



Legislation Details (With Text)

File #: ID-298-18 **Version:** 1 **Name:**
Type: Informational Report **Status:** Agenda Ready
File created: 8/30/2018 **In control:** City Council
On agenda: 9/11/2018 **Final action:**
Title: A Discussion of Compiled Research Regarding Injection Wells
Sponsors:
Indexes:
Code sections:

Attachments: 1. Exhibit A - Weld County Injection Wells, 2. Exhibit B - Adams County OG Traffic Impact Study, 3. Exhibit C - Reference List with Studies, 4. Exhibit D - Spills Reported to COGCC by NGL, 5. Exhibit E - Sesimicity Review for Class II Underground Injection Control Wells, 6. Exhibit F - Injection Well Accidents, 7. City Council Study Session Presentation 18.08.31_Injection Well Research

Date	Ver.	Action By	Action	Result
------	------	-----------	--------	--------

Department of Community Development

Reference: Injection Well Moratorium Research

To: Mayor Kenneth J. Kreutzer and Members of City Council

Through: Philip A. Rodriguez - City Manager

Marv Falconburg, AICP - Assistant City Manager

Holly Prather, AICP - Community Development Director

Prepared By: Matthew Sura, Esq. and Joshua Tetzlaff, AICP - Senior Planner

Date Prepared: August 19, 2018

This memo is to describe Class II Waste Water Injection Facilities and the possible impacts they could have on the City of Brighton in order to give the Brighton City Council the information it needs to determine whether to update the way injection wells are regulated in the *Land Use and Development Code*.

WHAT ARE CLASS II INJECTION WELLS?

Class II waste injection wells are used only to dispose of “produced water” associated with oil and natural gas production. “Produced water” is a general term used to refer to water that flows from oil and gas wells, which may include used hydraulic fracturing fluids as well as natural waters from the formation. The produced water contains chemicals used in hydraulic fracturing fluid, salts, petrochemicals, and other naturally occurring organic and inorganic compounds that are mobilized from the formation during drilling and hydraulic fracturing activity. In Colorado, permanently disposing of this contaminated water is considered less expensive than treating the water for possible re-use.

In Weld County alone there are currently 47 injection well facilities and nine more facilities with pending applications with the Colorado Oil and Gas Conservation Commission (COGCC). (See Exhibit A) These facilities include “Commercial Disposal Well Facilities” that dispose of Class II waste from third parties for financial profit and “Centralized E&P Waste Management Facilities” that dispose of waste for one Operator or for multiple Operators under an operating agreement.

IMPACTS OF INJECTION WELLS

The impacts of injection wells are both positive and negative. On the positive side, there is a real and growing need to dispose of produced water from oil and gas development. Each well in the Greater Wattenberg field (generally located in Weld County and Adams County) requires 5-8 millions of gallons of water for hydraulic fracturing. Given the increase in oil and gas wells in the area surrounding Brighton, Class II injection facilities in or near Brighton would provide Operators with a convenient location to dispose of their produced water. An injection facility business would also provide some tax revenue.

However, injection well facilities could pose impacts to transportation, water quality, air quality, seismic activity, and fire danger. These are all addressed as separate topics below.

1. Transportation

A Class II injection facility in or around Brighton would bring increased heavy truck traffic to Brighton roads. A Class II injection facility currently proposed north of Brighton has estimated it will dispose of 420,000 to 1,008,000 gallons of water every day - from 150 -200 trucks unloading at the facility *each day*. 300-400 heavy truck trips in and out of a facility will cause road damage over time.

Adams County recently adopted an impact fee structure for oil and gas development (Exhibit B). As stated in the Executive Summary, “Adams County has commissioned this study to understand the potential impacts of oil and gas development and production on the County’s road system and to design a roadway impact fee to offset increased transportation maintenance, rehabilitation, and safety costs associated with heavy truck traffic and road damage from oil and gas activity.”

The report recommended a traffic impact fee for oil and gas development, which was approved by the Board of County Commissioners in a public hearing on Tuesday, June 19, 2018. Recognizing the impact of oil field traffic on roads, Adams County assigned different impacts fees depending on the well’s dependence on trucks. Truck dependent wells that required trucks for hauling water to the location as well as trucks for hauling oil and produced water from the location will be required to pay as much as \$61,827 *per well* to pay for impacts to Adams County roads.

Loaded water trucks can weigh close to the maximum 80,000 pound limit permitted on Colorado roads. Because of the weight, the impact of oil and gas water trucks can be as much as 15,000 to 46,000 times that of a passenger car.

300-400 one-way trips equates to 37-50 trips an hour during an eight-hour workday. The weight and size of water trucks requires more stopping and starting time which could potentially slow Brighton traffic and may impact response times for emergency services.

2. Water Quality

Hydraulic fracturing and produced water contains dangerous chemicals that can make humans sick if they are ingested in even small amounts. As required by state law, the oil and gas industry is required to report the chemicals used in its hydraulic fracturing operations on the website Frac Focus. Numerous scientific journal articles that describe the threat those chemicals pose to drinking water, as well as the petrochemicals and other pollutants in “produced water,” are summarized and attached to this memo as Exhibit C.

A. The chemicals in the waste water injected at the site pose a contamination risk, through spills, to drinking water

Spills related to an injection facility could pose a threat to Brighton’s drinking water, which is primarily sourced from shallow ground water wells. The produced water disposed of at an injection facility would contain both used hydraulic fracturing fluid as well as contaminants that are naturally occurring in the geologic formations that contain oil and natural gas.

i. Chemicals from Hydraulic Fracturing Fluid

“Flowback” is a type of produced water, and refers to fluids containing predominantly hydraulic fracturing fluids that return to the surface after the pressure on a well is initially released. Flowback and produced water are generally stored in storage containers at the well site, and may be recycled, treated for reuse, or disposed of in underground injection wells.

Hydraulic fracturing in the Greater Wattenberg Field takes approximately 5-8 million gallons of hydraulic fracturing fluid for a tight sand gas well. Chemicals in the hydraulic fracturing fluid include gelling agents, breakers, surfactants, corrosion inhibitors, and others, which are used as additives in hydraulic fracturing fluids. This mixture of chemical additives and chemicals from the formation may return to the surface in flowback and produced water from the well.

While less than fifty chemicals are typically used for the hydraulic fracturing of a single well, there are approximately 1,173 different chemicals used by the industry across the United States. The United States Environmental Protection Agency (EPA) identified 1,173 chemicals associated with hydraulic fracturing fluids, flowback, or produced water, of which 1,026 (87%) have not been studied extensively for their potential effects on human health. This lack of research on toxicity is not unique to the hydraulic fracturing industry; in fact, there are estimated to be tens of thousands of chemicals in industrial use that have not undergone significant toxicological evaluation.

Of the hydraulic fracturing chemicals that have been sufficiently studied, many have been linked to adverse human health outcomes, including reproductive/developmental impacts, neurotoxicity, and carcinogenicity. Contact with hydraulic fracturing chemicals cause harm to the endocrine system with negative outcomes to the sexual organs.

Fifteen “chemicals of concern” to water quality were identified in a 2015 University of Colorado study. The study chose the fifteen “chemicals of concern” based on the chemicals’ toxicity, mobility, persistence and frequency of use that made them particularly threatening to drinking water sources. Many of the chemicals pose a threat to water quality in *parts per*

billion. This means that in even small quantities, the chemicals can pollute a public water supply.

ii. Chemicals from the Formation

The chemicals in hydraulic fracturing fluids that return as flowback are not the only threat produced water poses to drinking water. Other chemicals, such as naturally-occurring organic and inorganic compounds, may be mobilized from the formation during drilling and hydraulic fracturing activity. This mixture of chemical additives and chemicals from the formation may return to the surface in flowback and produced water from the well. The produced water from oil and gas development is known to carry high levels of saline and total dissolved solids. This may include toxic substances such as heavy metals, volatile organic compounds (e.g., BTEX, benzene, toluene, ethylbenzene, xylenes), semivolatile organic compounds, and/or radioactive materials. An increased cancer risk may be associated with produced water from hydraulic fracturing activity, as it opens up new pathways for exposure to these naturally occurring and carcinogenic compounds. Water pollution from metals is also a serious problem as they are taken up readily in the digestive tract and exhibit harmful effects on many tissues.

Another recent study found that produced water not only contains fracturing additives and formation chemicals, but also intended and unintended “transformation products” generated during the process. Nontoxic chemicals were found to have reacted with other chemicals and converted to problematic products.

B. An injection facility presents a long-term risk from a spill or release

If an injection well were to be approved within or near the City’s source water protection areas, spills, unintended releases, and other accidents could pose a continuing threat to shallow ground water supplies. Several recent studies have found that even one spill was enough to impact long-term water quality and fish health downstream. Two recent studies investigated an injection facility near a stream in West Virginia. Water samples were collected from a background site in the area and both upstream and downstream of the disposal facility. The results were that high levels of endocrine disrupting chemicals were found downstream of the injection site that are known to result in adverse health effects in aquatic organisms and other animals. Streambed microbial diversity was also lower below an oil and gas waste injection plant in West Virginia and water downstream from this site had higher endocrine-disrupting activities than reference water. The researchers concluded that the activities at the disposal facility were negatively impacting the stream and altering the biogeochemistry of nearby ecosystems.

Another study of a produced water release from a leaking pipeline into the Blacktail Creek in North Dakota found lasting impacts to fish and water quality for over 25 miles. The results of that study suggest that chemicals from hydraulic fracturing fluids and formation chemicals incorporated into the sediment - causing a longer-term impact to water quality.

It goes without saying, that if the water is dangerous for fish and other aquatic organisms, it could have health implications for human beings as well. Produced water spills have been found to contaminate ground water sources with benzene. Benzene is a petrochemical that is found in the gas-producing formations in Weld County and is known to cause cancer in humans.

Injection well facilities in Weld County have reported several spills and releases in the past three years. The largest commercial disposal well facility company, NGL Water Solutions, owns 21 of the 47 locations in Weld County. According to the COGCC, NGL had seven (7) reportable spills since April 2015. (See Exhibit D). The spills were a result of malfunctioning equipment (3), human error (2), and lightning (2). It should be noted that any spills by water trucks away from the facility would not be reported to the COGCC.

3. Air Quality

Increased truck traffic and the injection tanks could negatively impact air quality. On-site storage tanks at an injection facility would be serviced by diesel water trucks and would themselves have the potential to emit methane and volatile organic compounds. The Colorado Department of Public Health and the Environment has estimated emission factors for VOCs, benzene and hexane for produced water tanks just as they do for condensate and oil storage tanks. While there is little to no literature on injection wells, other waste water facilities such as evaporation ponds have been found to emit a suite of hydrocarbons including carcinogenic chemicals such as benzene.

4. Seismic Activity

On June 1, 2014, an M_w 3.2 earthquake occurred in Weld County, Colorado, near Greeley. Greeley residents reported the quake felt like a truck ran into their house. Historically, Weld County had rarely seen any seismic activity but it started seeing frequent earthquakes that scientists eventually determined were caused by Class II injection wells. Within a month of the Greeley earthquake, scientists had pinpointed the source of the seismic activity to one injection well in particular - an NGL Water Solutions facility near Greeley.

It is now accepted that Class II injection wells can cause human-induced seismicity. Induced seismicity can occur when large volumes of water are injected into a formation with existing fractures. In some cases, the liquid waste can lubricate the fractures - allowing the fracture to slip - thereby causing an earthquake.

In the case of the 2014 Greeley quake, COGCC regulators shut down the injection well and required the company to cement the bottom portion of the well. The operation was allowed to resume but was initially required to inject smaller volumes of water at lower pressures. Since that time, the COGCC has implemented a system to investigate and remediate any wells believed to be causing larger earthquakes. (Exhibit E).

5. Fire danger

Four injection facilities have been struck by lightning in recent years. In April, 2015, lightning struck a produced water disposal facility near Greeley, CO, leading to a fire and several large explosions. In 2016, two injection facilities were destroyed by lightning strikes - even though at least one was equipped with lightning protection systems. The resulting fires consumed the produced water tanks.

STATE AND LOCAL CONTROL OF INJECTION WELLS

Class II injection wells are regulated by the COGCC and local governments. The COGCC regulates and permits injection wells but, unlike some other oil and gas regulations, the COGCC has taken the position that it DOES NOT preempt local zoning authority over where the wells can be located. Former COGCC Director

Matt Lepore stated during a Board of County Commissioners hearing in Garfield County, “There is not a mineral right associated with the injection permit. So, if the County does not approve the site for this well then that decision has primacy.”

In a number of recent court cases, the COGCC has taken the position that local zoning cannot be applied to oil and gas development. But waste injection is not oil and gas development. Unlike oil and gas mineral rights that are located in a certain location, Class II waste water injection wells can be located anywhere.

Weld County LGD Troy Swain wrote in a recent comment on an injection well, “Disposal facility siting is under the authority of the local governing body.” Several local governments have decided to strictly regulate injection wells. Broomfield and Commerce City prohibit waste water injection wells. Other municipalities, such as Brighton and Erie, prohibit injection wells through the optional MOU process they use with Operators. This optional MOU process has proven effective with oil and gas Operators who are primarily concerned with developing oil and gas but not with Commercial Disposal Well Facility Companies that are only concerned with developing waste injection facilities for profit.

RECOMMENDED CHANGES TO THE MUNICIPAL CODE REGARDING REGULATION OF INJECTION WELLS

The Brighton Municipal Code treats waste injection wells the same as all other oil and gas wells. The Code does not contain additional safeguards, standards, or criteria for the approval, construction, operation, use, regulation, closure, or clean-up of such facilities. Because waste disposal injection wells are different than other oil and gas facilities and have far different impacts, they deserve different treatment in the Code.

New Code provisions could be established to accomplish one or more of the following:

- 1) Prohibiting injection wells within the City of Brighton.
- 2) Prohibiting injection wells only within specified zoning districts.
- 3) Establishing an application process that has standards and review criteria for approval of injection well applications.
- 4) Establishing requirements for the construction, operation, use, regulation, closure, and clean-up of injection well facilities.

Given the potential impacts to Brighton roads, traffic, water and air quality, and ultimately, the public’s health, safety and welfare, it is the opinion of City Staff that waste disposal injection wells should not be permitted in the City. While they may be a necessary part of the oil and gas industry, it is the opinion of City Staff that waste disposal injection facilities should be located in unincorporated and unpopulated areas of the county as the potential negative impacts to residents and businesses outweigh any potential benefits.

Based on feedback from the City Council at the study session meeting, City Staff may also need additional time to prepare the requisite documents and may seek an extension of the moratorium (scheduled end date of December 4th).