

Filling the Void: A Citizens' Audit of Ohio Oil and Gas Waste Disposal Wells

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Citizen's summary

Authors of Ohio's oil and gas regulatory framework have systematically removed citizens from the process of regulating and monitoring the industry. From awarding the Ohio Department of Natural Resources (ODNR) "sole and exclusive authority" over the industry to refusing to allow public hearings on permits, Ohio's legislature has engineered a system where people don't matter. As a result, citizens have lost faith in the regulatory process and now work to fill the void by preparing this audit of Ohio's management of fracking waste disposal through the Underground Injection Control (UIC) program. This report presents a snapshot of just one part of the ODNR's fracking authority, yet it demonstrates systemic problems that resonate throughout the agency's handling of all fracking related activity.

The U.S. EPA also owns some blame for this problem. Since ceding authority for underground injection control to the ODNR in 1983, their oversight has been inconsistent, shallow and devoid of substantive criticism, as evidenced by the two most recent audits, from 2005 and 2009, and by failure to release a subsequent audit as of December 12, 2014. As the pace of oil and gas activity and fracking waste disposal increases, so does the need for timely and thorough oversight. The U.S. EPA's "hands-off" approach has failed to meet this need.

Both the U. S. EPA and the ODNR wield their authority to protect the public interest. Failure to do their jobs puts public health and natural resources at risk, which is why citizens have stepped in. The Center for Health Environment and Justice, Buckeye Forest Council, and Ohio Sierra Club conducted Citizens' Hearings on injection wells in Portage and Athens Counties in October 2013, after the U.S. EPA and the ODNR refused to do so. They collected hundreds of pages of testimony from citizens affected by class 2 disposal wells and submitted it to the U.S. EPA. Detailed citizens' comments included problems with specific wells in their communities. It was citizen research into the issues of these wells which led to the idea of conducting a citizens' audit of the class 2 disposal wells permitted by the ODNR since the 2009 U.S. EPA audit.

Ohio Citizen Action and Ohio Citizen Action Education Fund, with assistance from the Center for Health, Environment and Justice, and Buckeye Forest Council have engaged citizen volunteers to review hundreds of permits, well logs, inspection reports and other documents to produce an audit of Ohio's Class 2 injection wells – something that the U.S. EPA and the ODNR have not been moved to do.

Findings include:

- Inadequate oversight by the U.S. EPA;
- Inconsistency of practice among the ODNR inspectors;
- Non-enforcement of some conditions mandated by a well's operational permit;
- Neglect of well conditions that indicate mechanical problems;
- Inconsistency and absence of information in the ODNR's database;
- ODNR disrespect or disdain for public inquiries and requests; and
- A correlation between regulatory failure and a revolving door between agency and industry.

The authors of this report recommend that the U.S. EPA suspend the ODNR's authority to operate the Underground Injection Control program until completing a thorough audit of all of Ohio's active injection wells and only reinstating that authority if and when the ODNR's competence and independence from industry influence can be demonstrated.

Methodology

Toward the goal of involving people affected by and interested in injection wells who have been shut out of the regulatory process, the authors of this report recruited citizen investigators to assist. Volunteers from Portage, Summit, Medina, Mahoning, Ashtabula, Geauga, Lake, Washington, Athens, Cuyahoga, and Hamilton counties were trained to read documents secured from the ODNR and asked to prepare profiles of specific injection wells. Those documents include 1,877 inspection reports and hundreds of pages of permit applications, permits, well completion reports, well histories, and inspection reports found in the ODNR's Risk Based Data Management System (RBDMS) and documents scanned into the ODNR's online database for the 43 wells permitted since 2009 which have been drilled.

Well profiles, the 2005 and 2009 U.S. EPA audits of Ohio's injection well program, citizen testimony and correspondence between the ODNR and the U.S. EPA were used to create this audit.

Background

Fracking is a process of vertical and horizontal drilling, followed by injecting millions of gallons of fresh water, sand and chemicals under high pressure, deep underground to fracture shale and release oil and gas trapped inside. Many of these chemicals are dangerous enough to be regulated by either the Clean Air Act, Clean Water Act or Safe Drinking Water Act and are linked to a range of health effects including rashes, breathing problems, organ failure and cancer¹. About half of the fluid injected returns to the surface. Oil and gas deposits are always associated with remnants of ancient oceans deep underground, which also comes to the surface on the scale of thousands of barrels per day. This salty oilfield brine, can also contain radioactive² material picked up from underground rock formations.

Despite these facts, U.S. EPA designated oilfield brine as non-hazardous and therefore subject to less regulation than material designated hazardous in 1988.³ Oilfield brine is disposed of in loosely regulated Class 2 injection wells, which are similar in construction to oil and gas

¹<http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic-Fracturing-Chemicals-2011-4-18.pdf>

²<http://www.epa.gov/radiation/tenorm/oilandgas.html>

³U.S. EPA "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes" 1988, <http://www.epa.gov/osw/nonhaz/industrial/special/oil/og88wp.pdf>

production wells but work in reverse. Instead of withdrawing oil and gas from geologic formations, Class 2 disposal wells push oilfield brine *into* geologic formations.

The wells themselves consist of a well head and pressure gauge, visible above ground, which connect to several concentric layers of steel casing and cement tubes, which extend underground. (See Appendix A1.) The areas between the outermost casing layer and the surrounding rock, between casing layers, and between the injection tubing and innermost casing layers are called annuluses. The outer annuluses are partially filled with cement. The innermost annulus contains fluid which should be held under pressure.

The fluid waste is typically injected under higher pressure than the pressure maintained in the innermost annulus. Ideally, waste is absorbed by permeable rock layers under consistent pressure. The rocks into which waste is injected are called the injection zone. The permeable injection zone should be overlaid by an impermeable layer to keep fluids from migrating toward the surface. For this equation to work, the location of the well must be ideal and the integrity of the well and consistency of both the injection and annulus pressure must be scrupulously maintained.

Problems can and do occur with injection wells throughout the United States, because of poor well location or poor monitoring and enforcement. According to a review of public documents conducted by independent media outlet ProPublica, structural failures inside injection wells are routine. They found more than 17,000 violations nationally from late 2007 to late 2010 for injection wells of all classes- one well integrity violation issued for every six deep injection wells examined. The records show more than 7,000 wells had signs of leaks and indicate that wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid migration and the threat of water contamination.⁴

Once contaminated, ground water cannot easily be decontaminated. Because many rural communities where fracking occurs depend upon groundwater, the risk is especially great.

Inadequate oversight by the U.S. EPA

In 1983, the U.S. EPA granted the ODNr's request for authority over the injection well program. At that time, the ODNr chose from among two sections of the Safe Drinking Water Act under which Class 2 injection wells can be regulated, the more thorough Section 1422, or the weaker Section 1425. ODNr chose Section 1425. Still, the 1983 agreement between Ohio and the U.S. EPA promises better oversight than now occurs in Ohio.

Under that agreement, audits are to be conducted of the ODNr's management of the injection well program every few years. After comparing the two most recent audits performed by the U.S. EPA, Teresa Mills of the Center for Health, Environment and Justice and Buckeye Forest Council concluded that the U.S. EPA failed to take the job seriously. In March, 2013 letter to the U.S. EPA, she explains the problem:

⁴<http://www.propublica.org/article/injection-wells-the-poison-beneath-us>

“We urge you to examine your Region’s last two audits performed in October, 2005, and October, 2009, because they will swiftly convince you that the current auditing process is broken. The most obvious and compelling evidence in this regard is that your Region’s 2009 audit is over 80% a direct cut-and-paste from the 2005 audit without changes! Not only was no apparent effort put into the 2009 audit, but these superficial audits heaped such excessive, uncritical praise on ODNR’s barely staffed program (less than four full time equivalents) that the audits appeared to have been written by ODNR itself rather than by independent professionals performing a serious oversight function.”

Both the 2005 and 2009 U.S. EPA audits cover wells permitted since the previous audit. In each audit, only a fraction of the permits granted were reviewed in detail - 2 of 14 in the 2005 audit and 5 of 10 in the 2009 audit. Both audits neglected to review any field inspections, nor were field visits made by U.S. EPA officials. No audit of volumes injected was conducted. No citizens living near injections wells were contacted.

The U.S. EPA has neglected to release a subsequent audit, even though fracking and injection well activity ramped up considerably after 2009. As of this writing, 1,652 wells in the Utica shale in Ohio and 9,781 Marcellus shale wells permitted in Pennsylvania produce millions of gallons of waste, millions of gallons of which are sent to 198 active injection wells⁵ in Ohio. In 2013, injection wells in Ohio took 672 million gallons of waste, 344 million gallons of which came from out of state.

The 2009 U.S. EPA audit indicates that, *“The next audit of Ohio DMRM (Division of Mineral Resources Management)’s UIC program should occur in 2012 or 2013.”* At the time of writing, no subsequent audit has been produced by the U.S. EPA and recent conversations with agency indicate the audit may be delayed again until 2015.

Inconsistency of practice among ODNR inspectors

Conditions for citing a violation vary between inspectors. For example, one inspector, Jon Scott, cites violations for wells missing the valves necessary for inspectors to test injection and annulus pressure, as he did on February 7, 2013 for well # 34105236190000. Inspector David Ball encountered a similar situation on November 18, 2014 at well # 34013206090000, but *did not* cite it for a violation.

Only two inspectors ever record the fact that they take samples of brine being injected for testing by ODNR labs – Stephen Ochs and Jon Scott. Only 10 of the wells reviewed had samples of brine taken for testing.

The time between inspections varies widely both between inspectors and specific wells. Some are visited on a consistent once a quarter schedule, while others are visited multiple times a week, even when there isn’t anything unusual going on at the well.

⁵ODNR RBDMS update 11/26/14 <http://oilandgas.ohiodnr.gov/industry/rbdms>

Quality and detail of inspection comments varies widely as well. Inspector Jerry Kohl writes the least helpful comments, almost always the same even when injection and annulus pressures indicate a probable mechanical failure. On the other hand, inspector Jon Scott's inspections are typically clear and detailed, and he seems to be the most likely to enforce permit conditions, although he neglects annulus pressure issues. Stephen Ochs and David Ball fall between Kohl and Scott in comment quality, occasionally making detailed comments, occasionally making unhelpful comments. There are other inspectors, but these four perform the most inspections. The following table illustrates the quality range found between inspectors' comments for a typical inspection when nothing is going wrong:

Inspector name	Inspector #	Typical inspection
Jerry Kohl	1250	5/9/14 - My inspection of the well pressures and the storage facility found no violations
Stephen Ochs	2158	5/29/14 - An inspection of the well and injection facility found no violations
David Ball	2156	6/8/14 - Inspection revealed that injection pump was in operation today and it was noted that three IBEX vacuum trucks were unloading at facility during my inspection
Jon Scott	2473	7/21/14 - Inspected the injection pressure, annulus pressure, containment dike, tanks, injection pump, and the unloading pad. Good identification at the well. Containment dike is free of fluids. Checked brine trucks

Non-enforcement of some conditions mandated by a well's operational permit

For permits issued before a 2012 rule change, the ODNR's database includes both construction and operational condition requirements. However, permits issued after the rule change appear in the database with only construction conditions laid out – the operational conditions aren't making it into the database.

In almost all cases the operational conditions require a minimum annulus pressure of 200 pounds per square inch (PSI). The language is very similar across all permits:

“The annulus between the injection tubing and the 4-112” production casing must be monitored either continuously during injection of fluids or at least monthly at a minimum pressure of 200 psi. If such monitoring indicates a leak in the casing, tubing, or packer, the UIC Section must be immediately notified at (614) 265-1032.”

Of the 1,877 inspection reports reviewed, annulus pressure is recorded at *less* than 200 PSI 416 times. There are several instances of inspectors encouraging well operators to increase pressure, especially when the pressure drops to 0. Annulus pressure dropped to zero 164 times in the inspection reports reviewed.

On one such occasion inspector David Ball visits Guernsey County well # 34059242020000 and comments:

“Inspection revealed that injection pump was in operation today and there was (sic) three Myers Vacuum trucks unloading during my inspection. Note: The two inch valve on annulus of tubing appeared to have frozen and busted and is in need of replacement, once replaced positive pressure needs to be applied to annulus”.

Despite the fact that this well’s operational permit requires annulus pressure to be 200 or greater, the annulus pressure is less than 200 PSI 23 times and the well is never cited for a violation.

The single instance found of low annulus pressure triggering a violation occurred on January 24, 2013 in an inspection of the extremely troubled Vinton County well #34163203370000 by Andrew Thomas, who commented:

“An inspection of the tank battery revealed no violations. Good identification was observed at the tank battery and the well. The annulus pressure on the well was 0. I called Mr. Lee Atha at 11:20 on the day of inspection and notified him of the problem and told him that the annulus pressure needs to be above 0 and a mini-test needs to be conducted. I also told him that when he remedies the problem to call me so that I can be present. This message was left on his voicemail. Accompanied on inspection by Justin Smith.”

Inspection comments recommending increased annulus pressure appear even for wells for which operational conditions do not appear in the ODNr’s database. This suggests that the operational conditions do indeed require a minimum annulus pressure be maintained. One such instance is when Stephen Ochs inspected completed Trumbull County well # 34155240780000 on July 24, 2014 indicating:

“An inspection of the well and injection facility found no violations. The pump was off at the time. The well owner was instructed to put a minimum pressure of 200 psi. on the tubing/casing annulus.”

Annulus pressure was still 0 at well # 34155240780000 when Inspector Ochs returned a month later and commented:

“An inspection of the well and injection facility found no violations.”

Apparently, not following an inspector’s instructions is not enough to warrant a violation.

Neglect of well conditions that indicate mechanical problems

The U.S. EPA provides guidance by which mechanical integrity of wells can be assessed⁶. Part of that guidance, particularly relevant to Ohio injection wells puts wells into three categories. Those three categories are those that under normal operating conditions have:

- Injection pressure higher than annulus pressure
- Annulus pressure higher than injection pressure and injection pressure higher than zero (not on a vacuum)

⁶ http://www.epa.gov/r5water/uic/r5guid/r5_05_2008.htm#att2

- Injection on a vacuum

The guidance explains that different conditions of rising or falling injection or annulus pressures can indicate that the well has lost mechanical integrity – see Appendix A2. If a well loses mechanical integrity, injected brine could spill or leak into the environment and injection should be ceased immediately.

The U.S. EPA's guidance does not explain what it means if injection pressure and annulus pressure cross each other – that is the injection pressure is higher than annulus pressure for some period and the annulus pressure rises above the injection pressure, or vice versa. It is safe to say that injection and annulus pressure dominance flipping is indicative of some kind of problem, since less major variances in injection and annulus pressure are known to indicate mechanical failure.

Instances of injection and annulus pressures indicating a probable mechanical failure according to U.S. EPA guidance occurred in 42 instances, with very few of the probable mechanical failures being investigated by inspectors. Injection and annulus pressure dominance has flipped at least once in 20 of the 43 wells reviewed, and none are cited for a violation because of this. See Appendix A3 – audit table for more detail.

Belmont County well # 34013206090000, inspected by David Ball shows this behavior. The following table comes from the ODNR's database of inspection reports, not the flipping of the balance of injection vs. annulus pressure in the last few months:

Date inspected	INJECTION PRESSURE	ANNULUS PRESSURE	COMMENT
8/19/2014	1610	390	Inspection revealed that injection pump was in operation during my inspection and it was noted that the cage for the wellhead has been put back in place.
10/14/2014	1780	400	Inspection revealed that injection pump was not in operation during my inspection. Note: 500 bbl storage tanks are still up on location waiting on operator to truck material down to storage tanks and then inject it into well.
11/14/2014	2170	2230	Inspection revealed that injection pump was in operation today and it was noted that two HWR vacuum trucks were unloading at the facility during my inspection.

Any of the U.S. EPA's above conditions warrant shut down of the well and tests for mechanical integrity, yet this was not done. Many of Ohio's wells are even worse, especially those which flip between producing oil and gas and accepting waste.

Of the 43 wells reviewed for this audit, 34 showed instances of injection pressure fluctuations greater than 100 PSI from inspection to inspection at some point, like Trumbull County well # 34155214380000, inspected by Stephen Ochs. This table comes from the ODNR's

inspection reports table, notice how the injection and annulus pressures change by more than 100 PSI between inspections:

Date inspected	INJECTION PRESSURE	ANNULUS PRESSURE	COMMENT
1/9/2013	775	350	My inspection of the injection facility and well found no violations.
4/4/2013	900	80	My inspection of the injection facility and well found no violations. The pump was operating at the time pressures were gauged.
5/14/2013	1130	0	My inspection of the well and surface facility found a truck without an Underground Injection Control number. The truck was owned and operated by Liquid Luggers. Dave Jenkins was notified. The truck driver was instructed to wait on location, until the truck was properly labeled.
8/20/2013	1020	155	There were no violations at the time of inspection.
10/10/2013	1000	160	No violations were found at the time of inspection.
3/17/2014	890	370	My inspection of the well found no violations at the time.
6/13/2014	1150	230	The well was found operating over the maximum allowable injection pressure. Matt Kleese was notified in person. The pump rate was slowed, lowering the injection pressure.

Thirty four of the wells also show annulus pressures varying by 100 PSI or more.

Inconsistency and absence of information in ODNR's database

For this audit, well completions, well histories, and inspections reports from the ODNR's RMBDS database and scanned documents available through the ODNR's online database were reviewed for each well. Information important to establishing the lawfulness and geologic integrity of these wells is frequently inconsistent or absent from the ODNR's database.

A. Depth logs

Injection wells as a concept are based on the idea that we can inject waste into porous layers of rock that will keep brine trapped for the rest of time, even after the well is plugged and the injection pump turned off. The porous injection zone should be overlaid with an impermeable layer. It is important to know what the geology looks like at what depths in order for the injection well to be most likely to actually seal off the injected waste.

In permit applications, would-be injection well operators propose the depths to which they intend to drill their injection well and into which formations. The permit does not require any demonstration that the intended injection zone is actually porous, nor the existence of a confining layer.

Well #34007230970000 in Ashtabula County was a production well that was converted to injection in 2011. The operator poured cement in the hole to plug the well to a depth of 3,600

feet in order to isolate the formerly oil and gas rich Clinton sandstone from the impermeable Newberg dolomite which is the injection zone. The depth log for this well follows, what geologic formation exists at 3,600 feet deep?

Big Lime	344-4	2140	3558
Oriskany	347-2		
Salina xxx Salt	351-2	2746	3212
Newburg	351-3	3411	3482
Lockport	354-1		
Little Lime	354-3		
Packer Shell	354-5	3632	3666
Stray Clinton	357-2	3676	3703
xxx Red Clinton 1st	357-3	3711	3741
xx White Clinton 2nd	357-4	3760	3793
Medina	357-7	3820	3850
Queenston	361-3	3850	T.D.

This depth log does not say.

The next deepest layer recorded after the injection zone is salt, but that salt has 199 feet between it and the Newberg dolomite. What's between them? The depth log does not say that either.

In other cases the proposed injection zone is not even reached by the total depth of the well, as in Trumbull County well #34155240780000, which was proposed to be drilled to 9,100 feet into the Mt. Simon sandstone. According to the depth log, it is actually drilled to 8,748 feet into the Rome formation. Does it matter that the well is not injecting into the formation the operator intended?

B. Legal requirements for granting permits

The Ohio Administrative Code requires⁷ those seeking to operate an injection well to publish a notice in a "newspaper of general circulation" in the county where the well is to be located for at least five days. In August 2014, a Monroe County citizen asked the ODNR why notice of a new injection well permit had not been published in a county newspaper, as the law required. Jennifer Gringas of the ODNR replied that public notice doesn't necessarily have to be

⁷<http://codes.ohio.gov/oac/1501%3A9-3>

published in a newspaper of the county where the injection well will be, just a newspaper published nearby. Proof of public notice is in the ODNR's database for only one of the 43 wells reviewed, the Muskingum County well #34119287760000.

C. Data removed from ODNR's database

On September 5, 2014 a 2.1 magnitude earthquake occurred just outside of Niles Ohio centered on well # 34155240760000, run by American Water Management. The most recent inspection report in the November 26, 2014 update of the RBDMS for this well is from July. Why has information on this well been removed? There have almost certainly been further inspections.

ODNR Disdain or disrespect for public inquiries and requests

A. Portage County

The ODNR permitted seven disposal wells on a single Portage County landowner's property in October 2012. The seven wells were permitted in a geologic layer above a deeper geologic layer where horizontal fracking was planned. Neighbors in the area were not happy about the plans:

*"We're alarmed by what's being allowed ... and we have serious concerns about putting all these wells in one place," said Gwen Fischer, a Portage County resident and member of Concerned Citizens Ohio. "We have serious reservations about how safe this will be and how the industrial nature of these wells will affect the whole community."*⁸

Drilling the horizontal production wells proceeded and citizens requested a public hearing about the wells with the ODNR, particularly the injection well head geologist at the time, Tom Tomastik. Instead of a public hearing, Portage County citizens got an "informational meeting," where 55 residents were greeted by 14 armed guards and a canine unit. In a true public hearing, citizens would have been able to assemble in one room, ask questions, make comments and hear answers from ODNR officials publicly, into the public record maintained by the ODNR.

The informational meeting consisted of 10 information stations scattered throughout a large room, followed by a presentation by Tom Tomastik on the history of oil and gas drilling in Ohio. No substantive questions were taken or answered by Tomastik regarding the seven wells on one site.

B. Athens County

Citizens of Athens County have peacefully protested brine disposal wells three times- February 2013, February 2014, and June 2014. Despite repeated requests for public hearings, ODNR officials have refused to grant one. In June 2014, a public records request by Athens County Fracking Action Network uncovered emails between UIC head geologist Tom Tomastik and oil and gas industry consultants saying "Here is the kind of crap I have to deal with from our

⁸<http://www.ohio.com/news/local-news/neighbors-rocked-by-cluster-of-14-new-injection-production-wells-planned-in-northeast-portage-county-1.343856>

folks who live in Athens. This is just one of about 80 letters we have gotten so far.”⁹ Tomastik complained to the Government Accountability Office (GAO) about the U.S. EPA asking him to respond to citizen complaints: “Telling us we need to respond to public comments on a Class II injection well permit application is not what I would consider working in good faith or cooperation from the U.S. EPA.”¹⁰

Revolving door between agency and industry

The GAO released a report on September 23, 2014 comparing brine disposal laws in California, Colorado, Kentucky, North Dakota, Ohio, Oklahoma, Pennsylvania, and Texas. The report singles out Ohio for having unusually lax regulations on brine disposal, noting “all of the states we selected except for Ohio require that applicants provide some information on the characteristics of fluids injected into class II wells,” meaning that all of the other states have some idea of what’s being injected underground.

Just two weeks prior to the report’s release, Tom Tomastik left the ODNR to work for ALL Consulting, an oil and gas consultancy, and Mark Bruce, spokesperson for the ODNR, left for the industry funded Ohio Oil and Gas Energy Educational Program. Their exit just before the release of the GAO report is unlikely to be coincidence.

A few especially notable wells

The **RHOA well** operated by Shalelogix in Ashtabula County appears to have been drilled as a disposal well (1982 by POI), then converted to production (1983 by POI), then back to disposal (1995 by Atwood Energy, injection zone was fractured or acidized), then back to production (Petrox, 2005? – documents are missing from the database), then back to disposal (2013 by Shalelogix).

The **Adams #1 well** operated by Buckeye Brine in Coshocton County has been acidized 10 times from September 2013-August 2014. Tens of thousands of gallons of hydrochloric acid have been pumped down this well to attempt to open up pore space, yet it’s still having problems with overly high injection pressures. It has minimum required annulus pressure of 200 PSI – its annulus pressure has never been above 200. It was sold by Preferred Fluids Management to Buckeye Brine on 3/19/14, Steve Mobley of Austin Texas owns both companies.

The ODNR found an old, improperly plugged production well within a half mile of **injection well Roscoe Mills # 1** in Meigs County. As such, the ODNR only allowed the injection well to gravity feed into the injection zone, to avoid accidental contamination. In order to inject more fluid the operator wanted to increase the injection pressure. They found someone named Bobby Jo Adams who signed an affidavit that he was on site and witnessed proper plugging of the old production well in 1974. The ODNR took this as proof enough that the old production well was in fact correctly plugged, and allowed increased injection pressure.

⁹http://www.eenews.net/assets/2014/06/03/document_ew_01.pdf

¹⁰http://www.eenews.net/assets/2014/06/03/document_ew_02.pdf

The Tedrick 1-B well currently owned by Houghton Investments, formerly of Paul Grim, is in Vinton County. This troubled well was drilled in 1975 as an enhanced recovery well – injecting waste to push oil or gas out of a formation. From 1975-2011 it operated as an enhanced recovery well and racked up 22 violations for various problems – pumps and tanks leaking, owners’ neglect of the site, lacking identification, pollution and contamination of its surroundings, mechanical failures, etc. Despite all of its ongoing problems, it was never plugged. Since its conversion by drilling deeper to a disposal well in November 2011, it still has problems. Parts essential to operation laid around in disrepair from 3/10/14-5/21/14, escaping mandatory plugging despite missing its state mandated, already extended deadline of 5/9/14. The drillers had problems with well walls caving in, and currently it’s having trouble holding pressure on the annulus.

The **K&H 2 well** in Athens County is perhaps the most “celebrated” injection well reviewed for this audit. During construction this well had hundreds of feet of cement slide down the annulus of the well into oblivion. Since the operators finally got the casing cemented in place, they’ve had trouble keeping fluid and pressure in the annulus – it too falls down into some unknown depths. Drillers hit a pocket of brine at 1,432 feet deep, which shot up the well and contaminated a nearby creek, causing drilling operations to shut down for several days.

Kleese Development Associates in Trumbull County owns four injection wells injecting into the same geologic layer within .9 square miles. All of these wells inject into the Clinton sandstone. Porous rock layers can be filled up, why did ODNR allow these wells so close together?



A map of the Kleese Development Associates property with 4 injection wells on less than one square mile.

The **Northstar 1 well**, operated by D&L Energy, extends into the deepest layer of Ohio's geology, the pre-Cambrian "basement" rock, near Youngstown. The original permitted injection pressure was 1,850 PSI. In March 2011, D&L applied for and received permission to increase injection pressure to 2,250 PSI. They applied for and received permission to increase the maximum injection pressure again in May 2011, to 2500 PSI. Under the increased pressure, brine caused a previously unknown fault to slip, and caused a 4.0 earthquake.

A 2013 study by Dr. Won-Young Kim, of the Lamont-Dougherty Earth Observatory at Columbia University and published in peer-reviewed JOURNAL OF GEOPHYSICAL RESEARCH: SOLID EARTH concluded that the Northstar 1 injection well was in fact responsible for 109 earthquakes in the Youngstown area.¹¹

¹¹<http://ohiocitizen.org/wp-content/uploads/2013/08/Y-town-injection-peer-reviewed.pdf>

Immediately following the greatest Youngstown earthquake, Ohio Governor John Kasich suspended operations of the Northstar 1 well and other injection wells within a 5 mile radius. By March 2012, the governor directed ODNR to make some nice sounding but ultimately hollow changes to Ohio's injection well rules, essentially requiring somewhat better monitoring during injection. The well has not been accepting waste since 2011. While operational conditions indicate that inactive wells must be plugged and abandoned within 60 days after discontinuance of operations, the well has still not been plugged nearly 4 years later.

Conclusions and recommendations

The U.S. EPA's 1983 agreement with the ODNR proposes to keep the ODNR accountable for its regulation of the Underground Injection Control program, including Class 2 disposal wells. It reads, "The Regional Administrator is responsible for keeping the Director apprised of the meaning and content of Federal guidelines, technical standards, regulations, policy decisions, directives, and any other factors which could affect the UIC program." It appears that the U.S. EPA has not done this. In fact, we discovered no evidence that U.S. EPA has ever held the ODNR accountable for injection/annulus pressure anomalies cited in its own guidelines. Furthermore, the agency has not demonstrated the thoroughness required to protect public health and natural resources in its two most recent audits and has failed to produce an audit promised nearly 2 years ago.

With such a lack of oversight, the ODNR has allowed its own discipline to falter. Their inspectors don't seem to know what their job is or how to do it. There's too much variance in enforcement and lack of focus in inspection comments. They fail to require Class 2 injection well operators to follow the conditions of their permits, especially with respect to annulus pressure violations. Possibly worst of all, ODNR employees shut out, marginalize and even intimidate the citizens they are supposed to be serving, in order to maintain relationships with the industry that may one day employ them.

To begin to make things right, the U.S. EPA should suspend the authority of the ODNR to regulate Class 2 disposal wells in Ohio until they have conducted a full, thorough audit of Ohio's Class 2 injection well program. A satisfactory audit will include:

- In depth review of permits, well histories, inspection reports, and all associated documents of currently operating Class 2 disposal wells by personnel knowledgeable about the proper construction and operation of injections wells and Ohio geology;
- Review of the ODNR's rulemaking and lack of rulemaking regarding Class 2 disposal wells in Ohio;
- Review of injection volume records and fee collection. Injection volume review should include assessing feasibility of volumes injected actually being absorbed by permitted injection zones, based on width and porosity;
- Site visits and mechanical integrity tests at every active well by U.S. EPA officials; and
- ODNR personnel interviews to assess organizational culture

The U.S. EPA should release this thorough audit to the public, invite public input, and then make a determination about whether the ODNR should retain authority over Class 2 disposal wells in Ohio.

Appendices

Appendix A – information generated in the process of this audit

1. Anatomy of an injection well
2. Citizen audit summary table
3. Table of details on audited wells
4. Inspection reports for selected wells
5. Citizen audits

Appendix B – recommended reading

1. Teresa Mills' 2013 primacy letter
2. 1983 agreement between U.S. EPA and ODNR
3. 1988 regulatory determination considering oil and gas waste non-hazardous
4. Tom Tomastik's emails referring to citizen comments as "crap"

Find all appendices at www.ohiocitizen.org/class2citizenaudit