Out of Sight and out of Mind, or so we hoped: How the American Regulatory Process Has Failed to Protect the Public Trust from Underground Injection Wells

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July 1, 2012

In a middle school natural science class many of us learned the various layers of the earth which extend outward from the earth's core. The core in the middle, the outer core, the mantle and the crust are all terms that most students are familiar with to some degree or another. A new layer has been created in the United States, however, that might mean a change is necessary to our science books. No it is not a new geologic formation but rather a substrate of liquids somewhere two miles beneath the earth's surface. So what is this new liquid and where on earth did it come from?

In the early to mid twentieth century many industries such as pharmaceuticals, agriculture, chemical and oil and gas began to realize that the liquid waste from their activities was a detriment to the rivers into which they were being directly deposited. The industry and the government decided that the best place to store these harmful liquids containing everything from radioactive waste, to carcinogens to salt water was beneath several miles of the earth's bedrock where it could be injected and then sealed so that we would never have to see the mess again. In other words, we lifted up the earth's crust and swept the harmful liquids underneath. Geologists would hypothesize where these injection wells should be placed based on underlying geology in the hopes that these hazardous liquids would never be seen anywhere near the surface or groundwater sources. Over the past several decades more than 30 trillion gallons of these toxic liquids have been deposited beneath our feet by various industries. It is important to note that these waters truly do become out of sight, meaning that this waste, once injected, is supposed to stay enclosed at depth forever.

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Or so we hoped.

Many events over the past half century have led us to reconsider whether this toxic waste is actually out of sight and in the process have forced these dangerous liquids back into our minds:

- 1967: pesticide waste being injected in Colorado destabilized a seismic fault and caused a magnitude 5 earthquake
- 1974: Safe Drinking Water Act is passed establishing the federal Underground Injection Control program, older wells are grandfathered in
- 1975: dioxin and a highly acidic herbicide burn a hole through a well casing

sending 5 million gallons of waste into a nearby drinking aquifer in Texas

- 1984: radioactive waste discovered near an injection well at a government nuclear facility in Tennessee
- 1989: GAO reports that 23 wells in 7 states had failed and polluted aquifers
- 1989: Chemical workers overwhelmed by the smell of Phenol (a deadly chemical previously injected on site), which had somehow, possibly over decades, risen 1,400 feet through bedrock and threatened surface aquifers in southern Ohio.
- Early 1990's: 20 of the nation's most stringently regulated disposal wells fail, release half a billion gallons of partly treated sewage per day into Miami aquifer
- 2003: Pool of contaminated water accompanied by dying trees spews out from undocumented wells adjacent to an injection well in Chico, Texas
- 2008-2011:Regulators reported 150 instances in which waste from injection wells purportedly reached aquifers
- 2009: After finding a roadside ditch filled with oil and gas waste, a nearby injections well is tested only to find a hole 600 feet down, just a few hundred feet from a drinking water source in Louisiana
- 2010: Contaminants bubble up in Los Angeles Dog Park
- 2010: Well operators conducting mechanical integrity tests lead to more than 7,500 violations nationally, with more than 2,300 wells failing
- 2010: one violation issued for every three class 2 wells in Texas
- 2010: After discovering failures in mechanical integrity, Kansas shut down 47 injection wells, Louisiana 82 and Wyoming 144
- 2010-2012: fountains of oil and gas drilling waste appear in Oklahoma, Louisiana

Three important questions form in response to this list: Why do we have so many of these wells, why are these wells leaking, and what is being done to stop these leaks from occurring?

Why these wells are leaking is really a slew of problems associated with the practice. First, these injection wells are being made using concrete as a buffer and concrete is made of organic materials and hence breaks down over time. Couple that fact with the fact that the concrete walls are being barraged with the pressure from intense injections of potentially corrosive material and these failures become not only understandable, but predictable. Second, injected waste is injected under pressure, and sometimes that pressure is enough to crack the rock at the bottom of the well which is meant to contain the waste. Permits are typically conditioned on a certain amount of waste and a particular amount of pressure. With the lack of regulatory enforcement, those injecting really have no reason to follow these conditions. In fact, deep well operators have been caught exceeding pressure limits more than 1,100 times since 2008. Third, enforcing current regulations, or adding new regulations is very expensive. Federal and State Environmental Protection Agencies are strapped for cash in the current economic climate.

The federal EPA, for example, has failed to count the number of instances of waste migration or contamination in more than 20 years and often relies on reports from state regulators that are incomplete or even contain conflicting figures. Fourth, the fact that these wells are out of sight lends to the difficulty in monitoring for leaks or breaks. Many types of wells are only inspected every five years which could lead to a leak having the better part of five years to disperse who knows how far. As former EPA injection expert Mario Salazar put it, "the absence of episodes of pollution can mean that there are none, or that no one is looking. I would tend to believe the latter." And finally, many are not even worried about the leaks because they believe that the rock formations around or at the bottom of the wells provide an adequate safeguard. Industry notes that the laws of physics and fluid dynamics ***should*** ensure that the waste cannot spread far and is diluted as it goes.

So where does the hope lie? What is the government doing to protect our underground water supplies, and why is it not working? The government saw the problems of the mid-20th century and reacted by passing the Safe Drinking Water Act which contained a baseline provision for underground injection requirements. In 1980 the EPA set up tiered classes of wells, a program so as to set out different requirements depending on the inherent dangers of the types of liquid waste being injected. Tier 'one' was the most stringent with one handling most hazardous materials and 'two' handling all waste from the energy industry. These two classes are required to be drilled deeper than other types of wells so as to be furthest away from drinking water sources. These classes also require that the operators conduct seismic tests prior to drilling, frequent well-integrity testing, and the area around the well which must be checked for abandoned wells is greater. In 1988 the oil and gas industry decided that these restrictions were to expensive and difficult and lobbied to have all material resulting from the oil and gas drilling process to be considered non-hazardous, regardless of its content or toxicity. This immediately repealed many of the aforementioned precaution measures. Another reason for the current ineffective regulation has been the boom of the natural gas industry n the United States over the past decade. Hydraulic fracturing, the process by which much of our nations natural gas is attained, requires huge volumes of water which are mixed with an array of chemicals, pumped into the earth, then returned to the surface requiring disposal elsewhere. A single 'frack' can use upwards of 8 million gallons of water, of which a variable percentage will return to the surface as flowback and require disposal in deep injection wells. In the early boom of this industry, oil and gas lobbyists again fought an increase in regulation and were able to pass the so called 'Halliburton Loophole' which states that fracking chemicals cannot be regulated under the Safe Drinking Water Act because they are not an injection because some of the material comes back out as flowback.

And finally, an inkling hope. Although the EPA is reconducting a 2004 test which found that fracking waste posed no threat to groundwater and was widely regarded as flawed, many states are choosing not to wait on a federal band-aid in the form of inclusion of fracking waste in the SDWA and taking action into their own hands. One method for curbing the possible ill-effects of injection wells has been to ban the practice altogether or at the very least in areas where previous injections have led to earthquakes. Another

method has been to require recycling fracking waste and using the liquids over and over in the fracking process delaying the wastes eventual trip deep underground. Recycling of waste can also be done at some water treatment facilities though most facilities are not equipped to handle the dangerous chemicals that are both a part of the fracking mixture but also some radioactive elements which occur naturally in the ground but are brought back up in the flowback. Other states and companies have explored ways to use less water in the fracking process and some have reduced water usage by as much as 40%. Further, some companies have experimented with using propane instead of water which can be easier to recycle and treat.

A Matter of Public Trust

One route which has not been fully explored by any states to date would be to judicially challenge the current regulation at the state level using the Public Trust Doctrine. The Public Trust Doctrine states that the government holds navigable waters, and the lands underneath these waters in trust for the public. The trust has been extended in some instances to include groundwater and tributaries citing the fact that these portions of the hydraulic cycle are inherently necessary to protect the public and private landowner's uses of the navigable waters in the same watershed. The Public Trust carries with it an inherent responsibility for state governments to protect the public trust waters and ensure that nothing is done to degrade the quality of such waters. This has been held by courts to mean that this responsibility includes a duty to evaluate and establish a long term water plan to ensure no impairment of water resources. Other courts have held this to require state governments to protect the integrity of flows and levels, waters and ecosystems.

Still other courts have said this entails a duty to prevent groundwater withdrawal in the vicinity of a navigable water body based on the withdrawals probable effects on flows and levels. Is injecting our contaminated waters into subsurface chambers which at best have a net negative impact on the levels of our most precious natural resource, and at worst may forever contaminate whatever portions of this resource that industry is kind enough to leave in the ground, really protecting the public trust?

Granted, most injection wells do not leak, and have been effective at holding waste for varying amounts of time at this point. But, with a level of uncertainty where it currently sits, doesn't the government have a duty to make sure that the best standards are in place, regulation is steadfast, and enforcement mechanisms are in place to ensure that these doomsday worst case scenarios won't impair our Public Trust resources? We sure think so.