production begins has resulted in abnormally pressurized casing strings and leaks of gas into zones that would otherwise not be gas bearing”.

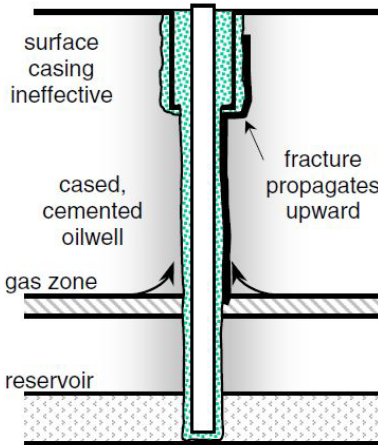
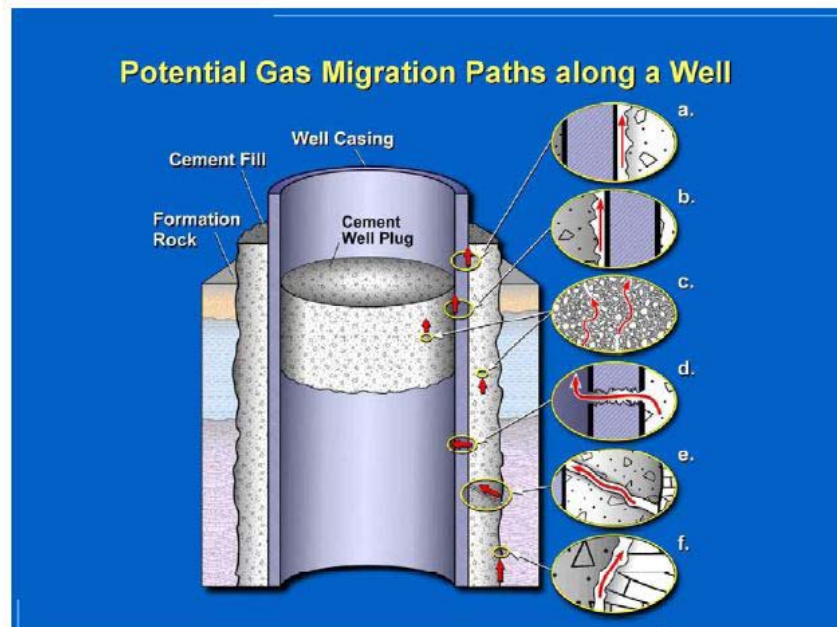


Figure 1. Simplified schematic showing phenomenon of upward gas migration along a casing string. From Dusseault *et al.*, 2000.



Source: Alberta Energy Utilities Board

Figure 2. Schematic of details of possible fluid migration paths in and around a cased/cemented well.

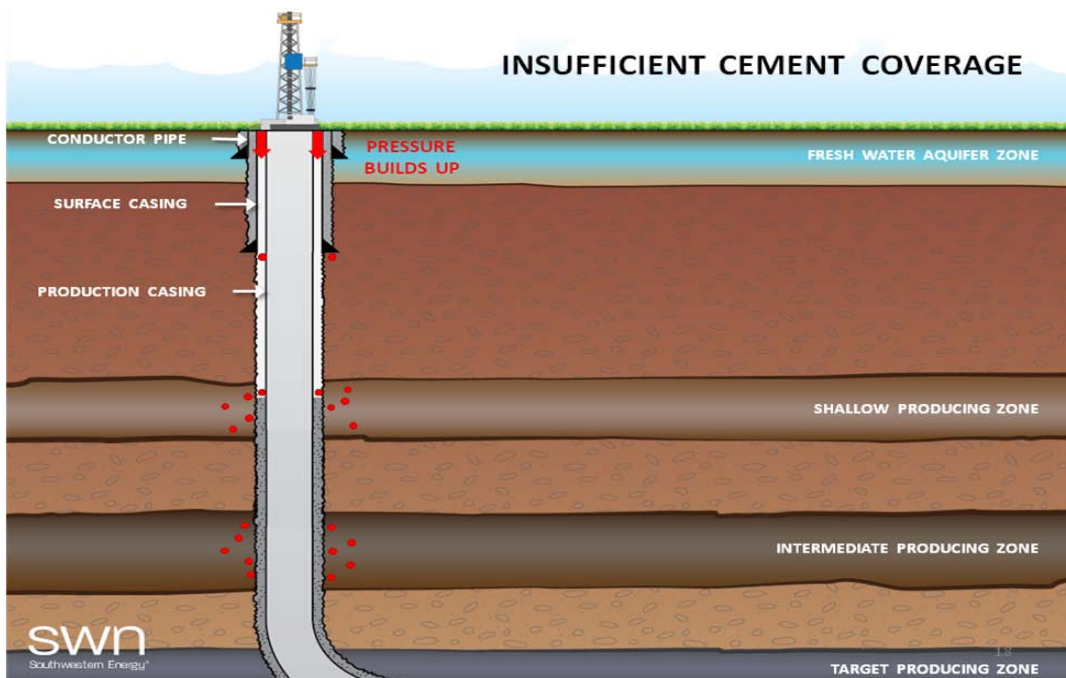
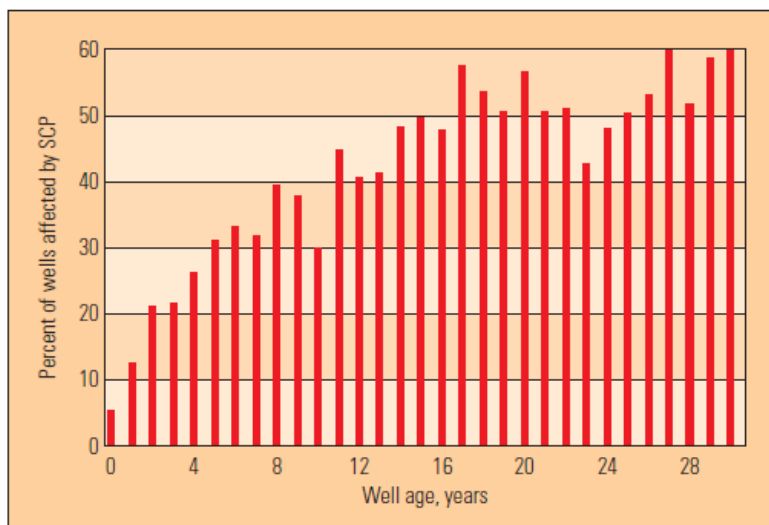


Figure 3. Depiction of entry of gas from a shallow source into an un-cemented annulus, leading to sustained casing pressure and migration of fluids into an USDW. From Boling (2011).



^ Wells with SCP by age. Statistics from the United States Mineral Management Service (MMS) show the percentage of wells with SCP for wells in the outer continental shelf (OCS) area of the Gulf of Mexico, grouped by age of the wells. These data do not include wells in state waters or land locations.

Figure 4. Data on frequency of occurrence of sustained casing pressure (SCP) in offshore wells.

From Brufatto *et al.* (2003).

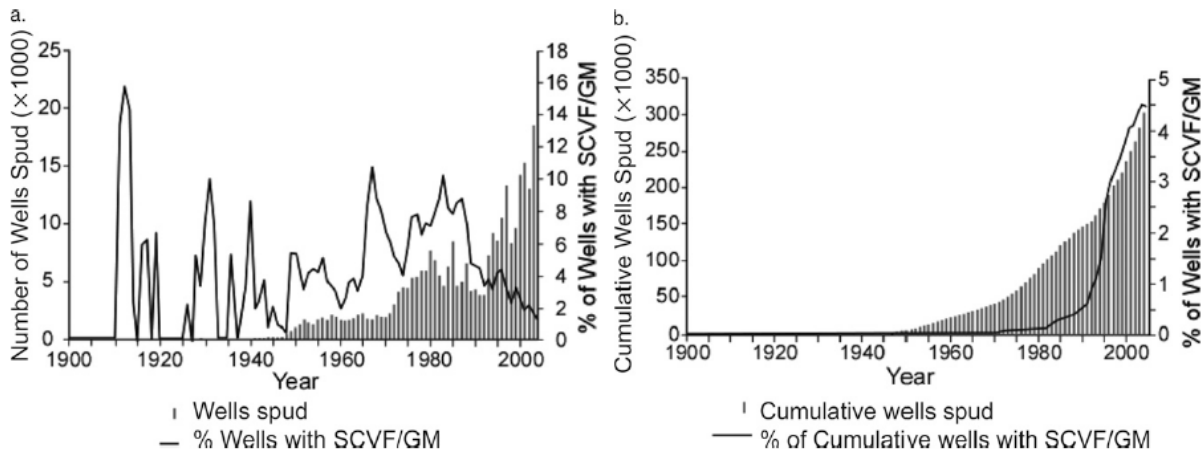


Fig. 8—Historical levels of drilling activity and SCVF/GM occurrence in Alberta: (a) by year of well spud and (b) by cumulative wells drilled.

Figure 5. Data on frequency of occurrence of sustained casing vent flow (SCVF) or gas migration (GM). From Watson *et al.* (2009).

In their statistical analysis of information about nearly 315,000 onshore oil and gas wells, Watson and Bachu (2009) state:

“Low cement top or exposed casing was found to be the most important indicator for SCVF/GM. The effect of low or poor cement was evaluated on the basis of the location of the SCVF/GM compared to the cement top... the vast majority of SCVF/GM originates from formations not isolated by cement.”

Figure 5 shows data gathered by Watson and Bachu that is consistent for young wells with that shown in Figure 4. Note that all these citations are from industry sources. It should be noted that, even with ongoing technological and chemistry improvements in cement and in cementing, loss of wellbore integrity is still common. For example, during 2011, Cabot drilled 68 new Marcellus wells in Pennsylvania, and was cited by PA DEP seven times for “Failure to report defective, insufficient, or improperly cemented casing w/in 24 hrs or submit plan to correct w/in 30 days”. Chesapeake Appalachia drilled 279 wells and was cited 24 times for the same violation. A summary of the incidence of well failure in the PA Marcellus since 2010 is presented in Section 3, below.

## 2.0 PREVALENCE OF FLUID MIGRATION FROM FAULTY WELLS

The science on contamination of drinking water from shale gas drilling, fracing, and production, is recent, ongoing, and incomplete. A peer-reviewed, archival journal study from Duke University (Osborne, *et al.*, 2011) found apparent migration of substantial amounts of methane from gas wells to private water wells as far out as 1000m in the Marcellus play in Pennsylvania. A more recent paper from the Duke University team (Warner *et al.*, 2012)

documented geochemical evidence for possible natural migration of Marcellus formation brine to shallow aquifers in Pennsylvania. Also, the U.S. Environmental Protection Agency (EPA, 2011) recently released a preliminary report from an on-going study in Pavilion, WY, that suggests that substances used in fracking might migrate into adjacent water-bearing strata. The study also found clear evidence that there had been migration of methane from gas wells to nearby drinking water wells - likely caused by deficient cement jobs. Inadequate well construction and, of course, spills have been implicated in many states in a large number of cases of migration of drilling related substances into nearby drinking water.

Along with these fairly direct evaluations of the migration of methane and other substances, industry sources have asserted that private water wells are often contaminated by "naturally occurring" methane. This is often presented in an apparently analytical but confusing way, suggesting that the appearance of methane in drinking water wells is sort of "common" and thus unlikely related to any gas well drilling. Such presentation fails nearly entirely to, first, distinguish between dangerous/hazardous levels of methane in water (7 mg/L or more in PA), and much lower levels that are not generally taken to be of concern. Second, it ignores the prevalence or likelihood of having a dangerous "natural" level of methane in drinking water. Third, it ignores any time line: has there been any significant change in the concentration of methane concurrent with the beginning of nearby gas field development?

The New York DEC's data (NYS rdSGEIS, pg. 4-39) make crystal clear that for a 2010 sample of water wells (n=46) in the "Delaware, Genesee, and St. Lawrence River Basins," presumably not near gas wells, just 2% of the wells had a dangerous level over 10 mg/L. One well had a level of 22 mg/L; the remaining wells then had an average level of 0.31 mg/L. This low percentage of "normal" risk has been confirmed repeatedly in studies in PA, Figure 6, in the Southern Tier of NY (1450 water wells, USGS, 2010), in Alberta, Canada (360,000 wells, Griffiths, 2007) and by both independent investigations and by testing by gas drillers (e.g., Boyer, *et al.*, 2011). None of these findings suggest, in any way, that dangerous levels of methane are at all common in rural private water wells. Thus, a fairly strong implication is that, if and when methane does occur at high levels in water wells near gas drilling, it is likely due to some aspects of gas drilling, fracking and/or production operations themselves. This is consistent with both the Osborn, *et al.* (2011) study and the EPA Pavilion (2011) preliminary report. Exact migration mechanisms are not yet completely clear in each case, but the potential well failure mechanisms described in the previous section are often implicated.

### **3.0 RECENT EXPERIENCES IN THE PA MARCELLUS PLAY**

A previous review of the PA DEP Marcellus Violations Database at

[http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil\\_Gas/OG\\_Compliance](http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/OG_Compliance)

## Frequency Distribution of Methane Concentration in Water Supplies in Susquehanna County, PA

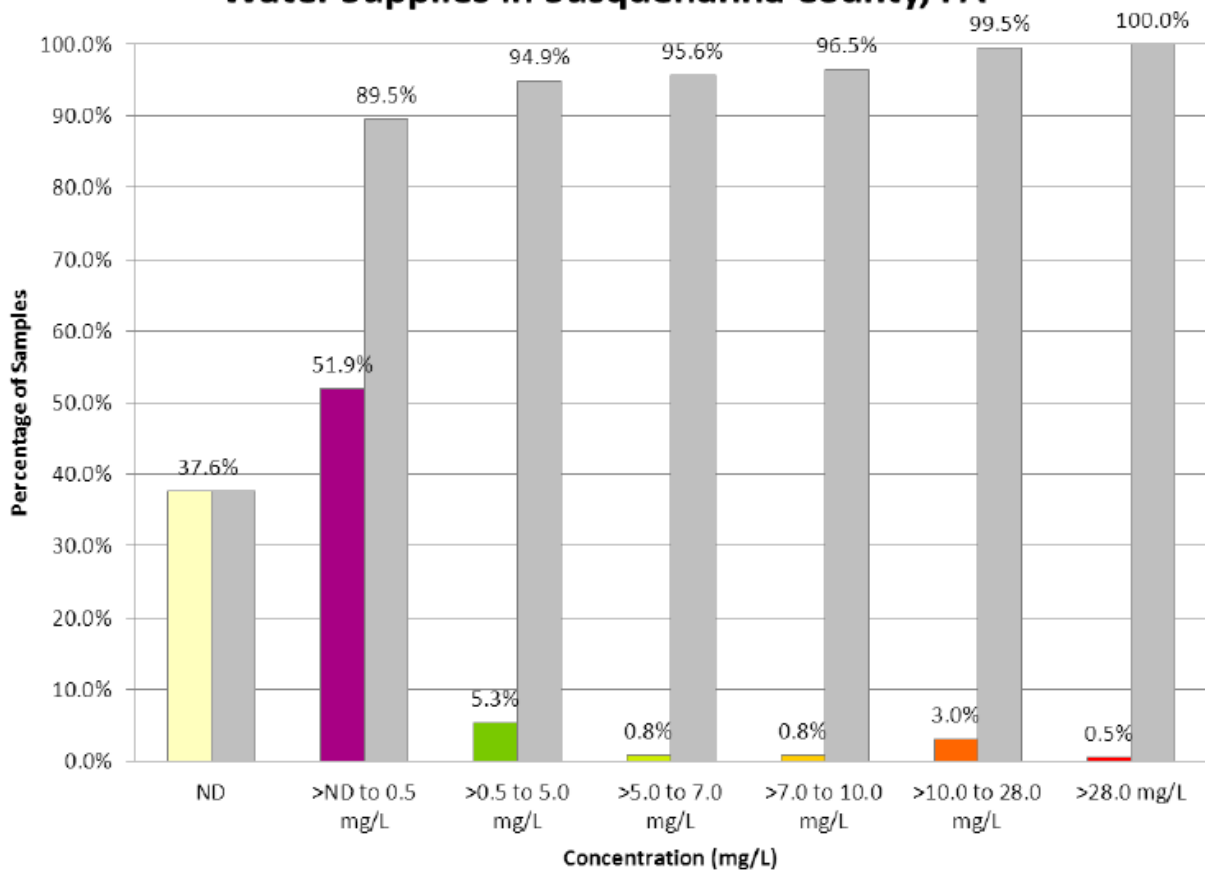


Figure 6. Data collected by PA DEP on methane concentration in private water wells in Susquehanna County, PA. 2433 water supplies were tested: 89.5% had concentrations of methane < 0.5 mg/L, 95.6% had concentrations of methane < 7.0 mg/L. Courtesy of Seth Pelepko, PA DEP.

resulted in the data shown in Figure 7. However, a recent re-review of this database revealed that the data shown in Figure 7 are inaccurate. That data was obtained by searching the violations database for all violations indicating that a well was leaking outside its production casing. Table 1 shows all the violation codes used by PA DEP to indicate that a well is leaking outside its production casing, why it might have occurred, and the consequences of such failure. These were the codes used to filter the entire violations database to identify wells with compromised structural integrity presented in Figure 7.

However, recently it has come to our attention that this filtering process results in a *lower-bound on the number of wells with compromised structural integrity*. That is, more wells have failed cement jobs than have been reported through the violations shown in Figure 7. All inspection

1,454 wells drilled in 2010.  
 90 well failures.  
 6.2% rate of failure.

1,937 wells drilled in 2011.  
 121 well failures.  
 6.2% rate of failure.

262 wells drilled in Jan/Feb 2012  
 19 well failures  
 7.2% rate of failure

Consistent with previous industry data,  
 and not improving.

Figure 7. Preliminary results of survey of leaking wells in the Pennsylvania Marcellus play based on violations issued by the DEP. Violations data from [http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil\\_Gas/Oil\\_Gas/Compliance](http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/Oil_Gas/Compliance)

Table 1. Violation Codes Used to Identify Wells with Violations for Figure 7.

78.73A - Operator shall prevent gas and other fluids from lower formations from entering fresh groundwater.
78.81D2 - Failure to case and cement properly through storage reservoir or storage horizon
78.83A - Diameter of bore hole not 1 inch greater than casing/casing collar diameter
78.73B - Excessive casing seat pressure
78.83GRNDWTR - Improper casing to protect fresh groundwater
78.83COALCSG - Improper coal protective casing and cementing procedures
78.85 - Inadequate, insufficient, and/or improperly installed cement
78.86 - Failure to report defective, insufficient, or improperly cemented casing
207B - Failure to case and cement to prevent migrations into fresh groundwater

reports for the more than 6000 wells drilled to-date in the Marcellus in PA were reviewed; this is a more complete and revealing search than just filtering on certain violations. The inspection reports indicate that many failed wells were not issued violations. Rather, they received “Violation Pending” comments; or comments indicating that “squeezing”, a cement repair procedure which would only be done if a well was leaking outside its production casing, had been done or was to be done; or comments that repairs were underway for a perforated casing; or comments that gas was detected at the wellhead at or above the LEL (lower explosive limit).

Table 2 shows the comparison for each of 2010, 2011, and 2012 between the numbers of wells that had actually received violations, and those that were noted in inspection comments to be leaking but had not received violations.

Table 2. Additional Counts of Wells with Loss of Integrity Included in Figure 8.

2010	64 wells with violations, 47 additional wells with loss of integrity noted in Inspection Comments
2011	97 wells with violations, 45 additional wells with loss of integrity noted in Inspection Comments
2012	44 wells with violations, 76 additional wells with loss of integrity noted in Inspection Comments

Figure 8 contains the revised well failure rates, using both actual violations and inspection comments to identify leaking wells. The complete database supporting the results shown in Figure 8 is available on request to <http://www.psehealthyenergy.org/CONTACT>.

Finally, it should be noted that a well that appears, at its wellhead, not to be leaking is not necessarily a sound well. It is well known that fluid migration can occur a significant distance away from the wellhead of a well that appears on inspection of only the wellhead to be of sound structural integrity.

#### 4.0 SUMMARY

The most recent experience with shale gas wells in the Pennsylvania Marcellus play reflects long term, world-wide industry data with respect to new wells with compromised structural integrity. Operator-wide statistics in Pennsylvania show that about 6-7% of new wells drilled in each of the past three years have compromised structural integrity. This apparently low failure rate should be seen in the context of a full buildout in the Pennsylvania Marcellus of at least 100,000 wells, and in the entire Marcellus, including New York, of twice that number. Therefore, based on recent statistical evidence, one could expect at least 10,000 new wells with compromised structural integrity. It is too early to discern whether the other industry experience with this technical problem, an increase in loss of integrity with well age, will also be reflected. However,



at play in modern shale gas development are many of the key factors identified by industry researchers as having a negative influence on well structural integrity: the need for deviated wells, rapid development of a field, presence of "shallow" high-pressure gas horizons, and disturbance of young cement due to adjacent drilling activities on the same pad.

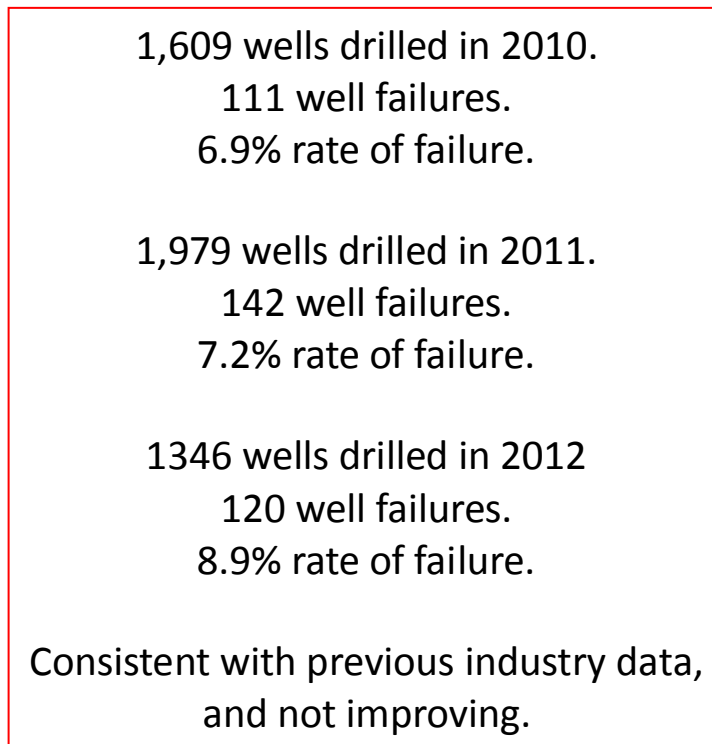


Figure 8. Revised results of survey of leaking wells in the Pennsylvania Marcellus play based on violations issued by the DEP and well inspector comments. Violations and comments data from [http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil\\_Gas/OG\\_Compliance](http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/OG_Compliance)

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# Exhibit 28

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**INJECTION WELLS****Injection Wells: The Poison Beneath Us**

Lax oversight, uncertain science plague program under which industries dump trillions of gallons of waste underground

by Abrahm Lustgarten, June 21, 2012, 8:20 a.m. EDT



Over the past several decades, U.S. industries have injected more than 30 trillion gallons of toxic liquid deep into the earth, using broad expanses of the nation's geology as an invisible dumping ground.

No company would be allowed to pour such dangerous chemicals into the rivers or onto the soil. But until recently, scientists and environmental officials have assumed that deep layers of rock beneath the earth would safely entomb the waste for millennia.

There are growing signs they were mistaken.

Records from disparate corners of the United States show that wells drilled to bury this waste deep beneath the ground have repeatedly leaked, sending dangerous chemicals and waste gurgling to the surface or, on occasion, seeping into shallow aquifers that store a significant portion of the nation's drinking water.

In 2010, contaminants from such a well bubbled up in a west Los Angeles dog park. Within the past three years, similar fountains of oil and gas drilling waste have appeared in Oklahoma and Louisiana. In South Florida, 20 of the nation's most stringently regulated disposal wells failed in the early 1990s, releasing partly treated sewage into aquifers that may one day be needed to supply Miami's drinking water.

There are more than 680,000 underground waste and injection wells nationwide, more than 150,000 of which shoot industrial fluids thousands of feet below the surface. Scientists and federal regulators acknowledge they do not know how many of the sites are leaking.

Federal officials and many geologists insist that the risks posed by all this dumping are minimal. Accidents are uncommon, they say, and groundwater reserves — from which most Americans get their drinking water — remain safe and far exceed any plausible threat posed by injecting toxic chemicals into the ground.

But in interviews, several key experts acknowledged that the idea that injection is safe rests on science that has not kept pace with reality, and on oversight that doesn't always work.

"In 10 to 100 years we are going to find out that most of our groundwater is polluted," said Mario Salazar, an engineer who worked for 25 years as a technical expert with the EPA's underground injection program in Washington. "A lot of people are going to get sick, and a lot of people may die."

The boom in oil and natural gas drilling is deepening the uncertainties, geologists acknowledge. Drilling produces copious amounts of waste,

burdening regulators and demanding hundreds of additional disposal wells. Those wells — more holes punched in the ground — are changing the earth's geology, adding man-made fractures that allow water and waste to flow more freely.

"There is no certainty at all in any of this, and whoever tells you the opposite is not telling you the truth," said Stefan Finsterle, a leading hydrogeologist at Lawrence Berkeley National Laboratory who specializes in understanding the properties of rock layers and modeling how fluid flows through them. "You have changed the system with pressure and temperature and fracturing, so you don't know how it will behave."

A ProPublica review of well records, case histories and government summaries of more than 220,000 well inspections found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also show wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination.

Structurally, a disposal well is the same as an oil or gas well. Tubes of concrete and steel extend anywhere from a few hundred feet to two miles into the earth. At the bottom, the well opens into a natural rock formation. There is no container. Waste simply seeps out, filling tiny spaces left between the grains in the rock like the gaps between stacked marbles.

Many scientists and regulators say the alternatives to the injection process — burning waste, treating wastewater, recycling, or disposing of waste on the surface — are far more expensive or bring additional environmental risks.

Subterranean waste disposal, they point out, is a cornerstone of the nation's economy, relied on by the pharmaceutical, agricultural and chemical industries. It's also critical to a future less dependent on foreign oil: Hydraulic fracturing, "clean coal" technologies, nuclear fuel

production and carbon storage (the keystone of the strategy to address climate change) all count on pushing waste into rock formations below the earth's surface.

The U.S. Environmental Protection Agency, which has primary regulatory authority over the nation's injection wells, would not discuss specific well failures identified by ProPublica or make staffers available for interviews. The agency also declined to answer many questions in writing, though it sent responses to several. Its director for the Drinking Water Protection Division, Ann Codrington, sent a statement to ProPublica defending the injection program's effectiveness.

"Underground injection has been and continues to be a viable technique for subsurface storage and disposal of fluids when properly done," the statement said. "EPA recognizes that more can be done to enhance drinking water safeguards and, along with states and tribes, will work to improve the efficiency of the underground injection control program."

Still, some experts see the well failures and leaks discovered so far as signs of broader problems, raising concerns about how much pollution may be leaking out undetected. By the time the damage is discovered, they say, it could be irreversible.

"Are we heading down a path we might regret in the future?" said Anthony Ingraffea, a Cornell University engineering professor who has been an outspoken critic of claims that wells don't leak. "Yes."

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In September 2003, Ed Cowley got a call to check out a pool of briny water in a bucolic farm field outside Chico, Texas. Nearby, he said, a stand of trees had begun to wither, their leaves turning crispy brown and falling to the ground.

Chico, a town of about 1,000 people 50 miles northwest of Fort Worth, lies in the heart of Texas' Barnett Shale. Gas wells dot the landscape like mailboxes in suburbia. A short distance away from the murky pond, an oil

services company had begun pumping millions of gallons of drilling waste into an injection well.

Regulators refer to such waste as salt water or brine, but it often includes less benign contaminants, including fracking chemicals, benzene and other substances known to cause cancer.

The well had been authorized by the Railroad Commission of Texas, which once regulated railways but now oversees 260,000 oil and gas wells and 52,000 injection wells. (Another agency, the Texas Commission on Environmental Quality, regulates injection wells for waste from other industries.)

Before issuing the permit, commission officials studied mathematical models showing that waste could be safely injected into a sandstone layer about one-third of a mile beneath the farm. They specified how much waste could go into the well, under how much pressure, and calculated how far it would dissipate underground. As federal law requires, they also reviewed a quarter-mile radius around the site to make sure waste would not seep back toward the surface through abandoned wells or other holes in the area.

Yet the precautions failed. "Salt water" brine migrated from the injection site and shot back to the surface through three old well holes nearby.

"Have you ever seen an artesian well?" recalled Cowley, Chico's director of public works. "It was just water flowing up out of the ground."

Despite residents' fears that the injected waste could be making its way toward their drinking water, commission officials did not sample soil or water near the leak.

If the injection well waste "had threatened harm to the ground water in the area, an in-depth RRC investigation would have been initiated," Ramona Nye, a spokeswoman for Texas' Railroad Commission, wrote in an email.

The agency disputes Cowley's description of a pool of brine or of dead trees, saying that the waste barely spilled beyond the overflowing wells,



though officials could not identify any documents or staffers who contradicted Cowley's recollections. Accounts similar to Cowley's appeared in an article about the leak in the Wise County Messenger, a local newspaper. The agency has destroyed its records about the incident, saying it is required to keep them for only two years.

After the breach, the commission ordered two of the old wells to be plugged with cement and restricted the rate at which waste could be injected into the well. It did not issue any violations against the disposal company, which had followed Texas' rules, regulators said. The commission allowed the well operator to continue injecting thousands of barrels of brine into the well each day. A few months later, brine began spurting out of three more old wells nearby.

"It's kind of like Whac-a-Mole, where one thing pops up and by the time you go to hit it, another thing comes up," Cowley said. "It was frustrating. ... If your water goes, what does that do to the value of your land?"

Deep well injection takes place in 32 states, from Pennsylvania to Michigan to California. Most wells are around the Great Lakes and in areas where oil and gas is produced: along the Appalachian crest and the Gulf Coast, in California and in Texas, which has more wells for hazardous industrial waste and oil and gas waste than any other state.

Federal rules divide wells into six classes based on the material they hold and the industry that produced it. Class 1 wells handle the most hazardous materials, including fertilizers, acids and deadly compounds such as asbestos, PCBs and cyanide. The energy industry has its own category, Class 2, which includes disposal wells and wells in which fluids are injected to force out trapped oil and gas. The most common wells, called Class 5, are a sort of catch-all for everything left over from the other categories, including storm-water runoff from gas stations.

The EPA requires that Class 1 and 2 injection wells be drilled the deepest to assure that the most toxic waste is pushed far below drinking water aquifers. Both types of wells are supposed to be walled with multiple layers of steel tubing and cement and regularly monitored for cracks.

Officials' confidence in this manner of disposal stems not only from safety precautions, but from an understanding of how rock formations trap fluid.

Underground waste, officials say, is contained by layer after layer of impermeable rock. If one layer leaks, the next blocks the waste from spreading before it reaches groundwater. The laws of physics and fluid dynamics should ensure that the waste can't spread far and is diluted as it goes.

The layering "is a very strong phenomenon and it's on our side," said Susan Hovorka, a senior research scientist at the University of Texas at Austin's Bureau of Economic Geology.

According to risk analyses cited in EPA documents, a significant well leak that leads to water contamination is highly unlikely — on the order of one in a million.

Once waste is underground, though, there are few ways to track how far it goes, how quickly or where it winds up. There is plenty of theory, but little data to prove the system works.

"I do think the risks are low, but it has never been adequately demonstrated," said John Apps, a leading geoscientist who advises the Department of Energy for Lawrence Berkeley National Labs. "Every statement is based on a collection of experts that offer you their opinions. Then you do a scientific analysis of their opinions and get some probability out of it. This is a wonderful way to go when you don't have any evidence one way or another... But it really doesn't mean anything scientifically."

The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures. This information is the EPA's primary means of tracking the system's health on a national scale.

Yet, in response to questions from ProPublica, the EPA acknowledged it has done very little with the data it collects. The agency could not provide ProPublica with a tally of how frequently wells fail or of how often disposal

regulations are violated. It has not counted the number of cases of waste migration or contamination in more than 20 years. The agency often accepts reports from state injection regulators that are partly blank, contain conflicting figures or are missing key details, ProPublica found.

In 2007, the EPA launched a national data system to centralize reports on injection wells. As of September 2011 — the last time the EPA issued a public update — less than half of the state and local regulatory agencies overseeing injection were contributing to the database. It contained complete information from only a handful of states, accounting for a small fraction of the deep wells in the country.

The EPA did not respond to questions seeking more detail about how it handles its data, or about how the agency judges whether its oversight is working.

In a 2008 interview with ProPublica, one EPA scientist acknowledged shortcomings in the way the agency oversees the injection program.

"It's assumed that the monitoring rules and requirements are in place and are protective — that's assumed," said Gregory Oberley, an EPA groundwater specialist who studies injection and water issues in the Rocky Mountain region. "You're not going to know what's going on until someone's well is contaminated and they are complaining about it."

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ProPublica's analysis of case histories and EPA data from October 2007 to October 2010 showed that when an injection well fails, it is most often because of holes or cracks in the well structure itself.

Operators are required to do so-called "mechanical integrity" tests at regular intervals, yearly for Class 1 wells and at least once every five years for Class 2 wells. In 2010, the tests led to more than 7,500 violations nationally, with more than 2,300 wells failing. In Texas, one violation was issued for every three Class 2 wells examined in 2010.

Such breakdowns can have serious consequences. Damage to the cement or steel casing can allow fluids to seep into the earth, where they could migrate into water supplies.

Regulators say redundant layers of protection usually prevent waste from getting that far, but EPA data shows that in the three years analyzed by ProPublica, more than 7,500 well test failures involved what federal water protection regulations describe as "fluid migration" and "significant leaks."

In September 2009, workers for Unit Petroleum Company discovered oil and gas waste in a roadside ditch in southern Louisiana. After tracing the fluid to a crack in the casing of a nearby injection well, operators tested the rest of the well. Only then did they find another hole — 600 feet down, and just a few hundred feet away from an aquifer that is a source of drinking water for that part of the state.

Most well failures are patched within six months of being discovered, EPA data shows, but with as much as five years passing between integrity tests, it can take a while for leaks to be discovered. And not every well can be repaired. Kansas shut down at least 47 injection wells in 2010, filling them with cement and burying them, because their mechanical integrity could not be restored. Louisiana shut down 82. Wyoming shut down 144.

Another way wells can leak is if waste is injected with such force that it accidentally shatters the rock meant to contain it. A report published by scientists at the Department of Energy's Pacific Northwest National Laboratory and the University of Texas said that high pressure is "the driving force" that can help connect deep geologic layers with shallower ones, allowing fluid to seep through the earth.

Most injection well permits strictly limit the maximum pressure allowed, but well operators — rushing to dispose of more waste in less time — sometimes break the rules, state regulatory inspections show. According to data provided by states to the EPA, deep well operators have been caught exceeding injection pressure limits more than 1,100 times since 2008.

Excessive pressure factored into a 1989 well failure that yielded new clues about the risks of injection.

While drilling a disposal well in southern Ohio, workers for the Aristech Chemical Corp. (since bought by Sunoco, and sold again, in 2011, to Haverhill Chemicals) were overwhelmed by the smell of phenol, a deadly chemical the company had injected into two Class 1 wells nearby. Somehow, perhaps over decades, the pollution had risen 1,400 feet through solid rock and was progressing toward surface aquifers.

Ohio environmental officials — aided by the EPA — investigated for some 15 years. They concluded that the wells were mechanically sound, but Aristech had injected waste into them faster and under higher pressure than the geologic formation could bear.

Though scientists maintain that the Aristech leak was a rarity, they acknowledge that such problems are more likely in places where industrial activity has changed the underground environment.

There are upwards of 2 million abandoned and plugged oil and gas wells in the U.S., more than 100,000 of which may not appear in regulators' records. Sometimes they are just broken off tubes of steel, buried or sticking out of the ground. Many are supposed to be sealed shut with cement, but studies show that cement breaks down over time, allowing seepage up the well structure.

Also, if injected waste reaches the bottom of old wells, it can quickly be driven back toward aquifers, as it was in Chico.

"The United States looks like a pin cushion," said Bruce Kobelski, a geologist who has been with the agency's underground injection program since 1986. Kobelski spoke to ProPublica in May, 2011, before the EPA declined additional interview requests for this story. "Unfortunately there are cases where someone missed a well or a well wasn't indicated. It could have been a well from the turn of the [20th] century."

Clefts left after the earth is cracked open to frack for oil and gas also can connect abandoned wells and waste injection zones. How far these man-

made fissures go is still the subject of research and debate, but in some cases they have reached as much as a half-mile, even intersecting fractures from neighboring wells.

When injection wells intersect with fracked wells and abandoned wells, the combined effect is that many of the natural protections assumed to be provided by deep underground geology no longer exist.

"It's a natural system and if you go in and start punching holes through it and changing pressure systems around, it's no longer natural," said Nathan Wisner, an underground injection expert working for the EPA in its Rocky Mountain region, in a 2010 interview. "It's difficult to know how it would behave in those circumstances."

EPA data provides a window into some injection well problems, but not all. There is no way to know how many wells have undetected leaks or to measure the amount of waste escaping from them.

In at least some cases, records obtained by ProPublica show, well failures may have contaminated sources of drinking water. Between 2008 and 2011, state regulators reported 150 instances of what the EPA calls "cases of alleged contamination," in which waste from injection wells purportedly reached aquifers. In 25 instances, the waste came from Class 2 wells. The EPA did not respond to requests for the results of investigations into those incidents or to clarify the standard for reporting a case.

The data probably understates the true extent of such incidents, however.

Leaking wells can simply go undetected. One Texas study looking for the cause of high salinity in soil found that at least 29 brine injection wells in its study area were likely sending a plume of salt water up into the ground unnoticed. Even when a problem is reported, as in Chico, regulators don't always do the expensive and time-consuming work necessary to investigate its cause.

"The absence of episodes of pollution can mean that there are none, or that no one is looking," said Salazar, the EPA's former injection expert. "I would tend to believe it is the latter."

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The practice of injecting waste underground arose as a solution to an environmental crisis.

In the first half of the 20th century, toxic waste collected in cesspools, or was dumped in rivers or poured onto fields. As the consequences of unbridled pollution became unacceptable, the country turned to an out-of-sight alternative. Drawing on techniques developed by the oil and gas industry, companies started pumping waste back into wells drilled for resources. Toxic waste became all but invisible. Air and water began to get cleaner.

Then a host of unanticipated problems began to arise.

In April, 1967 pesticide waste injected by a chemical plant at Denver's Rocky Mountain Arsenal destabilized a seismic fault, causing a magnitude 5.0 earthquake — strong enough to shatter windows and close schools — and jolting scientists with newfound risks of injection, according to the U.S. Geological Survey.

A year later, a corroded hazardous waste well for pulping liquor at the Hamermill Paper Co., in Erie, Pa., ruptured. Five miles away, according to an EPA report, "a noxious black liquid seeped from an abandoned gas well" in Presque Isle State Park.

In 1975 in Beaumont, Texas, dioxin and a highly acidic herbicide injected underground by the Velsicol Chemical Corp. burned a hole through its well casing, sending as much as five million gallons of the waste into a nearby drinking water aquifer.

Then in August 1984 in Oak Ridge, Tenn., radioactive waste was turned up by water monitoring near a deep injection well at a government nuclear facility.

Regulators raced to catch up. In 1974, the Safe Drinking Water Act was passed, establishing a framework for regulating injection. Then, in 1980, the EPA set up the tiered classes of wells and began to establish basic

construction standards and inspection schedules. The EPA licensed some state agencies to monitor wells within their borders and handled oversight jointly with others, but all had to meet the baseline requirements of the federal Underground Injection Control program.

Even with stricter regulations in place, 17 states — including Alabama, North Carolina, South Carolina and Wisconsin — banned Class 1 hazardous deep well injection.

"We just felt like based on the knowledge that we had at that time that it was not something that was really in the best interest of the environment or the state," said James Warr, who headed Alabama's Department of Environmental Management at the time.

Injection accidents kept cropping up.

A 1987 General Accountability Office review put the total number of cases in which waste had migrated from Class 1 hazardous waste wells into underground aquifers at 10 — including the Texas and Pennsylvania sites. Two of those aquifers were considered potential drinking water sources.

In 1989, the GAO reported 23 more cases in seven states where oil and gas injection wells had failed and polluted aquifers. New regulations had done little to prevent the problems, the report said, largely because most of the wells involved had been grandfathered in and had not had to comply with key aspects of the rules.

Noting four more suspected cases, the report also suggested there could be more well failures, and more widespread pollution, beyond the cases identified. "The full extent to which injected brines have contaminated underground sources of drinking water is unknown," it stated.

The GAO concluded that most of the contaminated aquifers could not be reclaimed because fixing the damage was "too costly" or "technically infeasible."

Faced with such findings, the federal government drafted more rules aimed at strengthening the injection program. The government outlawed



certain types of wells above or near drinking water aquifers, mandating that most industrial waste be injected deeper.

The agency also began to hold companies that disposed of hazardous industrial waste to far stiffer standards. To get permits to dispose of hazardous waste after 1988, companies had to prove — using complex models and geological studies — that the stuff they injected wouldn't migrate anywhere near water supplies for 10,000 years. They were already required to test for fault zones and to conduct reviews to ensure there were no conduits for leakage, such as abandoned wells, within a quarter-mile radius. Later, that became a two-mile minimum radius for some wells.

The added regulations would have prevented the vast majority of the accidents that occurred before the late 1980s, EPA officials contend.

"The requirements weren't as rigorous, the testing wasn't as rigorous and in some cases the shallow aquifers were contaminated," Kobelski said. "The program is not the same as it was when we first started."

Today's injection program, however, faces a new set of problems.

As federal regulators toughened rules for injecting hazardous waste, oil and gas companies argued that the new standards could drive them out of business. State oil and gas regulators pushed back against the regulations, too, saying that enforcing the rules for Class 2 wells — which handle the vast majority of injected waste by volume — would be expensive and difficult.

Ultimately, the energy industry won a critical change in the federal government's legal definition of waste: Since 1988, all material resulting from the oil and gas drilling process is considered non-hazardous, regardless of its content or toxicity.

"It took a lot of talking to sell the EPA on that and there are still a lot of people that don't like it," said Bill Bryson, a geologist and former head of the Kansas Corporation Commission's Conservation Division, who lobbied for and helped draft the federal rules. "But it seemed the best way to

protect the environment and to stop everybody from just having to test everything all the time."

The new approach removed many of the constraints on the oil and gas industry. They were no longer required to conduct seismic tests (a stricture that remained in place for Class 1 wells). Operators were allowed to test their wells less frequently for mechanical integrity and the area they had to check for abandoned wells was kept to a minimum — one reason drilling waste kept bubbling to the surface near Chico.

Soon after the first Chico incident, Texas expanded the area regulators were required to check for abandoned waste wells (a rule that applied only to certain parts of the state). Doubling the radius they reviewed in Chico to a half mile, they found 13 other injection or oil and gas wells. When they studied the land within a mile — the radius required for review of many Class 1 wells — officials discovered another 35 wells, many dating to the 1950s.

The Railroad Commission concluded that the Chico injection well had overflowed: The target rock zone could no longer handle the volume being pushed into it. Trying to cram in more waste at the same speed could cause further leaks, regulators feared. The commission set new limits on how fast the waste could be injected, but did not forbid further disposal. The well remains in use to this day.

In late 2008, samples of Chico's municipal drinking water were found to contain radium, a radioactive derivative of uranium and a common attribute of drilling waste. The water well was a few miles away from the leaking injection well site, but environmental officials said the contaminants discovered in the water well were unrelated, mostly because they didn't include the level of sodium typical of brine.

Since then, Ed Cowley, the public works director, said commission officials have continued to assure him that brine won't reach Chico's drinking water. But since the agency keeps allowing more injection and doesn't track the cumulative volume of waste going into wells in the area, he's skeptical that they can keep their promise.

"I was kind of like, 'You all need to get together and look at the total amount you are trying to fit through the eye of the needle,'" he said.

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When sewage flowed from 20 Class 1 wells near Miami into the Upper Floridan aquifer, it challenged some of scientists' fundamental assumptions about the injection system.

The wells — which had helped fuel the growth of South Florida by eliminating the need for expensive water treatment plants — had passed rigorous EPA and state evaluation throughout the 1980s and 1990s. Inspections showed they were structurally sound. As Class 1 wells, they were subject to some of the most frequent tests and closest scrutiny.

Yet they failed.

The wells' designers would have calculated what is typically called the "zone of influence" — the space that waste injected into the wells was expected to fill. This was based on estimates of how much fluid would be injected and under what pressure.

In drawings, the zone of influence typically looks like a Hershey's kiss, an evenly dispersed plume spreading in a predictable circular fashion away from the bottom of the well. Above the zone, most drawings depict uniform formations of rock not unlike a layer cake.

Based on modeling and analysis by some of the most sophisticated engineering consultants in the country, Florida officials, with the EPA's assent, concluded that waste injected into the Miami-area wells would be forever trapped far below the South Florida peninsula.

"All of the modeling indicated that the injectate would be confined in the injection zone," an EPA spokesperson wrote to ProPublica in a statement.

But as Miami poured nearly half a billion gallons of partly treated sewage into the ground each day from the late 1980s through the mid 1990s, hydrogeologists learned that the earth — and the flow of fluids through it

— wasn't as uniform as the models depicted. Florida's injection wells, for example, had been drilled into rock that was far more porous and fractured than scientists previously understood.

"Geology is never what you think it is," said Ronald Reese, a geologist with the United States Geological Survey in Florida who has studied the well failures there. "There are always surprises."

Other gaps have emerged between theories of how underground injection should work and how it actually does. Rock layers aren't always neatly stacked as they appear in engineers' sketches. They often fold and twist over on themselves. Waste injected into such formations is more likely to spread in lopsided, unpredictable ways than in a uniform cone. It is also likely to channel through spaces in the rock as pressure forces it along the weakest lines.

Petroleum engineers in Texas have found that when they pump fluid into one end of an oil reservoir to push oil out the other, the injected fluid sometimes flows around the reservoir, completely missing the targeted zone.

"People are still surprised at the route that the injectate is taking or the bypassing that can happen," said Jean-Philippe Nicot, a research scientist at the University of Texas' Bureau of Economic Geology.

Conventional wisdom says fluids injected underground should spread at a rate of several inches or less each year, and go only as far as they are pushed by the pressure inside the well. In some instances, however, fluids have traveled faster and farther than researchers thought possible.

In a 2000 case that wasn't caused by injection but brought important lessons about how fluids could move underground, hydrogeologists concluded that bacteria-polluted water migrated horizontally underground for several thousand feet in just 26 hours, contaminating a drinking water well in Walkerton, Ontario, and sickening thousands of residents. The fluids traveled 80 times as fast as the standard software model predicted was possible.

According to the model, vertical movement of underground fluids shouldn't be possible at all, or should happen over what scientists call "geologic time": thousands of years or longer. Yet a 2011 study in Wisconsin found that human viruses had managed to infiltrate deep aquifers, probably moving downward through layers believed to be a permanent seal.

According to a study published in April in the journal Ground Water, it's not a matter of if fluid will move through rock layers, but when.

Tom Myers, a hydrologist, drew on research showing that natural faults and fractures are more prevalent than commonly understood to create a model that predicts how chemicals might move in the Marcellus Shale, a dense layer of rock that has been called impermeable. The Marcellus Shale, which stretches from New York to Tennessee, is the focus of intense debate because of concerns that chemicals injected in drilling for natural gas will pollute water.

Myers' new model said that chemicals could leak through natural cracks into aquifers tapped for drinking water in about 100 years, far more quickly than had been thought. In areas where there is hydraulic fracturing or drilling, Myers' model shows, man-made faults and natural ones could intersect and chemicals could migrate to the surface in as little as "a few years, or less."

"It's out of sight, out of mind now. But 50 years from now?" Myers said, referring to injected waste and the rock layers trusted to entrap it. "Simply put, they are not impermeable."

Myers' work is among the few studies done over the past few decades to compare theories of hydrogeology to what actually happens. But even his research is based on models.

"A lot of the concepts and a lot of the regulations that govern this whole practice of subsurface injection is kind of dated at this point," said one senior EPA hydrologist who was not authorized to speak to ProPublica, and declined to be quoted by name.

"It's a problem," he said. "There needs to be a hard look at this in a new way."



**Abrahm Lustgarten**

Abrahm Lustgarten covers energy, water, climate change and anything else having to do with the environment for ProPublica.

✉ [Abrahm.Lustgarten@propublica.org](mailto:Abrahm.Lustgarten@propublica.org) [@AbrahmL](https://twitter.com/AbrahmL)

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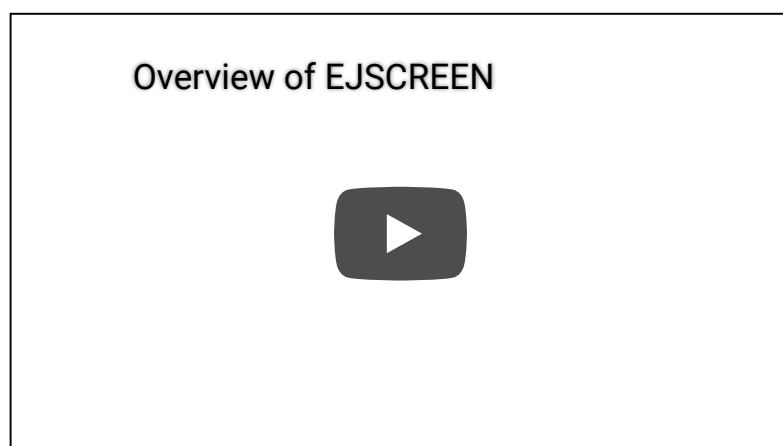
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We've made some changes to EPA.gov. If the information you are looking for is not here, you may be able to find it on the EPA Web Archive or the January 19, 2017 Web Snapshot.



## What is EJSCREEN?

### EJSCREEN Overview



EJSCREEN is an environmental justice mapping and screening tool that provides EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators. EJSCREEN users choose a geographic area; the tool then provides demographic and environmental information for that area. All of the EJSCREEN indicators are publicly-available data. EJSCREEN simply provides a way to display this information and includes a method for combining environmental and demographic indicators into EJ indexes.

EJSCREEN includes:

- [11 environmental indicators](#)
- [6 demographic indicators](#)
- [11 EJ indexes](#)

Each EJ index combines demographic indicators with a single environmental indicator. This tool uses provides a number of capabilities including:

- Color coded mapping
- The ability to generate a standard report for a selected area
- Comparisons showing how a selected area compares to the state, EPA region or the nation

EJSCREEN replaces EJView, a previous publicly available environmental justice screening tool, and incorporates recommendations from the [National Environmental Justice Advisory Council \(NEJAC\)](#).

Anyone using EJSCREEN should note there is substantial uncertainty in demographic and environmental data, particularly when looking at small geographic areas. EJSCREEN is not intended to provide a risk assessment. Also EJSCREEN does not provide data on every environmental impact and demographic indicator that may be

relevant to a particular location, and data may be several years old. Screening results should be supplemented with additional information and local knowledge to get a better understanding of the issues in a selected location. It is important to understand the caveats and limitations when using EJSCREEN.

LAST UPDATED ON OCTOBER 28, 2019



## Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well

### Introduction

This response is issued in accordance with Section 124.17(a), (b), and (c) of Title 40 of the Code of Federal Regulations (40 C.F.R. § 124.17(a), (b), and (c)), which require that at the time any final United States Environmental Protection Agency (EPA) permit decision is issued, the Agency shall: (1) briefly describe and respond to all significant comments on the draft permit decision raised during the public comment period; (2) specify which provisions, if any, of the draft decision have been changed and the reasons for the change; (3) include in the administrative record any documents cited in the response to comments; and (4) make the response to comments available to the public.

### Background

On February 10, 2017, EPA issued a draft Class II permit to inject fresh water for the purpose of enhanced oil recovery (Permit Number MI-035-2R-0034) to Muskegon Development Company for its Holcomb 1-22 well, and invited public comment. The public comment period ended March 15, 2017. Public comments were received indicative of significant interest in the draft permit, and EPA scheduled and held a public meeting and public hearing at Clare High School, in Clare, Michigan, on July 25, 2017. Following the public hearing, EPA extended the July 28 deadline for comments to August 18, 2017. The comments compiled include those received from the first comment period (February 10 to March 15, 2017), the July 25, 2017 public hearing (from the court reporter transcript), and the second comment period (June 21 to August 18, 2017). The first comment period lasted 34 days and the second comment period lasted 59 days, for a total of 93 days.

### General and Out of Scope Comments

EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have an Underground Injection Control (UIC) permit application approved. These regulations define the general scope of EPA's authority and review process, which include standards for geologic siting, well engineering, operation and monitoring, and plugging and abandonment of deep injection wells.

EPA received many comments directed at matters outside the scope of the UIC Program's purview. EPA is not responding to the following comments because they do not relate to the UIC permit process, or to geologic siting, well engineering, operation and monitoring standards, or plugging and abandonment of the proposed secondary recovery well. These general comments are listed below without response. Specific comments that address topics that are relevant to this permitting decision, with responses, follow in subsequent sections. Although EPA is not responding to general statements of support and opposition to the permit individually, it did consider them in making the decision to issue the final permit.

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The comments in the “out of scope” category focus on topics including:

- a. Fresh water should not be withdrawn at an unlimited rate because it may lower water levels in private wells
- b. Fresh water should not be withdrawn at an unlimited rate because it may deplete the aquifer
- c. Fresh water should not be withdrawn at an unlimited rate because it may cause earthquakes
- d. Will Muskegon Development Company pay for regular water testing for nearby residents?
- e. Will Muskegon Development Company pay for fair market compensation or purchase of polluted property?
- f. Increased truck traffic associated with well operations
- g. UIC regulations governing construction are insufficient to protect drinking water
- h. The well is not needed; oil prices are cheap
- i. Legal disputes involving other wells
- j. Inaccuracies in the permit application (commenters confused the 2008 state oil well permit application with the federal injection well permit application)
- k. Oil and gas wells have a history of failure in Pennsylvania
- l. Gulf oil wells have a history of failure
- m. Fracking wells can lead to contamination and earthquakes
- n. Location of injection well in residential area is questionable
- o. Hydrogen sulfide gas emissions

EPA received extensive comments that were “in scope” of the UIC Program’s purview:

1. Request for public hearing
2. Public hearing notification procedures were flawed
3. Request for time extension for public comments following hearing
4. Request for a second public hearing
5. Ground water contamination
6. Leak accident response
7. Muskegon Development Company providing fresh water samples and any additives
8. Nature of chemicals in injected waste
9. Maximum injection pressure calculation
10. Well design and construction inadequate to protect Underground Sources of Drinking Water (USDW’s)
11. Area of Review not sufficiently protective of USDW’s
12. Surface casing is not deep enough to protect USDW’s
13. Fresh water should not be used for injection in lieu of brine
14. Self-monitoring of injection wells is inadequate
15. Excessive injection into wells can cause earthquakes
16. Injection wells can drain the aquifer and cause earthquakes
17. Earthquake hazards from injection wells
18. EPA must address permitted and unmonitored injection wells
19. There may be orphaned wells within the Area of Review that were omitted from the permit application

## **Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

20. Low income population of the well site area should be factored into permit decision
21. Risk of water pollution at the well
22. Radioactivity of injectate
23. Injection well failure rate
24. Well casing failures
25. Structural failures inside injection wells are common
26. Please protect the water supply
27. There is insufficient information in the permit application to support a permit decision

### **Request for public hearing**

**Comment #1:** Our community would appreciate the questions we have, be directly answered by Muskegon in a public forum: that they will agree to have Muskegon Development Company, available to answer our questions/concerns, along with experts from the EPA. These are vital issues that could impact our community, our environment in the near future and in generations to come.

**Response #1:** A public meeting and public hearing regarding this proposed permit were held by EPA staff at Clare High School on July 25, 2017. EPA staff gave a presentation regarding the permit and answered questions during the public meeting, followed by the public hearing, where EPA received (but did not reply to) oral and written comments from the audience. Under the regulations governing public hearings for Underground Injection Control ('UIC') Permits (40 C.F.R. Part 124), the permit applicant, Muskegon Development Company, was not required to be present nor answer questions.

### **Public hearing notification procedures were flawed**

**Comment #2:** This meeting would have had many more citizens attend if the EPA had released accurate date, time, and meeting location of this meeting, but the Clare County Review shared that it would be on Thursday (instead of Tuesday), at Clare Middle School (instead of the high school). Even the EPA web site and your handout at the meeting listed the wrong meeting date. The public deserves to know about this permit and be informed, but so do the people who depend on this aquifer, and those people reside more in northern Clare County and Gladwin County. The Township Supervisor stated the Township Hall would have been the perfect location. Why was the meeting held in the City of Clare, 26 miles away from the area affected by the injection well?

**Response #2:** EPA held a public hearing on July 25, 2017 for the draft permit for the proposed Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that

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EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing and Clare High School as the location. On the evening of the hearing, it was discovered that the address published in the Fact Sheet was the mailing address, which differed from the physical address of Clare High School; EPA placed signs outside to direct people to the proper location. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

### **Request for time extension for public comments following hearing**

**Comment #3:** I ask that you consider extending the public comment period, that you hold a public hearing at the Hamilton Township Hall, that you publish the correction information on the notice to citizens and publish it in the Clare County Cleaver as well as cc: to the Hamilton Township Board and Zoning & Coding Officer (he was not aware of this at all). Another paper "more local" is the Gladwin Record Eagle out of Gladwin, MI. I also ask that a representative specialized in water matters from our District DEQ office in Saginaw is present.

**Response #3:** Subsequent to the hearing, EPA extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing.

### **Request for a second public hearing**

**Comment #4:** I demand a new public hearing on this matter on the grounds that the previous public hearing was improperly noticed and held at an inconvenient and at a location outside of Hamilton Township. I would like to also note that Hamilton Township is a rural community, one in which many residents lack reliable transportation or the ability or time to travel extra distance for a permit hearing. Therefore, I would like to request that the new public hearing be held in Hamilton Township.

**Response #4:** EPA held a public hearing on July 25, 2017 for the draft permit for the Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

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**Ground water contamination**

**Comment #5:** Injection and waste migration: Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects. A 1987 General Accountability Office review tallied ten cases in which waste had migrated from Class 1 hazardous waste wells into underground aquifers. Two of those aquifers were considered potential drinking water sources. In 1989, the GAO reported 23 more cases in seven states where oil and gas injection wells had failed and polluted aquifers. After the findings, the federal government drafted more rules aimed at strengthening the injection program. The government outlawed certain types of wells above or near drinking water aquifers, mandating that most industrial waste be injected deeper. In response, the energy industry lobbied and won a critical change in the federal government's legal definition of waste: Since 1988, all material resulting from the oil and gas drilling process is considered non-hazardous, regardless of its content or toxicity, making it subject to less strict standards than hazardous waste (Class I wells).

**Response #5:** The proposed permit allows only the injection of fresh water for enhanced oil recovery; injection of any wastes for disposal is prohibited. The proposed injection well will have multiple safeguards to prevent any leaks: multiple well casings (steel pipe), annulus fluid (surrounding the injection tubing), cement between the well casings, and a packer to seal off the well annulus. A thick (over 900 feet for this well) confining zone of impermeable rock lies above the injection zone. In the event of a well leak (loss of mechanical integrity), the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon Development Company must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

**Leak accident response**

**Comment #6:** In the event of a well leak or related accident, will Muskegon Development Company please outline the local safety procedures.

**Response #6:** In the event of a well leak, the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a Mechanical Integrity Test, transmit the test results to and request permission from EPA for written authorization to resume injection.

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**Muskegon Development Company providing fresh water samples and any additives**

**Comment #7:** Would Muskegon Development Company agree to provide "fresh water" samples used in the drilling process and disclose any additives?

**Response #7:** The Holcomb 1-22 well was drilled in 2008, and is still currently in use for oil production. After the well is converted for injection, the conditions of the permit take effect, and require Muskegon Development Company to inject only fresh water, drawn from the local aquifer, into the well; no additives or other fluids are allowed by the permit.

**Nature of chemicals in injected waste**

**Comment #8:** It is our understanding that the purpose of the permit is to inject fluid (displaced chemicals & brine waste) 2651 feet below the surface. Please disclose the "chemicals used and the effect of them being displaced" in the injection well waste disposal process.

**Response #8:** The proposed injection well permit only allows fresh water to be injected into the Holcomb 1-22 well for enhanced oil recovery, not for waste disposal. No chemicals, brine waste or any other substances are authorized for injection into the well.

**Maximum injection pressure calculation**

**Comment #9:** Explain how the injection pressure was selected, its depth into the rock and why it is safe. We have concerns that the injection pressure might induce formation fracturing and allow migration of the disposed waste into our aquifers and lakes.

**Response #9:** The limitation on wellhead pressure serves to prevent confining-formation fracturing, calculated using the following formula:

$$[1.112 \text{ psi/ft.} - (0.433 \text{ psi/ft.}) \times (\text{specific gravity})] \times \text{depth} - 14.7 \text{ psi}$$

Where psi = pounds/square inch

The maximum injection pressure is dependent upon depth and the specific gravity of the injected fluid. The Richfield Formation of the Detroit River Group at 4948 feet was used as the depth and a specific gravity of 1.05 was used for the injected fluid. The fracture gradient of 1.112 psi/ft. was determined from an acid-fracture job from a nearby well. The confining formations overlying the injection zone and underlying the underground source of drinking water consist of 922 feet of impermeable anhydrite and salt. The maximum injection pressure was calculated to prevent the confining rock formation from fracturing.

**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Well design and construction inadequate to protect USDW's**

**Comment #10:** The permit applicant, Muskegon Development Company, and the EPA, have not sufficiently demonstrated that the proposed injection well will not endanger Underground Sources of Drinking Water (USDW) and may likely present a public nuisance. The proposed injection well and any nearby offset wells are not properly designed and constructed and may endanger USDWs.

**Response #10:** EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the Area of Review (AOR) that penetrate the injection zone, to assure that USDWs are protected.

**Area of Review not sufficiently protective of USDW's**

**Comment #11:** The described Area of Review ("AoR") evaluation is not sufficient and neither the applicant nor EPA has demonstrated that the proposed fixed radius, assuming there is one, is appropriate to protect USDWs. The draft permit lists one (1) plugged and abandoned well within the 1/4-mile radius of the Area of Review (AOR). However, the MDEQ GeoWebFace map shows a plugged and abandoned well just north of the west edge of Decker Lake. This well appears to be within 1/4 mile of the Holcomb 1-22 well. If it is not, it is beyond 1/4 mile by just a few feet, and given the extremely small radius of the area of review (AOR) that a permit applicant must address, it would be in keeping with the spirit of the law to include this well in the AOR as well.

**Response #11:** 40 C.F.R. § 147.1155 requires EPA to use a fixed radius AOR of no less than 1/4-mile for Class II wells in Michigan. EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the AOR that penetrate the injection zone, to assure that USDWs are protected.

Regarding the plugged and abandoned well just north of the west edge of Decker Lake, EPA has reviewed the available data on GeoWebFace and has identified the well to be the McKenna et al-4, a well drilled in 1944 to a depth of 3840 feet. The well proved to be a dry hole (non-oil producing) that was adequately plugged and abandoned. The McKenna et al-4 well did not penetrate the injection zone of the proposed Holcomb 1-22 well, and therefore would not serve as a conduit for the migration of fluids into the USDW.

**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Surface casing is not deep enough to protect USDW's**

**Comment #12:** The draft permit should not be approved unless and until these deficiencies are addressed: Well Construction: Neither the applicant nor EPA has demonstrated that the surface casing extends below the base of the USDW and the production casing cement does not extend above the base of either the USDW or the surface casing. This means that a portion of the annular space adjacent to the USDW is uncemented. Leaving this annular space uncemented puts both the USDW and well integrity at risk. The top of the production casing cement does not appear to extend above the base of the surface casing. Failing to extend surface casing in any well to below the base of the lowest USDW puts those USDWs below the base of the surface casing at significant risk of contamination. Cross flow may occur between the USDW and other formations, potentially leading to contamination of the USDW. Leaving a potential flow zone uncemented can also result in over pressurization of the annulus and/or result in casing corrosion, both of which may lead to a well integrity failure, further putting drinking water at risk. Properly constructed wells typically have at least two barriers between USDWs and fluids contained in the well: 1) the surface casing and 2) the production casing. The American Petroleum Institute recommends that "surface casing be set at least 100 feet below the deepest USDW encountered while drilling the well. Both UIC Class I and Class VI well rules require surface casing to extend below the base of the lowest USDW, indicating that EPA clearly recognizes this as an important standard to protect ground water.

**Response #12:** Based upon the geological formation record obtained when the Holcomb 1-22 well was drilled for oil production, the USDW consists of the Glacial Drift, which extends from the surface to a depth of 464 feet. The surface casing and surface casing cement of the proposed injection well extends from the surface to 792 feet deep, which is 328 feet deeper than the bottom of the USDW, far exceeding 100 feet below the deepest USDW. The cemented portions of the annular space between the long string and intermediate well casings in the well extend from 2650' to 4082' – this cemented interval seals off the permeable rock formations known as the Traverse Formation (3034' to 3068'), Traverse Limestone (3068' to 3716') and Dundee Limestone (3782' to 4044'). Between 3034' and 1530', the formation record shows consecutive formations of impermeable shale, meaning that the depth interval between 2650' (top of the cement) and 1530' (top of the Coldwater Shale) consists of more than 1000 feet of impermeable rock acting as a barrier to potential upward migration of injected fluid. The depth interval between 1530' and 792' consists of shale and sandstone formations that are not USDWs. Underground injection wells are designed with multiple safeguards to prevent leaks from the well. Injection wells are constructed with multiple steel casings (pipe) cemented into place. Injection takes place through tubing located at the center of the innermost steel casing. A device called a packer seals off the bottom of the tubing, and the space between the innermost steel casing and tubing (annulus) is filled with a fluid containing a corrosion inhibitor. To assure that no leaking occurs in the well, the annulus space is tested after the well is completed and then re-tested periodically. If this test fails, the well is shut down immediately, and the cause of the leak is isolated and repaired. Once shut down, a successful pressure test must be demonstrated before EPA will allow the operator to resume well injection. Under the conditions of the permit, Muskegon Development is responsible for maintaining the well so that it works properly, and would be responsible for any contamination caused by any leaks. See 40 C.F.R. Part 146, Subpart C.



**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Fresh water should not be used for injection in lieu of brine**

**Comment #13:** There is an issue regarding the level of ground water withdrawal for the purpose of oil production enhancement. Because there is no limitation, in essence there is no coordination with the aquifer that's going to provide the fresh water, so you basically are allowing the permittee to drain the aquifer. That shouldn't happen. That should be a violation of the Safe Water Drinking Act. The Safe Water Drinking Act says you are supposed to protect all of the aquifers from loss or contamination. In Michigan we have a little bit more than 4 million people who draw their water every day from an aquifer, and we need to protect them all as far as I'm concerned, and I know that's exactly what you want to do. So I do think you need to readjust the standard that you have for these -- this class of injection to consider the aquifer that is -- to consider where the fresh water is coming from. Well, frankly, you should not use fresh water. You should do what they do in EPA Region 10 or Region 9 or Region 8.

**Response #13:** There is no prohibition in the Safe Drinking Water Act (SDWA) or UIC regulations to using fresh water or ground water for injection to enhance recovery of oil or natural gas. The SDWA does not restrict the withdrawal of fresh water from an aquifer. The State of Michigan regulates ground water and the volume or rate of ground water withdrawal.

**Self-monitoring of injection wells is inadequate**

**Comment #14:** You are currently permitting wells, injection wells, in Michigan that you do not have a realistic expectation of being able to site monitor. We feel that is a violation of the Safe Drinking Water Act. We hope that EPA will suspend activities on permitting until such time as EPA has caught up with the backlog of unmonitored wells, which is quite substantial. The idea that a company would be allowed to provide its own data and studies for any part of the permit process is completely absurd. At no point in any permit application should a company be trusted to provide its own numbers. It is absurd to trust any business to self-regulate. Should problems occur, there is an obvious profit motive for negligence in monitoring, reporting, and even for taking corrective actions to address potential issues. It is appalling that the regulations of the permitting process leave the EPA and MDEQ to rely on data submitted by the permit applicant and that the EPA and MDEQ do not obtain and maintain their own data.

**Response #14:** Self-monitoring under permit conditions has been well-established for decades and is the basis of compliance with most federal and state environmental protection statutes. Periodic environmental compliance inspections supplement regular self-monitoring data; permit violations are subject to enforcement action. Under federal law, there are criminal penalties for falsification of data and reports. Congress enacted the SDWA to protect USDWs from endangerment from underground injection practices, thereby protecting human health and the environment. The UIC regulations at 40 C.F.R. Parts 144 and 146 specify the geological siting, engineering, construction, and operation and monitoring requirements which injection wells must meet in order to prevent contamination of USDWs. Parties that wish to use an injection well must obtain a UIC permit showing that they satisfy those requirements. For the Holcomb 1-22 well permit, EPA has determined that there will be no

## **Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

impact to the drinking water aquifer as a result of injection into this well. The next step in the protection of a USDW is for the permit holder to be in compliance with the permit, which includes monitoring and reporting requirements. EPA reviews monthly operating reports and reports on periodic testing. EPA inspections and oversight verify the accuracy of the facility's self-monitoring and reporting, and the facility is subject to penalties and sanctions for failure to comply with its obligations. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Failure to comply fully with permit conditions is a violation and may subject an owner/operator to an action under the enforcement provisions of the SDWA, 42 U.S.C. § 300h-2. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to \$273,945, civil penalties of up to \$54,789 per day of violation and criminal penalties of up to 3 years imprisonment and fines in accordance with Title 18 of the United States Code.

### **Excessive injection into wells can cause earthquakes**

**Comment #15:** With an unlimited injection of ground water into your Class II wells, you have not adjusted the maximum limitation, and you are, in fact, permitting earthquakes by doing that. It may take 40 or 50 or 100 years, but infinity will catch up with whatever is there and physics will take over and you will have an earthquake. So, EPA must redo that standard so that disposal wells do not have infinity. In March of 2016, the United States Geological Survey issued a major finding that injection wells can cause earthquakes. The EPA has not incorporated that finding into its injection well permitting activities. Considering the USGS finding, infinity is not a realistic or safe limit on injection well permits. It is imperative the EPA develop a safe and realistic limit for the total amount of wastes injected allowed by EPA for each permit. Until the infinity limit problem is addressed, the EPA cannot legally issue injection well permits without violating both the letter and spirit of the Safe Drinking Water Act.

**Response #15:** The UIC permit limits the injection pressure that can be used. According to historical data compiled by the U.S. Geological Survey (USGS), the Clare County area is considered a low risk area regarding earthquakes, with no instances of property damage or fatalities due to earthquakes. Of the five historic earthquakes cited by the USGS in their web site report on Michigan earthquake history, none were located near Clare County. An earthquake in Michigan registered a Richter magnitude of 4.2 on May 2, 2015, but the epicenter was located 9 miles southeast of Kalamazoo, about 125 miles away from Hamilton Township, Clare County, Michigan, where the site of the proposed Holcomb 1-22 well is located. The depths of the earthquakes were determined by geologists to be more than 19,000 feet below ground, far deeper than any existing Class II injection wells. Based upon this data, and using the EPA Injection-Induced Seismicity Decision Model flow chart, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

## **Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Injection wells can drain the aquifer and cause earthquakes**

**Comment #16:** An earthquake of Richter Magnitude 4.2 occurred in Michigan during May of 2015. An earthquake easily can affect the confining strata within a 200 mile-plus area from the epicenter. Another problem with this well, and in particular, with the Class II wells, is that an infinity limitation on ground water withdrawal allows the permittee to drain the aquifer. The U.S. Geological Survey made a finding that injection wells do, in fact, cause earthquakes. If you live in Oklahoma, you don't have to wonder about that finding at all.

**Response #16:** EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away near Galesburg, Michigan, in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well, combined with the general lack of fault zones in the area, are an unlikely scenario for injection-induced earthquakes. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan.

### **Earthquake hazards from injection wells**

**Comment #17:** Earthquakes in Michigan were felt in the past few years. Core samples of the Holcomb well need to be taken to determine if there was any effect on the well casing integrity due to this seismic activity. Given that the USGS has found that injection wells do in fact cause earthquakes, EPA needs to take the entirety of Michigan's existing oil and gas wells and injection wells into account, and do a complete survey of orphan wells and their conditions, before issuing any new injection well permits.

**Response #17:** EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no concerns related to the Holcomb 1-22 well and seismicity were identified. Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well in Michigan, combined with the general lack of fault zones, are an unlikely scenario for injection-induced earthquakes related to the Holcomb 1-22 well. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan. Under Part I 10(c) of the proposed permit, Muskegon Development cannot commence injection in the well until they demonstrate mechanical integrity, submit a report for EPA review, and receive a written authorization to inject from EPA.

**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**EPA must address permitted and unmonitored injection wells**

**Comment #18:** It is not legal for the EPA to issue any more Class II injection well permits in Michigan without a prior substantial EPA effort to address the existing permitted and unmonitored injection wells in Michigan. Permitting without a realistic expectation of the monitoring required by federal law is a violation of that same law.

**Response #18:** EPA expends effort to evaluate compliance by persons who own or operate injection wells. EPA inspects such wells, reviews monitoring reports submitted by owners or operators, witnesses well mechanical integrity and geologic reservoir tests performed by such persons, reviews reports from mechanical integrity and reservoir tests, and issues information collection orders to owners or operators under 42 U.S.C. § 300j-4. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Neither the Safe Drinking Water Act nor regulations provide that a permit application should be denied on the basis of the scope of coverage of the compliance evaluation program administered by the permit-issuing agency.

**There may be orphaned wells within the Area of Review that were omitted from the permit application; they are a hazard and should be factored into permit decision**

**Comment #19:** Hamilton Township has a history with the oil and gas industry that goes back at least to the 1930s. This is a long and tumultuous history. Dangerous levels of methane have been found in homes in their drinking water; also, there are a number of incidents of exploding homes and basements due to old wells leaking methane and other gases. These wells were drilled in the 1930s and 1940s, a time when well drilling and closing standards were far from what is required today. We know that the DEQ has found ancient and improperly closed wells; wells plugged with garbage, timbers, whatever was available to fill the hole, rather than the cement and steel that is required today. Taking this into consideration along with well failure statistics of modern wells, leaves an alarming question as to whether or not this area is truly appropriate for injection wells and the high pressure used in such wells. That's what the area geologist for the Michigan Department of Environmental Quality tells us. Independent researchers have discovered a number of orphan wells NOT included in most of the archives, and there are orphan wells that are NOT included on the DEQ maps for Hamilton Township. Thus, it is very possible that Muskegon Development Company has failed to account for all the wells in the 1/4-mile AOR radius. Is there is a plan to locate these orphan wells before this permit is issued and the injection well becomes operational? There should be a full survey of the area be conducted to locate orphan wells and make sure that they are adequately plugged and if they are in fact leaking from well casing failure or other failure.

**Response #19:** During technical review of a UIC permit application, EPA evaluates the possible impact of abandoned wells if they are located within the 1/4-mile radius AOR, and if they are deep enough to penetrate the injection zone. If such wells are identified, a plan of corrective action to address these wells may be specified in the underground injection permit, to be implemented by the

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permit holder to assure that injection operations do not cause ground water migration to spread contamination into the USDW. Underground injection wells that are abandoned must be plugged, as specified by regulation or permit; 40 C.F.R. §146.24 a (3) requires "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." Within the Area of Review, EPA analysis of available information shows one active oil producing well that penetrates the injection zone, and two dry holes (non-oil producing wells that have been plugged and abandoned) that did not penetrate the injection zone of the proposed Holcomb 1-22 well.

**Low income population of the well site area should be factored into permit decision**

**Comment #20:** My hope is that EPA staff will understand the human condition that surrounds this well site and give due consideration to those concerns if any of the other conditions of approval are in question. If you look at the demographics of Michigan, you will note that Lake County and Clare County are the most impoverished area within our state. The northern half of Clare County is the most impoverished area within our county. The last numbers I saw the median income in that area was under \$20,000 per household. The Dodge City area is likely the most impoverished area in northern Clare County and it is located 2 miles west of the Holcomb 1-22 well site. As a full time realtor in Clare, Gladwin and Isabella County for over 25 years, I have seen this poverty first hand. Last year (per the Clare/Gladwin MLS) there were 239 home sales in the Harrison Area. 105 of those sales were under \$50,000. Most of these sales are in residential areas served by private well and septic systems. Most of the wells we see in that area are 1 or 1.5-inch diameter hand-driven wells that were put in prior to the health department permit requirements and they remain in use today because of the cost of upgrading and the homeowner's inability to fund improvements. While I understand that contamination from this project is unlikely, the unlimited use of excessive and unlimited quantities of water from the water table is a concern.

**Response #20:** EPA considers a number of factors in review of a permit application, including environmental justice (EJ) screening to identify areas where people are most vulnerable or may be exposed to different types of pollution, in order to assure that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. One of those EJ screening factors identified by EPA was that 56% of the local population were in the low income level. Other factors include evaluation of the well design; plugging and abandonment plan; and, geological suitability of the rock formations for injection.

## **Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Risk of water pollution at the well**

**Comment #21:** This appears to be a deep injection well in Clare County near the headwaters of the Middle Branch Tobacco River. I have not reviewed anything like this before and am not certain how to understand all the potential impacts. I went to the listed website and did look at that. I would have concerns over anything which could impact the ground water input to the Middle Branch Tobacco River as it is a designated trout stream. Any impacts that could possibly change the flows or temperatures would be a problem and negatively impact the trout stream. I forwarded this to our habitat unit and they also were unsure of potential harmful impacts on fish in the nearby streams. My guess is the deep injection would mostly impact ground water and possibly drinking water for nearby wells. Thank you for my chance to comment and know about this application.

**Response #21:** Based upon EPA's technical review of the permit application, the well and plugging design, site geology, and endangered species review, the well will be protective of Underground Sources of Drinking Water (USDWs) and the environment, including surface water. EPA reviewed the permit application to determine that the geologic setting was appropriate for underground injection and that the proposed well, which already exists, was properly constructed. EPA evaluated the well's geological siting and construction, and established operating requirements in the permit that are protective of the USDW. EPA used several information sources in its review including the Michigan Hydrologic Atlas, the U.S. Geological Survey, and State of Michigan records of nearby injection wells. EPA's permit includes limits on the surface injection pressure to prevent the injected fluid from causing fractures in the rock, which could become conduits for the injected fluid to leave the injection zone. EPA calculated the surface injection pressure limit using conservative, site-specific figures for injected fluid, injection zone depth, and rock characteristics. EPA also reviewed all deep wells in the ¼-mile zone surrounding the well site, to assure that they do not act as potential conduits for injection fluids to move into the USDW. EPA determined that all other wells in the surrounding ¼-mile zone were either properly constructed or properly plugged and abandoned, and will not act as conduits for injection fluids under pressure to move into the USDW or surface water. In addition, the applicant is required to pass a mechanical integrity test, in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted and after the well is completed. The operator is also required to repeat the test at least once every five years thereafter and to collect operating data and report to EPA monthly.

### **Radioactivity of injectate**

**Comment #22:** EPA fails to analyze Class II injection wells' waste stream, including this one, for the radioactivity which permeates oil and gas drilling wastes. Regardless of whether an injection well's engineering allows it to leak, there is no safeguard against radioactive contamination. There is no showing of any scrutiny of the question of whether any drill wastes will be contaminated routinely with "radioactive waste," which is defined at 40 C.F.R. § 144.3 as "any waste which contains radioactive material in concentrations which exceed those listed in 10 C.F.R. part 20, appendix B, table II, column 2." The referenced table and column specify threshold contamination levels for Ra-226, Ra-228, several Uranium isotopes associated with drilling wastes, and Th-232. It is incumbent upon the EPA to require sourced, predictive information of the likely radiological characteristics of the

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waste stream before a permit can even be considered for the proposed site. An entirely new permit must then be required of the operator, and the new process should afford the public the opportunity to scrutinize the underlying radioactive waste data along with another public hearing. Regarding geologic siting, what is the capacity of the targeted geologic formation for the Holcomb well to take radioactive waste from other formations and other drilling operations? Will the permit allow the operator to take such wastes in the future? Does EPA monitor the radioactivity of the injectates going into an injection well or the radioactivity of the injection well site?

**Response #22:** This permit only authorizes injection of fresh water for enhanced recovery of oil into the well. The proposed injection well will be a conversion of an existing oil production well that was permitted by the State of Michigan during 2008. No brine or any other wastes are allowed to be injected for disposal under this permit.

**Injection well failure rate**

**Comment #23:** Injection well integrity does fail and the toxic materials inside the wells do reach and contaminate the water supply. I put the following studies by Dr. Ingraffea and others into the record on this topic: Regarding well engineering in Michigan: EPA monitors injection wells throughout the state. What is the likelihood based on EPA's monitoring of Michigan injection wells that the proposed Holcomb injection well will fail in 10 years? In 20 years? In 100 years? Forever? EPA should require the operator to post a bond high enough that if contamination happens, ever, that will pay to clean up contaminations. I urge EPA to reject the permit well because of the known rates of well-casing failures. Because all well casings of injection wells (and frack wells) eventually fail--some right away, some in a few years, and all eventually--this guarantees that the toxic waste in the injection well will eventually endanger drinking water and aquifers. I put the following scientific study by Anthony Ingraffea, Ph.D., P.E., into the record: "Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play," January 2013. Physicians, Scientists & Engineers for Healthy Energy. A ProPublica review of well records, case histories, and government summaries of more than 220,000 well inspections from October 2007 to October 2010 found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also showed wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination. ProPublica's analysis showed that, when an injection well fails, it is most often because of holes or cracks in the well structure itself. Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects.

## **Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Response #23:** The permit requires that the well will inject only fresh water, not wastewater. The permit requires that “the permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8,” and specifies monitoring requirements designed to detect conditions that indicate possible loss of mechanical integrity, and procedures for restoring mechanical integrity. In the event of a well leak (loss of mechanical integrity), the permit specifies that the permittee (Muskegon Development Company) must shut-in (cease injection to) the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

### **There is insufficient information in the permit application to support a permit decision**

**Comment #24:** I am writing to oppose the issuance of a Class II Injection Permit to Muskegon Development Company (Holcomb 1-22 well, #MI-035-2R-0034). I would also like to request new surveys and studies be done where and when appropriate, new permit applications required, and that this process be generally reset to the starting point, which should include a new Public Hearing Transcript, as there have been problems throughout the application process.

**Response #24:** EPA has reviewed the technical information of record, and the comments received during the two public comment periods, and determined the permit application to be complete, with enough data and information to support a permit decision. The basis of the permit decision relies primarily upon assessment of the local geology, well design and the plugging and abandonment plan of the existing well. EPA considers the impact of other wells within the ¼ mile radius area of review that are deep enough to penetrate the proposed injection zone. Please see the responses to comments 1-4 for information about the process for public participation on the draft permit decision.

### **Determination**

After consideration of all public comments, EPA has determined that none of the comments submitted have raised issues which would alter EPA's basis for determining that it is appropriate to issue Muskegon Development a permit to operate the Holcomb 1-22 injection well. Therefore, EPA is issuing a final permit to Muskegon Development. No changes will be made to the final permit from the draft permit.

### **Appeal**

In accordance with 40 C.F.R. § 124.19(a), any person who filed comments on the draft permit or participated in the public hearing may petition the Environmental Appeals Board (EAB) to review any condition of the final permit decision. Additionally, any person who failed to file comments on the draft permit may petition the EAB for administrative review of any permit conditions set forth in the final permit decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit. Any petition shall identify the contested permit condition or other specific



**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed, as well as a demonstration that any issue raised in the petition was raised previously during the public comment period (to the extent required), if the permit issuer has responded to an issue previously raised, and an explanation of why the permit issuer's response to comments was inadequate as required by 40 C.F.R. § 124.19(a)(4). If you wish to request an administrative review, documents in EAB proceedings may be filed by mail (either through the U.S. Postal Service ("USPS") or a non-USPS carrier), hand-delivery, or electronically. The EAB does not accept notices of appeal, petitions for review, or briefs submitted by facsimile. All submissions in proceedings before the EAB may be filed electronically, subject to any appropriate conditions and limitations imposed by the EAB. To view the Board's Standing Orders concerning electronic filing, click on the "Standing Orders" link on the Board's website at [www.epa.gov/eab](http://www.epa.gov/eab). All documents that are sent through the USPS, except by USPS Express Mail, must be addressed to the EAB's mailing address, which is: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue, NW, Mail Code 1103M, Washington, DC 20460-0001. Documents that are hand-carried in person, delivered via courier, mailed by Express Mail, or delivered by a non-USPS carrier such as UPS or Federal Express must be delivered to: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1201 Constitution Avenue, NW, WJC East Building, Room 3332, Washington, D.C. 20004.

A petition for review of any condition of a UIC permit decision must be filed with the EAB within 30 days after EPA serves notice of the issuance of the final permit decision. 40 C.F.R. § 124.19(a)(3). When EPA serves the notice by mail, service is deemed to be completed when the notice is placed in the mail, not when it is received. However, to compensate for the delay caused by mailing, the 30-day deadline for filing a petition is extended by three days if the final permit decision being appealed was served on the petitioner by mail. 40 C.F.R. § 124.20(d). Petitions are deemed filed when they are received by the Clerk of the Board at the address specified for the appropriate method of delivery. 40 C.F.R. § 124.19(a)(3) and 40 C.F.R. § 124.19(i). The request will be timely if received within the time period described above. For this request to be valid, it must conform to the requirements of 40 C.F.R. § 124.19. This request for review must be made prior to seeking judicial review of any permit decision. Additional information regarding petitions for review may be found in the Environmental Appeals Board Practice Manual (August 2013) and A Citizen's Guide to EPA's Environmental Appeals Board, both of which are available at:

[http://yosemite.epa.gov/oa/EAB\\_Web\\_Docket.nsf/General+Information/  
Environmental+Appeals+Board+Guidance+Documents?OpenDocument](http://yosemite.epa.gov/oa/EAB_Web_Docket.nsf/General+Information/Environmental+Appeals+Board+Guidance+Documents?OpenDocument)

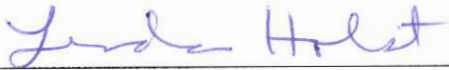
The EAB may also decide on its own initiative to review any condition of any UIC final permit decision. The EAB must act within 30 days of the service date of notice of the Regional Administrator's action. Within a reasonable time following the filing of the petition for review, the EAB shall issue an order either granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action when a final permit decision is issued by the EPA pursuant to 40 C.F.R. § 124.19(l).

**Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Final Permit**

The final permit and Response to Comments document are available for viewing at the Harrison District Library, 105 East Main Street, Harrison, MI 48625; Phone: (989) 539-6711.

Please contact William Tong of my staff at (312) 886-9380, or via email at tong.william@epa.gov if you have any questions about the Muskegon Development Company, Holcomb 1-22 Class II injection well permit.



Date 7/3/18

Linda Holst  
Acting Director, Water Division  
U. S. Environmental Protection Agency  
Region 5

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Introduction**

This revised response to comments is issued in accordance with Section 124.17(a), (b), and (c) of Title 40 of the Code of Federal Regulations (40 C.F.R. § 124.17(a), (b), and (c)), which require that at the time any final United States Environmental Protection Agency (EPA) permit decision is issued, the Agency shall: (1) briefly describe and respond to all significant comments on the draft permit decision raised during the public comment period; (2) specify which provisions, if any, of the draft decision have been changed and the reasons for the change; (3) include in the administrative record any documents cited in the response to comments; and (4) make the response to comments available to the public.

The original response to comments and final Permit No. MI-035-2R-0034 were issued by EPA on July 3, 2018. The final permit was appealed to the Environmental Appeals Board (EAB) on August 10, 2018. The EAB issued a decision on April 29, 2019, with an order remanding in part and denying review in part; specifically, EPA was directed to “demonstrate that the Region considered and responded to all significant comments” (EAB April 29, 2019 Decision at p. 12) and to correct deficiencies regarding its responses to Comment #20 (“Low income population of the well site area should be factored into permit decision”), #24 (“Well casing failures”), #25 (“Structural failures inside injection wells are common”), and #26 (“Please protect the water supply”). The revised responses to the comments referenced above are incorporated into this document. The abbreviation “RTC” used in citations refers to this revised Response To Comments document.

### **Background**

On February 10, 2017, EPA issued a draft Class II permit to inject fresh water for the purpose of enhanced oil recovery (Permit Number MI-035-2R-0034) to Muskegon Development Company for its Holcomb 1-22 well, and invited public comment. The public comment period ended March 15, 2017. Public comments were received indicative of significant interest in the draft permit, and EPA scheduled and held a public meeting and public hearing at Clare High School, in Clare, Michigan, on July 25, 2017. Following the public hearing, EPA extended the July 28 deadline for comments to August 18, 2017. The comments compiled include those received from the first comment period (February 10 to March 15, 2017), the July 25, 2017 public hearing (from the court reporter transcript), and the second comment period (June 21 to August 18, 2017). The first comment period lasted 34 days and the second comment period lasted 59 days, for a total of 93 days.

### **General and Out of Scope Comments**

EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have an Underground Injection Control (UIC) permit application approved. These regulations define the general scope of EPA’s authority and review process, which include standards for geologic siting, well engineering, operation and monitoring, and plugging and abandonment of deep injection wells.

EPA received many comments directed at matters outside the scope of the UIC Program’s purview. EPA is not responding to the following comments because they do not relate to the UIC permit process, or to geologic siting, well engineering, operation and monitoring standards, or plugging and abandonment of the proposed secondary recovery well. These general comments are listed below without response. Specific comments that address topics that are relevant to this permitting decision,

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

with responses, follow in subsequent sections. Although EPA is not responding to general statements of support and opposition to the permit individually, it did consider them in making the decision to issue the final permit.

The comments in the “out of scope” category focus on topics including:

- a. Fresh water should not be withdrawn at an unlimited rate because it may lower water levels in private wells
- b. Fresh water should not be withdrawn at an unlimited rate because it may deplete the aquifer
- c. Fresh water should not be withdrawn at an unlimited rate because it may cause earthquakes
- d. Will Muskegon Development Company pay for regular water testing for nearby residents?
- e. Will Muskegon Development Company pay for fair market compensation or purchase of polluted property?
- f. Increased truck traffic associated with well operations
- g. UIC regulations governing construction are insufficient to protect drinking water
- h. The well is not needed; oil prices are cheap
- i. Legal disputes involving other wells
- j. Inaccuracies in the permit application (commenters confused the 2008 state oil well permit application with the federal injection well permit application)
- k. Oil and gas wells have a history of failure in Pennsylvania
- l. Gulf oil wells have a history of failure
- m. Fracking wells can lead to contamination and earthquakes
- n. Location of injection well in residential area is questionable
- o. Hydrogen sulfide gas emissions

EPA received extensive comments that were “in scope” of the UIC Program’s purview:

1. Request for public hearing
2. Public hearing notification procedures were flawed
3. Request for time extension for public comments following hearing
4. Request for a second public hearing
5. Ground water contamination
6. Leak accident response
7. Muskegon Development Company providing fresh water samples and any additives
8. Nature of chemicals in injected waste
9. Maximum injection pressure calculation
10. Well design and construction inadequate to protect Underground Sources of Drinking Water (USDW’s)
11. Area of Review not sufficiently protective of USDW’s
12. Surface casing is not deep enough to protect USDW’s
13. Fresh water should not be used for injection in lieu of brine
14. Self-monitoring of injection wells is inadequate
15. Excessive injection into wells can cause earthquakes
16. Injection wells can drain the aquifer and cause earthquakes
17. Earthquake hazards from injection wells

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18. EPA must address permitted and unmonitored injection wells
19. There may be orphaned wells within the Area of Review that were omitted from the permit application
20. Low income population of the well site area should be factored into permit decision
21. Risk of water pollution at the well
22. Radioactivity of injectate
23. Injection well failure rate
24. Well casing failures
25. Structural failures inside injection wells are common
26. Please protect the water supply
27. There is insufficient information in the permit application to support a permit decision

### **Request for public hearing**

**Comment #1:** Our community would appreciate the questions we have, be directly answered by Muskegon in a public forum: that they will agree to have Muskegon Development Company, available to answer our questions/concerns, along with experts from the EPA. These are vital issues that could impact our community, our environment in the near future and in generations to come.

**Response #1:** A public meeting and public hearing regarding this proposed permit were held by EPA staff at Clare High School on July 25, 2017. EPA staff gave a presentation regarding the permit and answered questions during the public meeting, followed by the public hearing, where EPA received (but did not reply to) oral and written comments from the audience. Under the regulations governing public hearings for Underground Injection Control (“UIC”) Permits (40 C.F.R. Part 124), the permit applicant, Muskegon Development Company, was not required to be present nor answer questions.

### **Public hearing notification procedures were flawed**

**Comment #2:** This meeting would have had many more citizens attend if the EPA had released accurate date, time, and meeting location of this meeting, but the Clare County Review shared that it would be on Thursday (instead of Tuesday), at Clare Middle School (instead of the high school). Even the EPA web site and your handout at the meeting listed the wrong meeting date. The public deserves to know about this permit and be informed, but so do the people who depend on this aquifer, and those people reside more in northern Clare County and Gladwin County. The Township Supervisor stated the Township Hall would have been the perfect location. Why was the meeting held in the City of Clare, 26 miles away from the area affected by the injection well?

**Response #2:** EPA held a public hearing on July 25, 2017 for the draft permit for the proposed Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing and Clare High School as the location. On the evening of the hearing, it was discovered that the address published in the Fact Sheet was the mailing address, which differed from the physical address of Clare High School; EPA placed signs outside to direct people to the proper location. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

### **Request for time extension for public comments following hearing**

**Comment #3:** I ask that you consider extending the public comment period, that you hold a public hearing at the Hamilton Township Hall, that you publish the correction information on the notice to citizens and publish it in the Clare County Cleaver as well as cc: to the Hamilton Township Board and Zoning & Coding Officer (he was not aware of this at all). Another paper "more local" is the Gladwin Record Eagle out of Gladwin, MI. I also ask that a representative specialized in water matters from our District DEQ office in Saginaw is present.

**Response #3:** Subsequent to the hearing, EPA extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing.

### **Request for a second public hearing**

**Comment #4:** I demand a new public hearing on this matter on the grounds that the previous public hearing was improperly noticed and held at an inconvenient and at a location outside of Hamilton Township. I would like to also note that Hamilton Township is a rural community, one in which many residents lack reliable transportation or the ability or time to travel extra distance for a permit hearing. Therefore, I would like to request that the new public hearing be held in Hamilton Township.

**Response #4:** EPA held a public hearing on July 25, 2017 for the draft permit for the Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Ground water contamination**

**Comment #5:** Injection and waste migration: Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects. A 1987 General Accountability Office review tallied ten cases in which waste had migrated from Class 1 hazardous waste wells into underground aquifers. Two of those aquifers were considered potential drinking water sources. In 1989, the GAO reported 23 more cases in seven states where oil and gas injection wells had failed and polluted aquifers. After the findings, the federal government drafted more rules aimed at strengthening the injection program. The government outlawed certain types of wells above or near drinking water aquifers, mandating that most industrial waste be injected deeper. In response, the energy industry lobbied and won a critical change in the federal government's legal definition of waste: Since 1988, all material resulting from the oil and gas drilling process is considered non-hazardous, regardless of its content or toxicity, making it subject to less strict standards than hazardous waste (Class I wells).

**Response #5:** The proposed permit allows only the injection of fresh water for enhanced oil recovery; injection of any wastes for disposal is prohibited. The proposed injection well will have multiple safeguards to prevent any leaks: multiple well casings (steel pipe), annulus fluid (surrounding the injection tubing), cement between the well casings, and a packer to seal off the well annulus. A thick (over 900 feet for this well) confining zone of impermeable rock lies above the injection zone. In the event of a well leak (loss of mechanical integrity), the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon Development Company must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

### **Leak accident response**

**Comment #6:** In the event of a well leak or related accident, will Muskegon Development Company please outline the local safety procedures.

**Response #6:** In the event of a well leak, the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a Mechanical Integrity Test, transmit the test results to and request permission from EPA for written authorization to resume injection.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Muskegon Development Company providing fresh water samples and any additives**

**Comment #7:** Would Muskegon Development Company agree to provide "fresh water" samples used in the drilling process and disclose any additives?

**Response #7:** The Holcomb 1-22 well was drilled in 2008, and is still currently in use for oil production. After the well is converted for injection, the conditions of the permit take effect, and require Muskegon Development Company to inject only fresh water, drawn from the local aquifer, into the well; no additives or other fluids are allowed by the permit.

### **Nature of chemicals in injected waste**

**Comment #8:** It is our understanding that the purpose of the permit is to inject fluid (displaced chemicals & brine waste) 2651 feet below the surface. Please disclose the "chemicals used and the effect of them being displaced" in the injection well waste disposal process.

**Response #8:** The proposed injection well permit only allows fresh water to be injected into the Holcomb 1-22 well for enhanced oil recovery, not for waste disposal. No chemicals, brine waste or any other substances are authorized for injection into the well.

### **Maximum injection pressure calculation**

**Comment #9:** Explain how the injection pressure was selected, its depth into the rock and why it is safe. We have concerns that the injection pressure might induce formation fracturing and allow migration of the disposed waste into our aquifers and lakes.

**Response #9:** The limitation on wellhead pressure serves to prevent confining-formation fracturing, calculated using the following formula:

$$\{1.112 \text{ psi/ft.} - (0.433 \text{ psi/ft.}) \times (\text{specific gravity})\} \times \text{depth} - 14.7 \text{ psi}$$

Where psi = pounds/square inch

The maximum injection pressure is dependent upon depth and the specific gravity of the injected fluid. The Richfield Formation of the Detroit River Group at 4948 feet was used as the depth and a specific gravity of 1.05 was used for the injected fluid. The fracture gradient of 1.112 psi/ft. was determined from an acid-fracture job from a nearby well. The confining formations overlying the injection zone and underlying the underground source of drinking water consist of 922 feet of impermeable anhydrite and salt. The maximum injection pressure was calculated to prevent the confining rock formation from fracturing.



## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Well design and construction inadequate to protect USDW's**

**Comment #10:** The permit applicant, Muskegon Development Company, and the EPA, have not sufficiently demonstrated that the proposed injection well will not endanger Underground Sources of Drinking Water (USDW) and may likely present a public nuisance. The proposed injection well and any nearby offset wells are not properly designed and constructed and may endanger USDWs.

**Response #10:** EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the Area of Review (AOR) that penetrate the injection zone, to assure that USDWs are protected.

### **Area of Review not sufficiently protective of USDW's**

**Comment #11:** The described Area of Review ("AoR") evaluation is not sufficient and neither the applicant nor EPA has demonstrated that the proposed fixed radius, assuming there is one, is appropriate to protect USDWs. The draft permit lists one (1) plugged and abandoned well within the 1/4-mile radius of the Area of Review (AOR). However, the MDEQ GeoWebFace map shows a plugged and abandoned well just north of the west edge of Decker Lake. This well appears to be within 1/4 mile of the Holcomb 1-22 well. If it is not, it is beyond 1/4 mile by just a few feet, and given the extremely small radius of the area of review (AOR) that a permit applicant must address, it would be in keeping with the spirit of the law to include this well in the AOR as well.

**Response #11:** 40 C.F.R. § 147.1155 requires EPA to use a fixed radius AOR of no less than 1/4-mile for Class II wells in Michigan. EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the AOR that penetrate the injection zone, to assure that USDWs are protected.

Regarding the plugged and abandoned well just north of the west edge of Decker Lake, EPA has reviewed the available data on GeoWebFace and has identified the well to be the McKenna et al-4, a well drilled in 1944 to a depth of 3840 feet. The well proved to be a dry hole (non-oil producing) that was adequately plugged and abandoned. The McKenna et al-4 well did not penetrate the injection zone of the proposed Holcomb 1-22 well, and therefore would not serve as a conduit for the migration of fluids into the USDW.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Surface casing is not deep enough to protect USDW's**

**Comment #12:** The draft permit should not be approved unless and until these deficiencies are addressed: Well Construction: Neither the applicant nor EPA has demonstrated that the surface casing extends below the base of the USDW and the production casing cement does not extend above the base of either the USDW or the surface casing. This means that a portion of the annular space adjacent to the USDW is uncemented. Leaving this annular space uncemented puts both the USDW and well integrity at risk. The top of the production casing cement does not appear to extend above the base of the surface casing. Failing to extend surface casing in any well to below the base of the lowest USDW puts those USDWs below the base of the surface casing at significant risk of contamination. Cross flow may occur between the USDW and other formations, potentially leading to contamination of the USDW. Leaving a potential flow zone uncemented can also result in over pressurization of the annulus and/or result in casing corrosion, both of which may lead to a well integrity failure, further putting drinking water at risk. Properly constructed wells typically have at least two barriers between USDWs and fluids contained in the well: 1) the surface casing and 2) the production casing. The American Petroleum Institute recommends that “surface casing be set at least 100 feet below the deepest USDW encountered while drilling the well. Both UIC Class I and Class VI well rules require surface casing to extend below the base of the lowest USDW, indicating that EPA clearly recognizes this as an important standard to protect ground water.

**Response #12:** Based upon the geological formation record obtained when the Holcomb 1-22 well was drilled for oil production, the USDW consists of the Glacial Drift, which extends from the surface to a depth of 464 feet. The surface casing and surface casing cement of the proposed injection well extends from the surface to 792 feet deep, which is 328 feet deeper than the bottom of the USDW, far exceeding 100 feet below the deepest USDW. The cemented portions of the annular space between the long string and intermediate well casings in the well extend from 2650' to 4082' – this cemented interval seals off the permeable rock formations known as the Traverse Formation (3034' to 3068'), Traverse Limestone (3068' to 3716') and Dundee Limestone (3782' to 4044'). Between 3034' and 1530', the formation record shows consecutive formations of impermeable shale, meaning that the depth interval between 2650' (top of the cement) and 1530' (top of the Coldwater Shale) consists of more than 1000 feet of impermeable rock acting as a barrier to potential upward migration of injected fluid. The depth interval between 1530' and 792' consists of shale and sandstone formations that are not USDWs. Underground injection wells are designed with multiple safeguards to prevent leaks from the well. Injection wells are constructed with multiple steel casings (pipe) cemented into place. Injection takes place through tubing located at the center of the innermost steel casing. A device called a packer seals off the bottom of the tubing, and the space between the innermost steel casing and tubing (annulus) is filled with a fluid containing a corrosion inhibitor. To assure that no leaking occurs in the well, the annulus space is tested after the well is completed and then re-tested periodically. If this test fails, the well is shut down immediately, and the cause of the leak is isolated and repaired. Once shut down, a successful pressure test must be demonstrated before EPA will allow the operator to resume well injection. Under the conditions of the permit, Muskegon Development is responsible for maintaining the well so that it works properly, and would be responsible for any contamination caused by any leaks. See 40 C.F.R. Part 146, Subpart C.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Fresh water should not be used for injection in lieu of brine**

**Comment #13:** There is an issue regarding the level of ground water withdrawal for the purpose of oil production enhancement. Because there is no limitation, in essence there is no coordination with the aquifer that's going to provide the fresh water, so you basically are allowing the permittee to drain the aquifer. That shouldn't happen. That should be a violation of the Safe Water Drinking Act. The Safe Water Drinking Act says you are supposed to protect all of the aquifers from loss or contamination. In Michigan we have a little bit more than 4 million people who draw their water every day from an aquifer, and we need to protect them all as far as I'm concerned, and I know that's exactly what you want to do. So I do think you need to readjust the standard that you have for these -- this class of injection to consider the aquifer that is -- to consider where the fresh water is coming from. Well, frankly, you should not use fresh water. You should do what they do in EPA Region 10 or Region 9 or Region 8.

**Response #13:** There is no prohibition in the Safe Drinking Water Act (SDWA) or UIC regulations to using fresh water or ground water for injection to enhance recovery of oil or natural gas. The SDWA does not restrict the withdrawal of fresh water from an aquifer. The State of Michigan regulates ground water and the volume or rate of ground water withdrawal.

### **Self-monitoring of injection wells is inadequate**

**Comment #14:** You are currently permitting wells, injection wells, in Michigan that you do not have a realistic expectation of being able to site monitor. We feel that is a violation of the Safe Drinking Water Act. We hope that EPA will suspend activities on permitting until such time as EPA has caught up with the backlog of unmonitored wells, which is quite substantial. The idea that a company would be allowed to provide its own data and studies for any part of the permit process is completely absurd. At no point in any permit application should a company be trusted to provide its own numbers. It is absurd to trust any business to self-regulate. Should problems occur, there is an obvious profit motive for negligence in monitoring, reporting, and even for taking corrective actions to address potential issues. It is appalling that the regulations of the permitting process leave the EPA and MDEQ to rely on data submitted by the permit applicant and that the EPA and MDEQ do not obtain and maintain their own data.

**Response #14:** Self-monitoring under permit conditions has been well-established for decades and is the basis of compliance with most federal and state environmental protection statutes. Periodic environmental compliance inspections supplement regular self-monitoring data; permit violations are subject to enforcement action. Under federal law, there are criminal penalties for falsification of data and reports. Congress enacted the SDWA to protect USDWs from endangerment from underground injection practices, thereby protecting human health and the environment. The UIC regulations at 40 C.F.R. Parts 144 and 146 specify the geological siting, engineering, construction, and operation and monitoring requirements which injection wells must meet in order to prevent contamination of USDWs. Parties that wish to use an injection well must obtain a UIC permit showing that they satisfy those requirements. For the Holcomb 1-22 well permit, EPA has determined that there will be no

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

impact to the drinking water aquifer as a result of injection into this well. The next step in the protection of a USDW is for the permit holder to be in compliance with the permit, which includes monitoring and reporting requirements. EPA reviews monthly operating reports and reports on periodic testing. EPA inspections and oversight verify the accuracy of the facility's self-monitoring and reporting, and the facility is subject to penalties and sanctions for failure to comply with its obligations. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Failure to comply fully with permit conditions is a violation and may subject an owner/operator to an action under the enforcement provisions of the SDWA, 42 U.S.C. § 300h-2. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to \$273,945, civil penalties of up to \$54,789 per day of violation and criminal penalties of up to 3 years imprisonment and fines in accordance with Title 18 of the United States Code.

### **Excessive injection into wells can cause earthquakes**

**Comment #15:** With an unlimited injection of ground water into your Class II wells, you have not adjusted the maximum limitation, and you are, in fact, permitting earthquakes by doing that. It may take 40 or 50 or 100 years, but infinity will catch up with whatever is there and physics will take over and you will have an earthquake. So, EPA must redo that standard so that disposal wells do not have infinity. In March of 2016, the United States Geological Survey issued a major finding that injection wells can cause earthquakes. The EPA has not incorporated that finding into its injection well permitting activities. Considering the USGS finding, infinity is not a realistic or safe limit on injection well permits. It is imperative the EPA develop a safe and realistic limit for the total amount of wastes injected allowed by EPA for each permit. Until the infinity limit problem is addressed, the EPA cannot legally issue injection well permits without violating both the letter and spirit of the Safe Drinking Water Act.

**Response #15:** The UIC permit limits the injection pressure that can be used. According to historical data compiled by the U.S. Geological Survey (USGS), the Clare County area is considered a low risk area regarding earthquakes, with no instances of property damage or fatalities due to earthquakes. Of the five historic earthquakes cited by the USGS in their web site report on Michigan earthquake history, none were located near Clare County. An earthquake in Michigan registered a Richter magnitude of 4.2 on May 2, 2015, but the epicenter was located 9 miles southeast of Kalamazoo, about 125 miles away from Hamilton Township, Clare County, Michigan, where the site of the proposed Holcomb 1-22 well is located. The depths of the earthquakes were determined by geologists to be more than 19,000 feet below ground, far deeper than any existing Class II injection wells. Based upon this data, and using the EPA Injection-Induced Seismicity Decision Model flow chart, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **Injection wells can drain the aquifer and cause earthquakes**

**Comment #16:** An earthquake of Richter Magnitude 4.2 occurred in Michigan during May of 2015. An earthquake easily can affect the confining strata within a 200 mile-plus area from the epicenter. Another problem with this well, and in particular, with the Class II wells, is that an infinity limitation on ground water withdrawal allows the permittee to drain the aquifer. The U.S. Geological Survey made a finding that injection wells do, in fact, cause earthquakes. If you live in Oklahoma, you don't have to wonder about that finding at all.

**Response #16:** EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away near Galesburg, Michigan, in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well, combined with the general lack of fault zones in the area, are an unlikely scenario for injection-induced earthquakes. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan.

### **Earthquake hazards from injection wells**

**Comment #17:** Earthquakes in Michigan were felt in the past few years. Core samples of the Holcomb well need to be taken to determine if there was any effect on the well casing integrity due to this seismic activity. Given that the USGS has found that injection wells do in fact cause earthquakes, EPA needs to take the entirety of Michigan's existing oil and gas wells and injection wells into account, and do a complete survey of orphan wells and their conditions, before issuing any new injection well permits.

**Response #17:** EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no concerns related to the Holcomb 1-22 well and seismicity were identified. Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well in Michigan, combined with the general lack of fault zones, are an unlikely scenario for injection-induced earthquakes related to the Holcomb 1-22 well. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan. Under Part I 10(c) of the proposed permit, Muskegon Development cannot commence injection in the well until they demonstrate mechanical integrity, submit a report for EPA review, and receive a written authorization to inject from EPA.

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

### **EPA must address permitted and unmonitored injection wells**

**Comment #18:** It is not legal for the EPA to issue any more Class II injection well permits in Michigan without a prior substantial EPA effort to address the existing permitted and unmonitored injection wells in Michigan. Permitting without a realistic expectation of the monitoring required by federal law is a violation of that same law.

**Response #18:** EPA expends effort to evaluate compliance by persons who own or operate injection wells. EPA inspects such wells, reviews monitoring reports submitted by owners or operators, witnesses well mechanical integrity and geologic reservoir tests performed by such persons, reviews reports from mechanical integrity and reservoir tests, and issues information collection orders to owners or operators under 42 U.S.C. § 300j-4. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Neither the Safe Drinking Water Act nor regulations provide that a permit application should be denied on the basis of the scope of coverage of the compliance evaluation program administered by the permit-issuing agency.

### **There may be orphaned wells within the Area of Review that were omitted from the permit application; they are a hazard and should be factored into permit decision**

**Comment #19:** Hamilton Township has a history with the oil and gas industry that goes back at least to the 1930s. This is a long and tumultuous history. Dangerous levels of methane have been found in homes in their drinking water; also, there are a number of incidents of exploding homes and basements due to old wells leaking methane and other gases. These wells were drilled in the 1930s and 1940s, a time when well drilling and closing standards were far from what is required today. We know that the DEQ has found ancient and improperly closed wells; wells plugged with garbage, timbers, whatever was available to fill the hole, rather than the cement and steel that is required today. Taking this into consideration along with well failure statistics of modern wells, leaves an alarming question as to whether or not this area is truly appropriate for injection wells and the high pressure used in such wells. That's what the area geologist for the Michigan Department of Environmental Quality tells us. Independent researchers have discovered a number of orphan wells NOT included in most of the archives, and there are orphan wells that are NOT included on the DEQ maps for Hamilton Township. Thus, it is very possible that Muskegon Development Company has failed to account for all the wells in the 1/4-mile AOR radius. Is there is a plan to locate these orphan wells before this permit is issued and the injection well becomes operational? There should be a full survey of the area be conducted to locate orphan wells and make sure that they are adequately plugged and if they are in fact leaking from well casing failure or other failure.

**Response #19:** During technical review of a UIC permit application, EPA evaluates the possible impact of abandoned wells if they are located within the 1/4-mile radius AOR, and if they are deep enough to penetrate the injection zone. If such wells are identified, a plan of corrective action to address these wells may be specified in the underground injection permit, to be implemented by the

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permit holder to assure that injection operations do not cause ground water migration to spread contamination into the USDW. Underground injection wells that are abandoned must be plugged, as specified by regulation or permit; 40 C.F.R. §146.24 a (3) requires "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." Within the Area of Review, EPA analysis of available information shows one active oil producing well that penetrates the injection zone, and two dry holes (non-oil producing wells that have been plugged and abandoned) that did not penetrate the injection zone of the proposed Holcomb 1-22 well.

### **Low income population of the well site area should be factored into permit decision**

**Comment #20:** My hope is that EPA staff will understand the human condition that surrounds this well site and give due consideration to those concerns if any of the other conditions of approval are in question. If you look at the demographics of Michigan, you will note that Lake County and Clare County are the most impoverished area within our state. The northern half of Clare County is the most impoverished area within our county. The last numbers I saw the median income in that area was under \$20,000 per household. The Dodge City area is likely the most impoverished area in northern Clare County and it is located 2 miles west of the Holcomb 1-22 well site. As a full time realtor in Clare, Gladwin and Isabella County for over 25 years, I have seen this poverty first hand. Last year (per the Clare/Gladwin MLS) there were 239 home sales in the Harrison Area. 105 of those sales were under \$50,000. Most of these sales are in residential areas served by private well and septic systems. Most of the wells we see in that area are 1 or 1.5-inch diameter hand-driven wells that were put in prior to the health department permit requirements and they remain in use today because of the cost of upgrading and the homeowner's inability to fund improvements. While I understand that contamination from this project is unlikely, the unlimited use of excessive and unlimited quantities of water from the water table is a concern.

**Response #20:** EPA takes the concerns in this comment seriously, and gave all due consideration and investigation into the matter of Environmental Justice (EJ) issues related to the Muskegon permit application and presence of a UIC Class II well in this community.

EPA is tasked by Congress with protecting human health and the environment. EPA also must follow Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* (59 FR 7629, Feb. 16, 1994). EPA considers a number of factors in review of a permit application, including environmental justice (EJ) screening to determine whether the action area contains specified subpopulations. EPA identified that 56% of the local population is low income. EPA evaluated the well design; plugging and abandonment plan; and, geological suitability of the rock formations for injection. With respect to the EO, EPA used its EJ screening tool and the community factors listed therein as relevant for consideration:

- the proximity of sources being regulated to the affected EJ population;
- the number of sources that may be impacting the affected EJ population;
- the number and amount of pollutants that may be impacting the affected EJ population;

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- whether there are any unique exposure pathways involved;
- combinations of the various EJ factors occurring in conjunction with one another; and,
- expressed stakeholder concerns about the EPA action, if any.

See, AR 1, 91, 95.

The final Permit includes conditions necessary to protect against endangerment of USDWs, including any upon which the local low-income community relies. Consistent with the UIC regulations, EPA made sure that the geological siting is suitable for injection and applied standards for well construction, operation, monitoring and reporting, all to protect the USDW. The permit application and the conditions in the Muskegon Development Class II permit are consistent with those regulations. See RTC at 14 (AR 11) (“The UIC regulations at 40 C.F.R. Parts 144 and 146 specify the geological siting, engineering, construction, and operation and monitoring requirements which injection wells must meet in order to prevent contamination of USDWs.”). These technical determinations and conditions include:

- analyzing the proposed well's geologic siting, to determine the appropriately protective injection zone and confining zone and only authorizing injection into that injection zone. See RTC at 5 (AR 10); Permit Page 1 and Part II.A.1 (AR 7)
- imposing permit conditions regarding well construction, including as to well casing and cementing. See RTC at 12, 14 (AR 18); Permit at Part II.A, Part III.B (AR 7)
- analyzing the proposed well's construction, including the “engineering design of the injection well and cement plug.” See RTC at 10, 11 (AR 18)
- imposing permit conditions regarding monitoring, observing, recording and reporting various parameters of well operation and injectate characteristics. See RTC at 14, 18, 23 (AR 14); Permit at Part I.E.8, Part I.E.9.c, Part II.B.2, Part II.B.3, and Part III. A (AR 7).
- imposing permit conditions regarding periodically testing the well's mechanical integrity. See RTC at 5, 6, 17, 23 (AR 18); Permit at Part I.E.17 (AR 7)
- imposing permit conditions that require ceasing injection and notifying Region 5 if the permittee’s monitoring uncovers any leak in the well. See RTC at 5, 6 (AR 18); Permit at Parts I.E.9.e. I.E.16 (AR 7)
- reviewing surrounding wells to ensure that no area wells could provide a channel for injectate to migrate above the confining zone. See RTC at 10, 11, 19 (AR 17)
- establishing a safe maximum injection pressure. See RTC at 9 (AR 13); Permit at Parts II.B. 1 .a, II.B.1.b, III.A (AR 7)
- evaluating the injectate's composition and other characteristics. See RTC at 8, 22 (AR 1); Permit at Part III.A (AR 7)



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- evaluating area seismicity. See RTC at 15, 16, 17 (AR 23)
- requiring a plugging and abandonment plan dictating how the well must be closed. See Permit, Part III.B (AR 7).
- requiring that "the underground injection activity, otherwise authorized by this permit or rule, shall not allow 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 pursuant to 40 C.F.R. Part 142 or may otherwise adversely affect the health of persons" Permit at Part I.A (AR 7)
- requiring the proper operation and maintenance of the well, including effective performance, adequate funding, adequate operator staffing and training and adequate laboratory and process controls. See Permit at Part I.E.5 (AR 7)
- requiring that before beginning injection, the permittee must provide regulators a chance to inspect the well. See Permit at Part I.E.10 (AR 7)

EPA's public participation efforts went beyond the requirements of 40 CFR Part 124. EPA held two comment periods and held an evening public meeting and hearing at the local community (Clare, MI) high school on July 25, 2017. Further, in response to requests of the affected community, EPA extended the July 28, 2017 deadline for receipt of comments during the second comment period until August 18, 2017. By having comment periods that summed to 93 days, and having a public meeting in addition to a public hearing, EPA went well beyond its mandatory duty to engage and interact with the public in this instance, both to achieve the requirements of EPA's EJ policy, and because the Agency believes that public participation is central to good government.

EPA's EJ analysis considered both the expressed financial straits of the affected community as well as the potential for adverse effect to the community's underground drinking water supplies. EPA assessed the likelihood of the Muskegon well causing an impact to the full population as extremely low. The proposed well is for injection of fresh water (ground water), the well is designed with multiple barriers (multiple steel well casings, cement between casings, injection through steel tubing, annulus fluid to monitor and contain any future leaks from the tubing), and the geology of the well site contains multiple formations of impermeable rock to prevent upward migration of any fluid leaks. See RTC Responses #10, 12 (AR 18), and Permit at Part II.A, Part II.B.1.d, Part III.B (AR 7).

EPA's "omnibus authority" at 40 C.F.R. § 144.52(a)(9) allows the Agency to determine and (if necessary) add to a UIC Permit conditions that are deemed "necessary to prevent migration of fluids into underground sources of drinking water." *Id.* At Muskegon, EPA made use of the EJ screening tool in the Administrative Record, and reviewed all information in the Administrative Record to identify the permit conditions needed to protect USDW from contamination. EPA determined that the Permit application and conditions in the final permit will effectively protect the USDWs upon which the low-income portion of the community relies. EPA's analysis took into account the factors related to proper evaluation of the well design (see AR18, Internal well construction analysis and diagram), the Permit applicant's proposed plugging and abandonment plan (see AR1, UIC Permit Application), and, the Agency's knowledge and experience in determining geological suitability of the rock

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formation that would be the locus of the injection point of the well to be permitted. See RTC Responses #10, #11, #19, and #21.

EPA also notes that, in its April 29, 2019 Order Remanding in Part and Denying Review in Part, Appeal No. 18-05, the EPA Environmental Appeals Board (EAB) agreed with EPA Region 5's assessment of the failure of the Petitioner to "identify any comment during the public comment process that argued the Region should have included the additional demographic factors identified in the Region's EJ screen prior to issuing the Permit." In performing its overall analysis of the Permit application in this matter, the Region studied a variety of factors regarding the necessary protection of USDWs. As noted above, to the degree that some of these were also EJ screening tool factors that were properly raised during the public hearing or the extended public comment period, the Region fully met its obligation under the "omnibus authority" of 40 C.F.R. Part 144, because the final permit includes the conditions needed to prevent endangerment to USDWs.

EPA's EJ analysis was based on a full review of the relevant record, pursuant to the mandates of EO 12898; the relevant regulatory provisions; and the extensive opportunity for public participation. EPA properly determined that, after full review of the AR as described above, the issuance of the UIC Class II Permit to Muskegon would not result in a threat to protection of the USDWs upon which the affected EJ community (as well as the overall community) relies.

### **Risk of water pollution at the well**

**Comment #21:** This appears to be a deep injection well in Clare County near the headwaters of the Middle Branch Tobacco River. I have not reviewed anything like this before and am not certain how to understand all the potential impacts. I went to the listed website and did look at that. I would have concerns over anything which could impact the ground water input to the Middle Branch Tobacco River as it is a designated trout stream. Any impacts that could possibly change the flows or temperatures would a problem and negatively impact the trout stream. I forwarded this to our habitat unit and they also were unsure of potential harmful impacts on fish in the nearby streams. My guess is the deep injection would mostly impact ground water and possibly drinking water for nearby wells. Thank you for my chance to comment and know about this application.

**Response #21:** Based upon EPA's technical review of the permit application, the well and plugging design, site geology, and endangered species review, the well will be protective of Underground Sources of Drinking Water (USDWs) and the environment, including surface water. EPA reviewed the permit application to determine that the geologic setting was appropriate for underground injection and that the proposed well, which already exists, was properly constructed. EPA evaluated the well's geological siting and construction, and established operating requirements in the permit that are protective of the USDW. EPA used several information sources in its review including the Michigan Hydrologic Atlas, the U.S. Geological Survey, and State of Michigan records of nearby injection wells. EPA's permit includes limits on the surface injection pressure to prevent the injected fluid from causing fractures in the rock, which could become conduits for the injected fluid to leave the injection zone. EPA calculated the surface injection pressure limit using conservative, site-specific figures for injected fluid, injection zone depth, and rock characteristics. EPA also reviewed all deep wells in the

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¼-mile zone surrounding the well site, to assure that they do not act as potential conduits for injection fluids to move into the USDW. EPA determined that all other wells in the surrounding ¼-mile zone were either properly constructed or properly plugged and abandoned, and will not act as conduits for injection fluids under pressure to move into the USDW or surface water. In addition, the applicant is required to pass a mechanical integrity test, in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted and after the well is completed. The operator is also required to repeat the test at least once every five years thereafter and to collect operating data and report to EPA monthly.

### **Radioactivity of injectate**

**Comment #22:** EPA fails to analyze Class II injection wells' waste stream, including this one, for the radioactivity which permeates oil and gas drilling wastes. Regardless of whether an injection well's engineering allows it to leak, there is no safeguard against radioactive contamination. There is no showing of any scrutiny of the question of whether any drill wastes will be contaminated routinely with "radioactive waste," which is defined at 40 C.F.R. § 144.3 as "any waste which contains radioactive material in concentrations which exceed those listed in 10 C.F.R. part 20, appendix B, table II, column 2." The referenced table and column specify threshold contamination levels for Ra-226, Ra-228, several Uranium isotopes associated with drilling wastes, and Th-232. It is incumbent upon the EPA to require sourced, predictive information of the likely radiological characteristics of the waste stream before a permit can even be considered for the proposed site. An entirely new permit must then be required of the operator, and the new process should afford the public the opportunity to scrutinize the underlying radioactive waste data along with another public hearing. Regarding geologic siting, what is the capacity of the targeted geologic formation for the Holcomb well to take radioactive waste from other formations and other drilling operations? Will the permit allow the operator to take such wastes in the future? Does EPA monitor the radioactivity of the injectates going into an injection well or the radioactivity of the injection well site?

**Response #22:** This permit only authorizes injection of fresh water for enhanced recovery of oil into the well. The proposed injection well will be a conversion of an existing oil production well that was permitted by the State of Michigan during 2008. No brine or any other wastes are allowed to be injected for disposal under this permit.

### **Injection well failure rate**

**Comment #23:** Injection well integrity does fail and the toxic materials inside the wells do reach and contaminate the water supply. I put the following studies by Dr. Ingraffea and others into the record on this topic: Regarding well engineering in Michigan: EPA monitors injection wells throughout the state. What is the likelihood based on EPA's monitoring of Michigan injection wells that the proposed Holcomb injection well will fail in 10 years? In 20 years? In 100 years? Forever? EPA should require the operator to post a bond high enough that if contamination happens, ever, that will pay to clean up contaminations. I urge EPA to reject the permit well because of the known rates of well-casing failures. Because all well casings of injection wells (and frack wells) eventually fail--some right away,

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some in a few years, and all eventually--this guarantees that the toxic waste in the injection well will eventually endanger drinking water and aquifers. I put the following scientific study by Anthony Ingraffea, Ph.D., P.E., into the record: "Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play," January 2013. Physicians, Scientists & Engineers for Healthy Energy. A ProPublica review of well records, case histories, and government summaries of more than 220,000 well inspections from October 2007 to October 2010 found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also showed wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination. ProPublica's analysis showed that, when an injection well fails, it is most often because of holes or cracks in the well structure itself. Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects.

**Response #23:** The permit requires that the well will inject only fresh water, not wastewater. The permit requires that "the permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8," and specifies monitoring requirements designed to detect conditions that indicate possible loss of mechanical integrity, and procedures for restoring mechanical integrity. In the event of a well leak (loss of mechanical integrity), the permit specifies that the permittee (Muskegon Development Company) must shut-in (cease injection to) the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

### **Well casing failures**

**Comment #24:** A full survey of the area needs be conducted to locate orphan wells and make sure that they are adequately plugged and if they are in fact leaking from well casing failure or other failure.

I urge EPA to reject the permit well because of the known rates of well-casing failures. Because all well casings of injection wells (and frack wells) eventually fail--some right away, some in a few years, and all eventually--this guarantees that the toxic waste in the injection well will eventually endanger drinking water and aquifers.

I put the following scientific study by Anthony Ingraffea, Ph.D., P.E., into the record: "Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play," January 2013. Physicians, Scientists & Engineers for Healthy Energy. *[This study has been added by EPA as Document #93 to the Amended Administrative Record.]*

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**Response #24:** Regarding the comment about orphaned wells, see Response #19. Well casing failures are cited from a study of the Pennsylvania Marcellus Shale formation, the site of high-pressure hydraulic fracturing (“fracking”) of shale for the extraction of natural gas. The proposed well is not a fracking well; the permit limits the well to injection of only fresh water for enhanced oil recovery; the injection of any other substances or waste for disposal is prohibited. EPA has considered your comment regarding the potential for well failure due to inadequacy of the well-casing system releasing toxic wastes into the underground drinking water aquifer. First, EPA notes that the UIC Class II permit does not allow the injection of any toxic wastes into any drinking water aquifer. No “toxic waste” is permitted to be injected into this well.

Moreover, the permit at Part I. E.17. requires that “the permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8,” and specifies monitoring requirements designed to detect conditions that indicate possible loss of mechanical integrity, and procedures for restoring mechanical integrity. In the event of a well leak (loss of mechanical integrity), the permit specifies that the permittee (Muskegon Development Company) must shut-in (cease injection to) the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

The permit also requires the permittee to specifically adhere to the controlling regulation of 40 CFR 146.8. The regulation requires that Mechanical Integrity of the well casing must be demonstrated as follows: – “Mechanical Integrity” is defined as “no significant leak in the casing, tubing or packer” (internal mechanical integrity) and “no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore” (external mechanical integrity). This production well was approved by a State of Michigan permit in 2008, and was constructed as an oil producing well by Northshore Petroleum, before being purchased by Muskegon Development in June 2009. In 2016, Muskegon applied to EPA to approve a UIC permit conversion of the well to injection of fresh water for enhanced oil recovery (not disposal). The only physical changes to the existing well is the installation of injection tubing and a packer, a steel ring-shaped device near the bottom of the well that seals off the space between the tubing and innermost well casing, creating a space called the annulus, which will contain an annulus fluid with corrosion inhibitors added; the pressure of the annulus fluid is used to monitor for any leakage (“loss of mechanical integrity”) in the casing, tubing, and/or packer, and provide a barrier to contain leaks, in addition to multiple well casings and cement.

The permit requires an internal (Part 1) Mechanical Integrity Test (MIT) of the well every five years. The permittee shall demonstrate the mechanical integrity of the well by pressure testing whenever: 1) the injection tubing is removed from the well or replaced; 2) the packer is reset; or 3) a loss of mechanical integrity occurs. Operation shall cease whenever one of the aforementioned conditions occurs and not resume until the Director gives approval to recommence injection. The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.

A properly-constructed UIC well with multiple concentric steel well casings with cement between casings, with a well packer and annulus fluid provide a system with multiple, redundant barriers to

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prevent any leak from reaching underground sources of drinking water. EPA's review of the permit application and all supporting documentation of record indicates that the Muskegon well will perform properly. EPA has determined the permit application to be complete, with enough data and information to support a permit decision to approve the injection well. The basis of the permit decision relies primarily upon assessment of the local geology, well design and the plugging and abandonment plan of the existing well.

See Response to Comment #25 for more information on well failure.

### **Structural failures inside injection wells are common**

**Comment #25:** A ProPublica review of well records, case histories, and government summaries of more than 220,000 well inspections from October 2007 to October 2010 found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also showed wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination. ProPublica's analysis showed that, when an injection well fails, it is most often because of holes or cracks in the well structure itself. Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects.

**Response #25:** The “statistics” that commenters mentioned do not reflect EPA's experience in Michigan. In a review of all active Class II injection wells in Michigan over the past five years, the failure rate has been no higher than 5% in any given year. This failure rate is almost entirely (100% to 99.72%) limited to annulus fluid leaking into the tubing and then into the injection zone, and **not** injectate fluid passing through the casing into an area other than the intended injection zone. Such casing leaks are extremely rare in Michigan; in the past five years the rate of casing needing repairs has ranged from 0 to 0.28% per year. To better understand these failures, it helps to know the construction of the injection wells.

Injection wells must be constructed and operated to prevent the injection fluid from contaminating an Underground Source of Drinking Water (USDW). The proposed injection will take place through steel tubing that is set within the innermost casing. The fluid approved for injection (fresh water for this well) will only be permitted to flow through the inside of this tubing. A device called a packer will be set at the bottom of the tubing to seal off the space between the innermost casing and tubing. This space, called the annulus, will be filled with a liquid mixture containing a corrosion inhibitor, and the permittee must monitor the pressure of the annulus liquid to detect any changes in pressure that could indicate a leak in either the tubing, packer, or casing. This pressure will be tested initially after the conversion of the injection well to ensure that the well has mechanical integrity and then monitored

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

weekly thereafter to ensure that the well maintains mechanical integrity. The permit does not allow injecting fluids through this monitored annulus space. Because injection fluids will only be injected through the tubing, they will not be in contact with the well casing.

If monitoring indicates a leak in the annulus or if the well should fail a mechanical integrity demonstration, then the permit requires the well to be shut down immediately and the failure reported to EPA within 24 hours. This is what EPA considers a well “failure.”

Any repairs or corrective actions taken to bring the well back into compliance with the permit and any work performed on the well that requires the moving and/or removal of the tubing or packer must be reported to EPA and followed by a successful mechanical integrity test before EPA will give authorization to resume injection.

### **Please protect the water supply**

**Comment #26:** You have a difficult job to do. I would like to add to the comments not in favor of extending this well's output by forcing fresh water or brine to disperse its remaining reserves into the existing oilfield. The cost seems too high for the area residents. They are concerned about their drinking water. Please protect the water first and foremost. "Only when the last tree has died & the last river has been poisoned & the last fish has been caught will we realize that we cannot eat money." Please choose wisely.

**Response #26:** EPA is tasked with the mission to protect human health and the environment. Congress enacted the Safe Drinking Water Act (SDWA) to protect underground sources of drinking water (USDWs) from endangerment from underground injection practices, thereby protecting human health and the environment. The UIC regulations at 40 C.F.R. Parts 144 and 146 specify the geological siting, engineering, construction, and operation and monitoring requirements which injection wells must meet in order to prevent contamination of USDWs. Parties that wish to use an injection well must obtain a UIC permit showing that they satisfy those requirements. Muskegon Development submitted a complete application for a UIC well permit to allow the injection of fresh water to enhance oil recovery. The permit application was reviewed by EPA for technical adequacy to ensure the well design has sufficiently redundant barriers against any future leaks, and geological data confirms the absence of known faults and fractures in underground rock formations, and the presence of confining rock layers overlying the injection zone. In the event of leaks (detected by pressure loss in the well), the incident must be reported within 24 hours to EPA after which EPA requires the well to cease injection; the well must be immediately shut-in, repaired, successfully tested for mechanical integrity, and re-authorized in writing by EPA to resume fluid injection into the well. For the Holcomb 1-22 well permit, EPA has determined that there will be no impact to the drinking water aquifer as a result of injection into this well.

The next step in the protection of a USDW is for the permit holder to be in compliance with the permit, which includes monitoring and reporting requirements. EPA reviews monthly operating reports and reports on periodic testing as required of the permittee by the conditions of the permit and

## **Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

40 CFR Part 144. EPA inspections and oversight verify the accuracy of the facility's self-monitoring and reporting, and the facility is subject to penalties and sanctions for failure to comply with its obligations. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Failure to comply fully with permit conditions is a violation and may subject an owner/operator to an action under the enforcement provisions of the SDWA, 42 U.S.C. § 300h-2. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to \$273,945, civil penalties of up to \$54,789 per day of violation and criminal penalties of up to 3 years imprisonment and fines in accordance with Title 18 of the United States Code.

### **There is insufficient information in the permit application to support a permit decision**

**Comment #27:** I am writing to oppose the issuance of a Class II Injection Permit to Muskegon Development Company (Holcomb 1-22 well, #MI-035-2R-0034). I would also like to request new surveys and studies be done where and when appropriate, new permit applications required, and that this process be generally reset to the starting point, which should include a new Public Hearing Transcript, as there have been problems throughout the application process.

**Response #27:** EPA has reviewed the technical information of record, and the comments received during the two public comment periods, and determined the permit application to be complete, with enough data and information to support a permit decision. The basis of the permit decision relies primarily upon assessment of the local geology, well design and the plugging and abandonment plan of the existing well. EPA considers the impact of other wells within the ¼ mile radius area of review that are deep enough to penetrate the proposed injection zone. Please see the responses to comments 1-4 for information about the process for public participation on the draft permit decision.

### **Determination**

After consideration of all public comments, EPA has determined that none of the comments submitted have raised issues which would alter EPA's basis for determining that it is appropriate to issue Muskegon Development a permit to operate the Holcomb 1-22 injection well. Therefore, EPA is issuing a final permit to Muskegon Development. No changes have been made to the final permit from the draft permit.

### **Appeal**

Anyone dissatisfied with EPA's decision on remand must file a petition seeking EAB review in order to exhaust administrative remedies under 40 C.F.R. § 124.19(l). Any such appeal shall be limited to issues EPA addressed on remand. Any petition shall identify the contested permit condition or other specific challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed, as well as a demonstration



**Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

that any issue raised in the petition was raised previously during the public comment period (to the extent required), if the permit issuer has responded to an issue previously raised, and an explanation of why the permit issuer's response to comments was inadequate as required by 40 C.F.R. § 124.19(a)(4). If you wish to request an administrative review, documents in EAB proceedings may be filed by mail (either through the U.S. Postal Service ("USPS") or a non-USPS carrier), hand-delivery, or electronically. The EAB does not accept notices of appeal, petitions for review, or briefs submitted by facsimile. All submissions in proceedings before the EAB may be filed electronically, subject to any appropriate conditions and limitations imposed by the EAB. To view the Board's Standing Orders concerning electronic filing, click on the "Standing Orders" link on the Board's website at [www.epa.gov/eab](http://www.epa.gov/eab). All documents that are sent through the USPS, except by USPS Express Mail, must be addressed to the EAB's mailing address, which is: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue, NW, Mail Code 1103M, Washington, DC 20460-0001. Documents that are hand-carried in person, delivered via courier, mailed by Express Mail, or delivered by a non-USPS carrier such as UPS or Federal Express must be delivered to: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1201 Constitution Avenue, NW, WJC East Building, Room 3332, Washington, D.C. 20004.

A petition for review of any condition of a UIC permit decision must be filed with the EAB within 30 days after EPA serves notice of the issuance of the final permit decision. 40 C.F.R. § 124.19(a)(3). When EPA serves the notice by mail, service is deemed to be completed when the notice is placed in the mail, not when it is received. However, to compensate for the delay caused by mailing, the 30-day deadline for filing a petition is extended by three days if the final permit decision being appealed was served on the petitioner by mail. 40 C.F.R. § 124.20(d). Petitions are deemed filed when they are received by the Clerk of the Board at the address specified for the appropriate method of delivery. 40 C.F.R. § 124.19(a)(3) and 40 C.F.R. § 124.19(i). The request will be timely if received within the time period described above. For this request to be valid, it must conform to the requirements of 40 C.F.R. § 124.19. This request for review must be made prior to seeking judicial review of any permit decision. Additional information regarding petitions for review may be found in the Environmental Appeals Board Practice Manual (August 2013) and A Citizen's Guide to EPA's Environmental Appeals Board, both of which are available at:

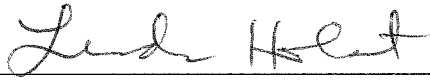
[http://yosemite.epa.gov/oa/EAB\\_Web\\_Docket.nsf/General+Information/Environmental+Appeals+Board+Guidance+Documents?OpenDocument](http://yosemite.epa.gov/oa/EAB_Web_Docket.nsf/General+Information/Environmental+Appeals+Board+Guidance+Documents?OpenDocument)

The EAB may also decide on its own initiative to review any condition of any UIC final permit decision. The EAB must act within 30 days of the service date of notice of the Regional Administrator's action. Within a reasonable time following the filing of the petition for review, the EAB shall issue an order either granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action when a final permit decision is issued by the EPA pursuant to 40 C.F.R. § 124.19(l).

**Revised Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well**

**Final Permit**

Please contact William Tong of my staff at (312) 886-9380, or via email at [tong.william@epa.gov](mailto:tong.william@epa.gov) if you have any questions about the Muskegon Development Company, Holcomb 1-22 Class II injection well permit.

  
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Date September 26, 2019

*for*  
Joan M. Tanaka  
Acting Director, Water Division  
U. S. Environmental Protection Agency  
Region 5



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

REGION 5

77 WEST JACKSON BOULEVARD

CHICAGO, IL 60604-3590

**Page 1 of 15**

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
UNDERGROUND INJECTION CONTROL PERMIT: CLASS II**

**Permit Number: MI-035-2R-0034**

**Facility Name: Holcomb 1-22**

Pursuant to the provisions of the Safe Drinking Water Act, as amended 42 U.S.C. §§ 300f et seq., (commonly known as the SDWA) and implementing regulations promulgated by the U.S. Environmental Protection Agency at Parts 124, 144, 146, and 147 of Title 40 of the Code of Federal Regulations (40 C.F.R.),

**Muskegon Development Company of Mount Pleasant, Michigan**


is hereby authorized to convert and operate an injection well located in Michigan, Clare County, T19N, R3W, Section 22, NW 1/4 Section, for injection into the Richfield Formation of the Detroit River Group at depths between 4948 and 5010 feet, upon the express condition that the permittee meet the restrictions set forth herein. Injection shall not commence until the operator has received authorization in accordance with Part I(E)(10) of this permit.

The injection shall be limited to fresh water for enhanced oil recovery from production wells owned or operated by Muskegon Development Company.

All references to Title 40 of the Code of Federal Regulations are to all regulations that are in effect on the date that this permit is effective. All terms used in this permit shall have the meaning set forth in the SDWA and implementing regulations at 40 C.F.R. Parts 124, 144, 146, and 147.

This permit shall become effective on NOV 17 2019 and shall remain in full force and effect during the operating life of the well, unless this permit is otherwise revoked and reissued, terminated or modified pursuant to 40 C.F.R. §§ 144.39, 144.40, and 144.41. This permit shall also remain in effect upon delegation of primary enforcement responsibility to the State of Michigan, unless that State chooses to adopt this permit as a State permit. The permit will expire in one (1) year if the permittee fails to commence construction, unless a written request for an extension of this one (1) year period has been approved by the Director. The permittee may request an expiration date sooner than the one (1) year period, provided no construction on the well has commenced. This permit will be reviewed at least every five (5) years from the effective date specified above.

Signed and dated: September 26, 2019

  
 Joan M. Tanaka  
 Acting Division Director,  
 Water Division

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## **PART I**

### **GENERAL PERMIT COMPLIANCE**

#### **A. EFFECT OF PERMIT**

The permittee is allowed to engage in underground injection in accordance with the conditions of this permit. The underground injection activity, otherwise authorized by this permit or rule, shall not allow 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 pursuant to 40 C.F.R. Part 142 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit or otherwise authorized by permit or rule is prohibited. Issuance of this permit does not convey 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 regulations. Compliance with the terms of this permit does not constitute a defense to any action brought under Section 1431 of the Safe Drinking Water Act (SDWA), or any other law governing protection of public health or the environment.

#### **B. PERMIT ACTIONS**

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 C.F.R. §§ 144.39, 144.40, and 144.41. The filing of a request for a permit modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition.

#### **C. 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.

#### **D. CONFIDENTIALITY**

In accordance with 40 C.F.R. Part 2 and § 144.5, any information submitted to EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in 40 C.F.R. Part 2 (Public Information). Claims of confidentiality for the following information will be denied:

- (1) The name and address of the permittee; and,
- (2) Information which deals with the existence, absence or level of contaminants in drinking water.

**E. 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 non-compliance is authorized by an emergency permit pursuant to 40 C.F.R. § 144.34. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance or modification.

2. **Penalties for Violations of Permit Conditions**

Any person who operates this well in violation of permit conditions is subject to civil penalties, fines, and other enforcement action under the SDWA and may be subject to such actions under the Resource Conservation and Recovery Act. Any person who willfully violates a permit condition is subject to criminal prosecution.

3. **Need to Halt or Reduce Activity not a Defense**

It shall not be a defense for a permittee in an enforcement action to state 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. **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.

6. **Duty to Provide Information**

The permittee shall furnish to the Director, by the date specified by the Director, 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 by this permit to be retained.

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. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
- b. Have access to and copy, at reasonable times, any records that must be retained under the conditions of this permit;
- c. Inspect, at reasonable times, any facilities, equipment (including monitoring equipment), practices, or operations, regulated or required under this permit; and
- d. Sample or monitor the injected fluids, at reasonable times, for the purposes of assuring permit compliance, or as otherwise authorized by the SDWA, at any location.

8. **Records**

- a. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all records required by this permit, for a period of at least three (3) years from the date of the sample, measurement or report. The permittee shall also maintain records of all data required to complete this permit application and any supplemental information submitted under 40 C.F.R. §§ 144.31 and 144.51. These periods may be extended by request of the Director at any time by written notice to the permittee.
- b. The permittee shall retain records concerning the nature and composition of all injected fluids until three (3) years after the completion of plugging and abandonment in accordance with the plugging and abandonment plan, contained in Part III(B) of this permit. The owner or operator shall continue to retain the records after the three (3) year retention period unless he delivers the records to the Regional Administrator or obtains

written approval from the Regional Administrator to discard the records.

- c. Records of monitoring information shall include:
- (i) The date, exact place, and the time of sampling or measurements;
  - (ii) The individual(s) who performed the sampling or measurements;
  - (iii) A precise description of both sampling methodology and the handling of samples;
  - (iv) The date(s) analyses were performed;
  - (v) The individual(s) who performed the analyses;
  - (vi) The analytical techniques or methods used; and,
  - (vii) The results of such analyses.

9. **Notification Requirements**

- a. **Planned Changes** - The permittee shall notify and obtain the Director's approval at least thirty (30) days prior to any planned physical alterations or additions to the permitted facility, or changes in the injection fluids. Within ten (10) days prior to injection, an analysis of new injection fluids shall be submitted to the Director for approval in accordance with Parts II(B)(2) and II(B)(3) of this permit.
- b. **Anticipated Noncompliance** - The permittee shall give at least thirty (30) days advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c. **Transfer of Permits** - This permit is not transferable to any person except after notice is sent to the Director at least thirty (30) days prior to transfer and the requirements of 40 C.F.R. § 144.38 have been met. 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 SDWA.
- d. **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 to the Director no later than thirty (30) days following each schedule date.



e. **Twenty-Four Hour Reporting**

- (i) The permittee shall report to the Director any noncompliance which may endanger health or the environment. This information shall be provided orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall include the following information:
  - (a) Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or,
  - (b) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.
- (ii) A written submission shall also be provided as soon as possible but no later than five (5) days from 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 recurrence of the noncompliance.

f. **Other Noncompliance** - All other instances of noncompliance shall be reported at the time when monthly reports are submitted under Part II(B)(3)(a) of this permit. 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 recurrence of the noncompliance.

g. **Other Information** - If or when the permittee becomes aware that the permittee failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit such facts or corrected information in accordance with 40 C.F.R. § 144.51(I)(8).

h. **Report on Permit Review** - Within thirty (30) days of receipt of the final issued permit, the permittee shall report to the Director that the permittee has read and is personally familiar with all terms and conditions of this permit.

10. **Commencing Injection**

The permittee shall not commence injection into any newly drilled or converted well until:

- a. Formation data and injection fluid analysis have been submitted in accordance with Parts II(A)(6) and II(B)(2), respectively;
- b. A report on any logs and tests required under Parts II(A)(5) and III(D) of this permit has been submitted;
- c. Mechanical integrity of the well has been demonstrated in accordance with Part I(E)(17);
- d. Any required corrective action has been performed in accordance with Parts I(E)(16) and III(C); and,
- e. Construction is complete and the permittee has submitted to the Permit Writer, by certified mail with return receipt requested, a notice of completion of construction using EPA Form 7520-10 and either:
  - (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, within thirteen (13) days of the date of the Director's receipt of the report required above, notice from the Director of his or her intent to inspect or otherwise review the new injection well, in which case prior inspection or review is waived and the permittee may commence injection.

11. **Signatory Requirements**

All reports required by this permit and other information requested by the Director shall be signed and certified according to 40 C.F.R. § 144.32.

12. **Notice of Plugging and Abandonment**

The permittee shall notify the Director at least forty-five (45) days before conversion or abandonment of the well.

13. **Plugging and Abandonment**

The permittee shall plug and abandon the well as provided in the plugging and abandonment plan contained in Part III(B) of this permit. Plugging shall occur as soon as practicable after operation ceases but not later than two (2) years

thereafter. During the period of non-operation, the well must be tested to ensure that it maintains mechanical integrity, unless the permittee fulfills the other requirements under 40 C.F.R. § 144.52(a)(6), prior to expiration of the two (2) year period. The permittee shall notify the Director of plugging and abandonment in accordance with the reporting procedures in Part I(E)(12) of this permit.

14. **Financial Responsibility**

The permittee shall maintain financial responsibility and resources to plug and abandon the underground injection well in accordance with 40 C.F.R. § 144.52(a)(7) as provided in Attachment R of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The permittee shall not substitute an alternative demonstration of financial responsibility from that which the Director has approved, unless the permittee has previously submitted evidence of that alternative demonstration to the Director and the Director has notified the permittee in writing that the alternative demonstration of financial responsibility is acceptable. The financial responsibility mechanism shall be updated periodically, upon request of the Director, except when Financial Statement Coverage is used as the financial mechanism, this coverage must be updated on an annual basis.

15. **Insolvency**

- a. In the event of the bankruptcy of the trustee or issuing institution of the financial mechanism, or a suspension or revocation of the authority of the trustee institution to act as trustee or the institution issuing the financial mechanism to issue such an instrument, the permittee must submit an alternative demonstration of financial responsibility acceptable to the Director within sixty (60) days after such event. Failure to do so will result in the termination of this permit pursuant to 40 C.F.R. § 144.40(a)(1).
- b. An owner or operator must also notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor of a corporate guarantee must make such a notification if he/she is named as debtor, as required under the terms of the guarantee.

16. **Corrective Action**

The permittee shall shut in the injection well whenever he/she or EPA determines that operation thereof may be causing upward fluid migration through the well bore of any improperly plugged or unplugged well in the area of review and shall take such steps as he/she can to properly plug the offending well(s). Any

operation of the well which may cause upward fluid migration from an improperly plugged or unplugged well will be considered a violation of this permit. If the permittee or the EPA determines that the permitted well is not in compliance with 40 C.F.R. § 146.8, the permittee will immediately shut in the well until such time as appropriate repairs can be effected and written approval to resume injection is given by the Director. In addition, the permittee shall not commence injection until any and all corrective action has been taken in accordance with any plan contained in Part III(C) of this permit and the requirements in Part I(E)(10) of this permit have been met.

17. **Mechanical Integrity**

- a. The permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8.
- b. A demonstration of mechanical integrity, in accordance with 40 C.F.R. § 146.8, shall be performed at least every five (5) years from the date of the last approved demonstration. The permittee shall notify the Director of his/her intent to demonstrate mechanical integrity at least thirty (30) days prior to such demonstration.
- c. The permittee shall demonstrate the mechanical integrity of the well by pressure testing whenever:
  - (i) the tubing is removed from the well or replaced;
  - (ii) the packer is reset; or,
  - (iii) a loss of mechanical integrity occurs. Operation shall cease whenever one of the aforementioned conditions occurs and not resume until the Director gives approval to recommence injection.
- d. The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.
- e. The permittee shall cause all gauges used in mechanical integrity demonstrations to be calibrated prior to the demonstration.
- f. The permittee shall cease injection if a loss of mechanical integrity occurs or is discovered during a test, or a loss of mechanical integrity as defined by 40 C.F.R. § 146.8 becomes evident during operation. Operations shall not be resumed until the Director gives approval to recommence injection.
- g. The permittee shall notify the Director of the loss of mechanical integrity, in accordance with the reporting procedures in Parts II(B)(3)(d) and

I(E)(9)(e) of this permit.

- h. The permittee shall report the result of a satisfactory mechanical integrity demonstration as provided in Part II(B)(3)(d) of this permit, except the first such result after Permit issuance, which shall be sent to the Permit Writer.

18. **Restriction on Injected Substances**

The permittee shall be restricted to the injection of fluids brought to the surface in connection with oil or natural gas production or those fluids used in the enhancement of oil and gas production as specified in 40 C.F.R. § 146.5(b). Further, no fluids other than those from sources noted in the administrative record for this permit and approved by the Director shall be injected.

**PART II**

**WELL SPECIFIC CONDITIONS FOR UNDERGROUND INJECTION CONTROL PERMITS**

**A. CONSTRUCTION REQUIREMENTS**

1. **Siting**

Notwithstanding any other provision of this permit, the injection well shall inject only 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 the review.

2. **Casing and Cementing**

Injection wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement to be used in the construction of the well shall be as contained in Attachments L and M of the permit application corresponding to this permit action which is hereby incorporated by reference as if they appeared fully set forth herein.

3. **Tubing and Packer Specifications**

Injection shall only take place through tubing with a packer set in the long string casing within or below the nearest cemented and impermeable confining system immediately above the injection zone. Tubing and packer specifications shall be as represented in engineering drawings contained in Attachments L and M of the permit application corresponding to this permit action which are hereby incorporated by reference as if they appeared fully set forth herein. Any proposed changes shall be submitted by the permittee in accordance with Part I(E)(9)(a) and (b) of this permit.

4. **Wellhead Specifications**

For every injection well, the operator shall provide a female fitting, with a cutoff valve, to the tubing at the wellhead, so that the amount of injection pressure being used may be measured by a representative of EPA by attaching a gauge having a male fitting.

5. **Logs and Tests**

Upon approval of the surface casing and cementation records by the Director, any logs and tests noted in Part III of this permit shall be performed, unless already provided. Prior to commencement of injection, the permittee shall submit a descriptive report prepared by a knowledgeable log analyst interpreting the results of those logs and tests to the Director for approval along with the notice of

completion required in Part I(E)(10) of this permit.

6. **Formation Data**

If not already provided, the permittee shall determine or calculate the following information concerning the injection formation and submit it to the Director for review and approval, prior to operation:

- a. Formation fluid pressure;
- b. Fracture pressure; and,
- c. Physical and chemical characteristics of the formation.

7. **Prohibition of Unauthorized Injection**

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

**B. OPERATING, MONITORING AND REPORTING REQUIREMENTS**

1. **Operating Requirements**

- a. Beginning on the effective date of this permit, the permittee is authorized to operate the injection well, subject to the limitations and monitoring requirements set forth herein. The injection pressure and injected fluid shall be limited and monitored as specified in Parts I(E)(18) and III(A) of this permit.
- b. Injection at a pressure which initiates fractures in the confining zone or causes the movement of injection or formation fluids into or between underground sources of drinking water is prohibited.
- c. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.
- d. The annulus between the tubing and the long string casing shall be filled with a liquid designed to inhibit corrosion. The annulus liquid will be monitored in accordance with Parts II(B)(2)(d) and II(B)(3)(b) of this permit. Any specific annulus requirements are contained in Part III(A) of this permit.

2. **Monitoring Requirements**

- a. Samples and measurements, taken for the purpose of monitoring as required in Part II(B)(3), shall be representative of the monitored activity. Grab samples shall be used to obtain a representative sample of the fluid to be analyzed. Part III(A) of this permit describes the sampling location and required parameters for injection fluid analysis. The permittee shall identify the types of tests and methods used to generate the monitoring data. The monitoring program shall conform to the one described in Part III(A) of this permit.
- b. **Analytical Methods** - Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of 40 C.F.R. § 136.3 or in Appendix III of 40 C.F.R. Part 261 or by other methods that have been approved by the Director.
- c. **Injection Fluid Analysis** - The nature of the injection fluids shall be monitored as specified in Part III(A) of this permit. An initial analysis of the injection fluid is contained in Attachment H of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The Director may, by written notice require the permittee to sample and analyze the injected fluid at any time.
- d. **Injection Pressure, Annulus Pressure, Annulus Liquid Loss, Flow Rate and Cumulative Volume** - Injection pressure, annulus pressure, flow rate and cumulative volume shall be recorded at least weekly and shall be reported monthly as specified in Part III(A) of this permit. Annulus liquid loss shall be recorded at least quarterly and shall be reported in accordance with the provisions of Part II(B)(3)(b), as the volume of liquid added to the annulus to keep it filled in accordance with Part II(B)(1)(d). All gauges used in monitoring shall be calibrated in accordance with Part I(E)(17)(e) of this permit.

3. **Reporting Requirements**

Copies of the monitoring results and all other reports shall be submitted to the Director at the following address:

**U.S. Environmental Protection Agency  
Region 5  
77 West Jackson Boulevard (WP-16J)  
Chicago, Illinois 60604-3590  
Attn: UIC Section, Permits Branch**



- a. **Monthly Reports** - Monitoring results obtained during each week shall be recorded on a form which has been signed and certified according to 40 C.F.R. § 144.32. The first report shall be postmarked no later than the 10th day of the month after authorization to inject has been granted. Thereafter, forms shall be submitted at the end of each month and shall be postmarked no later than the 10th day of the month following the reporting period. This report shall include the weekly measurements of injection pressure, annulus pressure, flow rate and cumulative volume as required in Parts II(B)(2)(d) and III(A) of this permit.
- b. **Quarterly Reports** - Monitoring results obtained each quarter shall include the measurement of annulus liquid loss as required in Parts II(B)(2)(d) and III(A) of this permit. Reports shall be submitted at the end of each quarter and shall be postmarked no later than the 10th day of the first month of the following quarter.
- c. **Annual Reports** - Monitoring results obtained each year shall include the measurements of injected fluid characteristics as required in Part III(A) of this permit. Reports shall be submitted at the end of each anniversary year and shall be postmarked no later than the 10th day of the first month of the following year.
- d. **Reports on Well Tests, Workovers, and Plugging and Abandonment** - The applicant shall provide the Director with the following reports and test results within sixty (60) days of completion of the activity:
  - (i) Mechanical integrity tests, except tests which the well fails in which case twenty-four (24) hour reporting under Part I(9)(e) is applicable;
  - (ii) Logging or other test data;
  - (iii) Well workovers (using EPA Form 7520-12); and
  - (iv) Plugging and abandonment.

**PART III**

**SPECIAL CONDITIONS**

These special conditions include, but are not limited to plans for maintaining correct operating procedures, monitoring conditions and reporting, as required by 40 C.F.R. Parts 144 and 146. These plans are described in detail in the permittee's application for a permit, and the permittee is required to adhere to these plans as approved by the Director, as follows:

- A. OPERATING, MONITORING AND REPORTING REQUIREMENTS (ATTACHED)
- B. PLUGGING AND ABANDONMENT PLAN (ATTACHED)
- C. CORRECTIVE ACTION PLAN (ATTACHED)

**OPERATING, MONITORING AND REPORTING REQUIREMENTS**

Characteristic	Limitation	Minimum Monitoring Requirements		Minimum Reporting Requirements
		Frequency	Type	Frequency
*Injection Pressure	3238 psig (maximum)	weekly		monthly
Annulus Pressure		weekly		monthly
Flow Rate		weekly		monthly
Cumulative Volume		weekly		monthly
Annulus Liquid Loss		quarterly		quarterly
**Chemical Composition of Injection Fluid		annually	grab	annually

**SAMPLING LOCATION:** The sample location is at the well head

\*The limitation on wellhead pressure serves to prevent confining-formation fracturing. This limitation was calculated using the following formula:  $[\{1.112 \text{ psi/ft} - (0.433 \text{ psi/ft})(\text{specific gravity})\} \times \text{depth}] - 14.7 \text{ psi}$ . The maximum injection pressure is dependent upon depth and specific gravity of the injected fluid. The Richfield Formation of the Detroit River Group at 4948 feet was used as the depth and a specific gravity of 1.05 was used for the injected fluid. The fracture gradient of 1.112 psi/ft was determined from an acid-fracture job from a nearby well.

\*\*Chemical composition analysis shall include, but not be limited to, the following: Sodium, Calcium, Magnesium, Barium, Total Iron, Chloride, Sulfate, Carbonate, Bicarbonate, Sulfide, Total Dissolved Solids, pH, Resistivity (ohm-meters @ 75°F), and Specific Gravity.





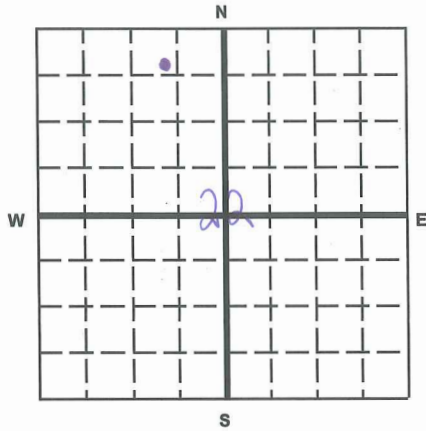
United States Environmental Protection Agency  
Washington, DC 20460

**PLUGGING AND ABANDONMENT PLAN**

Name and Address of Facility  
Holcomb 1-22  
Smith Creek Field

Name and Address of Owner/Operator  
Muskegon Development Company  
1425 South Mission Road, Mt. Pleasant, MI, 48858

Locate Well and Outline Unit on  
Section Plat - 640 Acres



State Michigan County Clare Permit Number 59345

Surface Location Description  
1/4 of NW 1/4 of NE 1/4 of NW 1/4 of Section 22 Township 19N Range 3W

Locate well in two directions from nearest lines of quarter section and drilling unit  
Surface  
Location 490 ft. frm (N/S) N Line of quarter section  
and 182 ft. from (E/W) W Line of quarter section.

TYPE OF AUTHORIZATION  
 Individual Permit  
 Area Permit  
 Rule  
Number of Wells 1  
Lease Name Holcomb

WELL ACTIVITY  
 CLASS I  
 CLASS II  
 Brine Disposal  
 Enhanced Recovery  
 Hydrocarbon Storage  
 CLASS III  
Well Number 1-22

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
9 5/8"	36		792'	12 1/4"
7"	23		1432'	8 3/4"
4.5"	11.6"		2037'	6 1/8"

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- The Balance Method
- The Dump Bailer Method
- The Two-Plug Method
- Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	4.5"	4.5", 7"	7", 8 3/4"	9 5/8"			
Depth to Bottom of Tubing or Drill Pipe (ft)	4898'	3214'	2700'	892'			
Sacks of Cement To Be Used (each plug)	5	35	65	335			
Slurry Volume To Be Pumped (cu. ft.)	5.90	41.30	76.70	395.30			
Calculated Top of Plug (ft.)	4848'	3014'	2500'	Surface			
Measured Top of Plug (if tagged ft.)	C.I.B.P.						
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6	15.6			
Type Cement or Other Material (Class III)	Class A	Class A	Class A	Class A			

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
4948'	4954'	3164'	Assumed Free Point for 4.5"
4966'	4976'	2650'	Calculated Free Point for 7"
4990'	5000'		
5004'	5010'		

Estimated Cost to Plug Wells  
\$27,800

**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. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)  
William C. Myler, Jr., President

Signature  
*William C. Myler, Jr.*

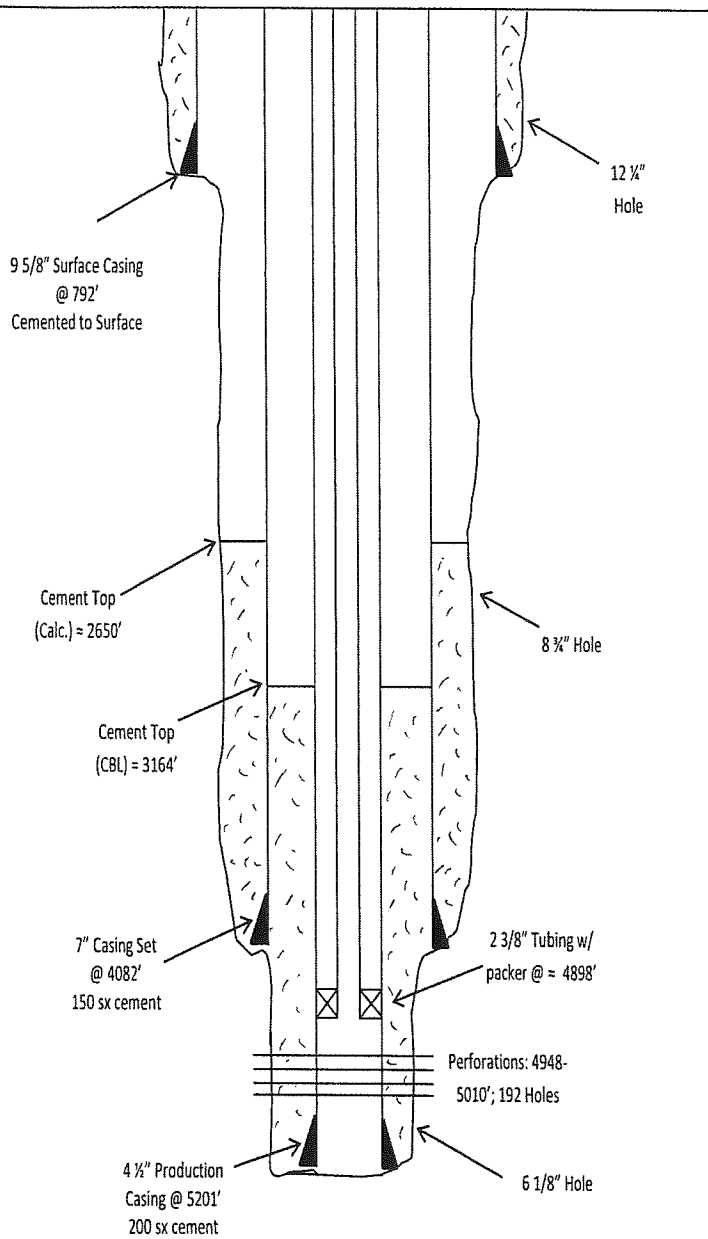
Date Signed  
8/8/16



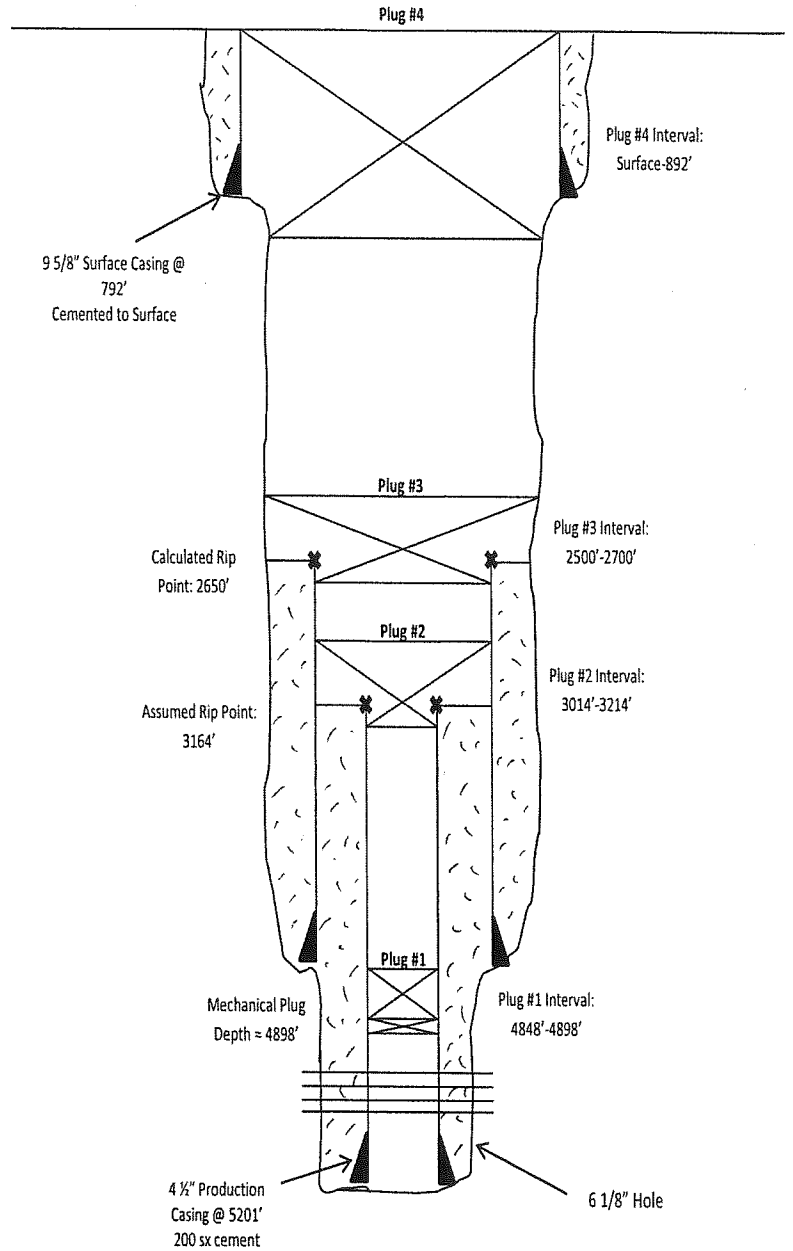
WELL CONSTRUCTION

Holcomb 1-22

Permit # 59345



PLUGGING &  
ABANDONMENT  
PLAN



RECEIVED

AUG 11 2015

WATERBURY  
REGION 5





**CORRECTIVE ACTION PLAN**

**No corrective action is required at this time.**