United States
Environmental Protection
Agency

Region 5
Office of Public Affairs
230 South Dearborn Street
Chicago, Illinois 60604

Illinois, Indiana,
Michigan, Minnesota,
Ohio, Wisconsin

EPA

FACT SHEET

Class V Injection Well Closure

July 1991

WHAT ARE INJECTION WELLS AND WHY ARE THEY A PROBLEM?

Underground injection wells are not like the wells we get drinking water from. They have a fundamental difference: Instead of removing fresh water from the ground, these wells insert waste liquids. Properly done, this is a safe way to dispose of wastes. The problem is that it isn't always done properly, and then the ground water that we drink can become polluted.

Ground water is an essential part of our water supply (see Box 1); we need it for our health, recreation, economic growth, and agricultural production—the quality of life we all share. Contamination is a grave threat, though. Once it has been contaminated, ground water can be very difficult, if not impossible, to clean.

Box 1. Our dependence on ground water

- Over 50 percent of the Nation's drinking water comes from ground water.
- More than 75 percent of our cities derive all or part of their water from underground sources.
- Rural America is 95 percent dependent on ground water.

Unlike surface water, ground water does not flow in a series of lakes and rivers. Ground water is stored beneath our communities in formations of rock, sand, gravel, and soil. Precipitation seeps into the ground and fills the pores of rock formations, similar to the way water fills a sponge. Unfortunately, this "rock sponge" absorbs more than water—things such as benzene, toluene, methylene chloride, tetrachloroethylene (PCE), trichloroethylene (TCE), and other chemicals—all common industrial wastes, many of which can cause cancer, birth defects, developmental problems, and other health problems.

To protect ground water from contamination, Congress has established the Underground Injection Control (UIC) program. This program sets rules for the operation and construction of injection wells and organizes them into five classes (see Box 2).

The subject of this fact sheet is Class V wells, the most common, and one of the most environmentally dangerous types of injection well. Unlike other classes of

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Box 2. Classes of injection wells

Class I	Deep wells used to inject hazardous wastes or dispose of nonhazardous industrial waste and treated municipal sewage below the deepest underground source of drinking water.
Class II	Wells used to inject fluids associated with the production of oil and natural gas, or fluids and compounds used for enhanced hydrocarbon recovery.
Class III	Wells that inject fluids used in the subsurface mining of minerals.
Class IV	Wells that dispose of hazardous or radioactive wastes into or above an underground source of drinking water. (These wells are banned and must be plugged.)
Class V	Wells, not included in the other classes, that inject nonhazardous fluid into or above an underground source of drinking water. These wells are commonly referred to as shallow injection wells.

injection wells that are often thousands of feet deep, most of these wells are only a few feet deep. In fact, a well is technically any hole that is deeper than it is wide. This means that the hole in a backyard that an unthinking person might pour used motor oil into is an underground injection well. In fact, most Class V wells are not much more sophisticated than a simple hole in the ground that wastes are poured into.

Shallow injection wells can be especially dangerous if they are near drinking water sources. Injection wells should not be in vulnerable ground water areas because of the potential for contaminating nearby drinking-water wells.

WHO USES THESE WELLS?

Shallow injection wells fall into two main categories: drainage wells and disposal wells. Over 80 percent of all Class V injection wells are in these two groups (see the attached table for a detailed list of Class V well types).

The other 20 percent of shallow injection wells include such diverse groups as geothermal reinjection wells that use the temperature of the Earth's core to heat buildings, radioactive waste disposal wells that dispose of low-level radioactive wastes, and even abandoned drinking-water wells that are used for waste disposal.

Drainage wells are used for removing water from places that have too much of it. Farmers use them to keep their fields dry, and cities use them to keep their streets dry. Often city storm sewers use injection wells to dispose of stormwater runoff. This is not just rainwater, though. It can become contaminated with fertilizers, animal wastes, heavy metals, and other pollutants. Once the contaminated water enters the well, the ground water can become contaminated also.

Disposal wells are the type of injection well most often used by businesses (see Box 3). Most of these wells are little more than a drain in the floor that leads to a

Box 3. Businesses that use disposal wells

- Automotive service facilities
- Dry cleaners
- Laundromats
- Refineries
- Chemical plants
- Pharmaceutical plants
- Tanneries
- Lumber companies
- Metal finishers
- Electronics manufacturers
- Photographic laboratories

septic tank or dry well. The problem is that these septic systems drain into the ground water. Septic tanks and dry wells do a fairly good job of treating normal domestic wastes, but they can't handle industrial chemicals. If the chemicals are toxic when they enter the septic tank, they're just as toxic when they enter the ground water.

Automotive service stations frequently damage ground water supplies with Class V wells. Waste oil, transmission fluid, battery acid, degreaser—it all goes down the drain and into the water. These liquids may be harmless when they're in your car, but not when they're in your coffee.

Another business problem can be laundromats. These businesses sometimes discharge water high in detergents and other laundry chemicals into their septic systems, which then contaminate ground water. Even photographic darkrooms sometimes put the ground water at risk. The developers and fixers—chemicals used to develop film—are usually just poured down the sink, which empties in the septic tank, which drains into ground water.

WHAT IS THE EPA DOING?

Operators of Class V injection wells were required to submit information about their wells by June 25, 1985—very few did so, and those that did not lost the right to continue using their wells. It is illegal to operate an underground injection well without a permit from EPA.

In 1987, the Region 5 Underground Injection Control section started a project to collect inventory information on Class V injection wells in Indiana, Michigan, and Minnesota. (The other Region 5 States—Illinois, Wisconsin, and Ohio—have their own underground injection control programs.) Through this effort, more than 2,300 injection wells were identified in Indiana, Michigan, and Minnesota. This is by no means a comprehensive inventory; EPA believes that many more wells exist, but they haven't been identified yet. In an effort to identify all these wells, EPA is beginning to organize volunteer groups to search communities for injection wells.

Although there are 32 types of Class V wells, EPA has determined that types 5X28 (Automobile Service Station Related Waste Disposal) and 5W20 (Industrial Process Waste Water Disposal) pose the greatest threat to the environment. Identified operators of these wells were told to cease injection and submit either permit applications for continued operation or plans for the permanent closure of the well. Also, operators were told to submit data so EPA could determine if injected fluids had already contaminated the ground water.

In 1990, EPA sent closure letters to operators of 48 Class V wells. By December 31, 1991, all these wells are scheduled to be closed. This year, Region 5 sent closure letters to operators of 200 Class V wells. Many offenders have not been identified by the EPA; so, persons knowing of Class V injection well operators are encouraged to relay that information to the EPA.

WHAT CAN OPERATORS DO?

EPA gives operators of Class V injection wells two options: They can close the well permanently, or they can apply for a permit for its continued operation.

Closing the well does not necessarily mean removing the septic tank or tearing the sink off the wall. It means taking measures to prevent nondomestic wastes from entering the septic tank. An easy way to do this is to install a holding tank that gets periodically emptied by a waste hauler. For example, a service station could reroute its floor drain from the septic tank to a holding tank. The motor oil and other chemicals would flow into the holding tank, but the domestic wastes would continue to enter the septic system.

Another way to close the well is to connect it to a municipal waste treatment system. In this way, the wastes could be properly treated and would not be able to enter the ground water.

The operator's second choice is to obtain a permit from the EPA. This is more than just sending in a form. The operator must be able to prove that continued operation of the well does not pose a threat to ground water. EPA will provide information on the permitting process to interested parties. (See phone numbers at end.)

There are some treatment processes that would allow the continued operation of the wells, but most oil/water separators are not acceptable. These separators are not

designed to protect the environment, but instead to keep waste oil from clogging the septic system. These devices do not remove all the oil and they remove none of the antifreeze and other chemicals in the waste water.

WHO HAS MORE INFORMATION?

If you want additional information on Class V injection wells, contact either of the EPA offices listed below:

U.S. Environmental Protection Agency Region 5
Underground Injection Control Section (5WD-TUB-9)
230 South Dearborn St.
Chicago, IL 60604

Phone: (312) 886-4298

U.S. Environmental Protection Agency Region 5
Office of Public Affairs (5PA-14)
230 South Dearborn St.
Chicago, IL 60604

Phone: (800) 572-2515 (in Illinois)
(800) 621-8431 (outside Illinois)

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Class V Injection Well Subclasses

Name of Well Type and Description	Ground Water Contamination Potential	Potential Contaminants	EPA Well Code
DRAINAGE WELLS (a.k.a. DRY WELLS) Agricultural Drainage Wells — receive irrigation tailwaters, other field drainage, animal yard, feedlot, or dairy runoff, etc.	High	Pesticides, nutrients, pathogens, metals transported by sediments, salts.	5F1
Storm Water Drainage Wells — receive storm water runoff from paved areas, including parking lots, streets, residential subdivisions, building roofs, highways, etc.	Moderate	Heavy metals (Cu, Pb, Zn) organics, high levels of coliform bacteria. Contaminants from streets, roofs, landscaped areas, Herbicides, Pesticides.	5D2
Improved Sinkholes — receive storm water runoff from developments located in karst topographic areas.	High-Moderate	Variable: pesticides, nutrients, coliform bacteria.	5D3
Industrial Drainage Wells — wells located in industrial areas which primarily receive storm water runoff but are susceptible to spills, leaks, or other chemical discharge.	High-Moderate	Usually organic solvents, acids, pesticides, and various other industrial waste constituents. Similar to storm drainage wells but usually higher concentrations.	5D4
Special Drainage Wells — used for disposing water from sources other than direct precipitation. Four types were reported: landslide control drainage wells (Montana), potable water tank overflow drainage wells (Idaho), swimming pool drainage wells (Florida), and lake level control drainage wells (Florida)	Moderate-Low	Chlorinated and treated water, pH imbalance, algaecides, fungicides, muriatic acid.	5G30
GEOTHERMAL REINJECTION WELLS Electric Power Reinjection Wells — reinject geothermal fluids used to generate electric power — deep wells.	Moderate	pH imbalance, minerals and metals in solution. (As, Bo, Se), sulfates.	5A5
Direct Heat Reinjection Wells — reinject geothermal fluids used to provide heat for large buildings or developments — deep wells.	Moderate	Hot geothermal brines with TDS between 2,000 to 325,000 mg/l. Co_1, $CaSO_4$, Sr and Ba, As.	5A6
Heat Pump/Air Conditioning Return Flow Wells — reinject groundwater used to heat or cool a building in a heat pump system — shallow wells.	Low	Potable water with temperatures ranging from 90° to 110° F., may have scale or corrosion inhibitors.	5A7
Groundwater Aquaculture Return Flow Wells — reinject groundwater or geothermal fluids used to support aquaculture. Non-geothermal aquaculture disposal wells are also included in this category (e.g. Marine aquariums in Hawaii use relatively cool sea water).	Moderate	Used geothermal waters which may be highly mineralized & include traces of arsenic, boron, fluoride, dissolved & suspended solids, animal detritus, perished animals and bacteria.	5A8
DOMESTIC WASTEWATER DISPOSAL WELLS Untreated Sewage Waste Disposal Wells — receive raw sewage wastes from pumping trucks or other vehicles which collect such wastes from single or multiple sources. (No treatment)	High	Soluble organic & inorganic compounds including household chemicals. Raw sewage with 99.9% water and .03% suspended solid. May contain pathogenic bacteria & viruses, nitrates, ammonia.	5W9
Cesspools — including multiple dwelling, community, or regional cesspools, or other devices that receive wastes and which must have an open bottom and sometimes have perforated sides. Must serve greater than 20 persons per day if receiving solely sanitary wastes. (Settling of solids)	High	Soluble organic & inorganic compounds including household chemicals. Raw sewage with 99.9% water and .03% suspended solid. May contain pathogenic bacteria & viruses, nitrates, ammonia.	5W10
Septic Systems (Undifferentiated Disposal Method) — used to inject the waste or effluent from a multiple dwelling, business establishment, community, or regional business establishment septic tank. Must serve greater than 20 persons per day if receiving solely sanitary wastes. (Primary Treatment)	High-Low	Varies with type of system: fluids typically 99.9% water (by weight) and .03% suspended solids: major constituents include nitrates, chlorides, sulfates, sodium, calcium, and fecal coliform.	5W11
Septic Systems (Well Disposal Method) — examples of wells include actual wells, seepage pits, cavitettes, etc. The largest surface dimension is less than or equal to the depth dimension. Must serve greater than 20 pesons per day if receiving solely sanitary wastes. (Less treatment per square area than 5W32)	High-Low	Varies with type of system: fluids typically 99.9% water (by weight) and .03% suspended solids: major constituents include nitrates, chlorides, sulfates, sodium, calcium, and fecal coliform.	5W31
Septic System (Drainfield Disposal Method) — examples of drainfields include drain or tile lines, and trenches. Must serve more than 20 persons per day if receiving solely sanitary wastes. (More treatment per square area than 5W31)	High-Low	Varies with type of system: fluids typically 99.9% water (by weight) and .03% suspended solids: major constituents include nitrates, chlorides, sulfates, sodium, calcium, and fecal coliform.	5W32
Domestic Wastewater Treatment Plant Effluent Disposal Wells — dispose of treated sewage or domestic effluent from small package plants up to large municipal treatment plants. (Secondary or further treatment)	High-Low	Lower levels of organics and bacteria than other septic systems and cesspools.	5W12
MINERAL AND FOSSIL FUEL RECOVERY RELATED WELLS Mining, Sand, or Other Backfill Wells — used to inject a mixture of water and sand, mill tailings, and other solids into mined out portions of subsurface mines whether what is injected is a radioactive waste or not. Also includes special wells used to control mine fires and acid mine drainage wells.	Moderate	Acidic waters	5X13
Solution Mining Wells — used for in-situ solution mining in conventional mines, such as stopes leaching.	Moderate-Low	2.4% sulfuric acid, pH less than 2 for copper & ferric cyanide solution for gold or silver.	5X14
In-situ Fossil Fuel Recovery Wells — used for in-situ recovery of coal, lignite, oil shale, and tar sands.	Moderate	Steam, air, solvents, igniting agents.	5X15
Spent-Brine Return Flow Wells — used to reinject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts.	Low	Variable	5X16

(continued)

Name of Well Type and Description	Ground Water Contamination Potential	Potential Contaminants	EPA Well Code
INDUSTRIAL/COMMERCIAL/UTILITY DISPOSAL WELLS Cooling Water Return Flow Wells — used to inject water which was used in a cooling process, both open and closed loop processes.	Low-Moderate	Anti-sealing additives, thermal pollution, potential for industrial spills reaching ground water.	5A19
Industrial Process Water and Water Disposal Wells — used to dispose of a wide variety of wastes and wastewaters from industrial, commercial, or utility processes. Industries include refineries, chemical plants, smelters, pharmaceutical plants, laundromats and dry cleaners, tanneries, carwashes, laboratories, etc. *Industry and waste stream must be specified* (e.g. Petroleum Storage Facility—storage tank condensation water; Electric Power Generation Plant—mixed waste stream of laboratory drainage, fireside water, and boiler blowdown; Car Wash—Mixed waste stream of detergent, oil and grease, and paved area washdown; Electroplating Industry—spent solvent wastes; etc.).	High	Potentially any fluid disposed by various industries, suspended solids, alkalinity, sulfate volatile organic compounds.	5W20
Automobile Service Station Disposal Well — repair bay drains connected to a disposal well. Suspected of disposal of dangerous or toxic wastes.	High	Heavy metals, solvents, cleaners, used oil and fluids, detergents, organic compounds.	5X28
RECHARGE WELLS Aquifer Recharge Wells — used to recharge depleted aquifers and may inject fluids from a variety of sources such as lakes, streams, domestic wastewater treatment plants, other aquifers, etc.	High-Low	Variable: water is generally of good quality	5R21
Saline Water Intrusion Barrier Wells — used to inject water into fresh water aquifers to prevent intrusion of salt water into fresh water aquifers.	Low	Varies: advanced treated sewage, surface urban and agricultural runoff, and imported surface waters.	5B22
Subsidence Control Wells — used to inject fluids into a non-oil or gas producing zone to reduce or eliminate subsidence associated with overdraft of fresh water and not used for the purpose of oil or natural gas production.	Low	No specific type of injected fluid noted, similar to aquifer recharge wells.	5S23
MISCELLANEOUS WELLS Radioactive Waste Disposal Wells — all radioactive waste disposal wells other than Class IV wells.	Unknown	Low-level radioactive wastes.	5N24
Experimental Technology Wells — wells used in experimental or unproven technologies such as pilot scale in-situ solution mining wells in previously unmined areas.	Low-Moderate	Varies depending on project.	5X25
Aquifer Remediation Related Wells — wells used to prevent, control, or remediate aquifer pollution, including but not limited to Superfund sites.	Unknown	Nutrients used in Biodegradation of organics, oil/grease, phenols, toluene.	5X26
Abandoned Drinking Water Wells — used for disposal of waste.	Moderate	Potentially any kind of fluid, particularly brackish or saline water, hazardous chemcials and sewage.	5X29
Other Wells — any other unspecified Class V wells: *Well type/purpose and injected fluids must be specified.*	Unknown	Variable	5X27