

Class 1 Underground Injection and Sustainability

Missouri Waste Control Coalition

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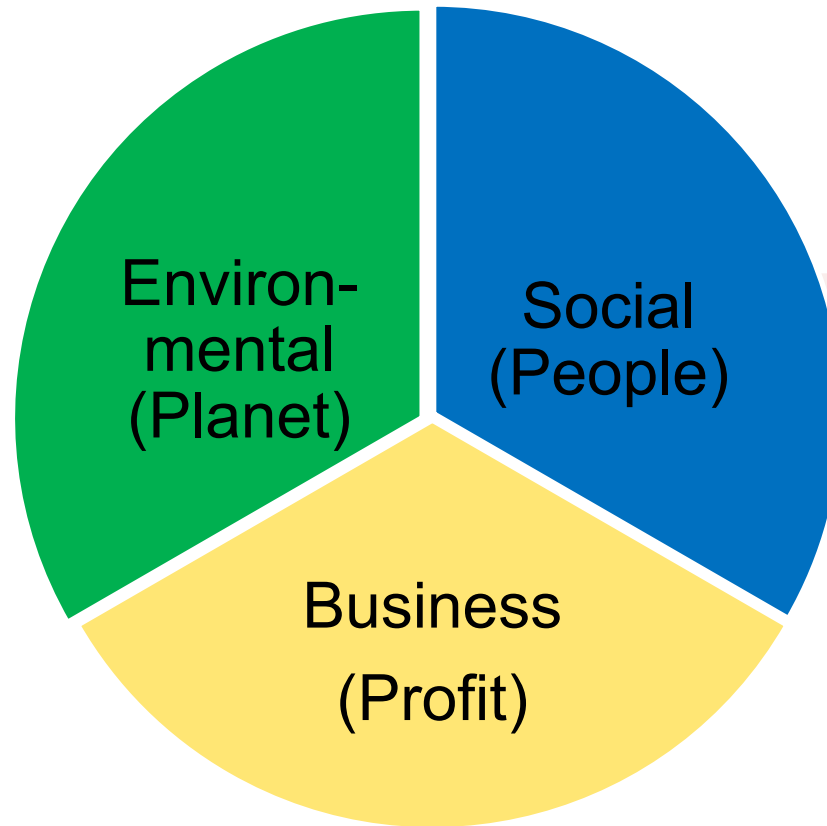
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Class 1 Underground Injection and Sustainability

- The Triple Bottom Line of Sustainability
- Class 1 Hazardous Underground Injection Triple Bottom Line
 - » Benefits
 - » EPA perspective.
- Captive Class 1 Underground Injection Wells
- Use of Commercial Class 1 Underground Injection
- References and Links
- Typical Class 1 Hazardous Underground Injection Well

Class 1 Underground Injection and Sustainability

The Triple Bottom Line of Sustainability



Class 1 Underground Injection and Sustainability

Triple Bottom Line

- Companies cannot sustain their operations without “profits” on their Triple Bottom Line. Companies have Stakeholders not just shareholders.
- The elements of the Triple Bottom Line are interconnected.
- Triple Bottom Line elements (Planet, People, Profit).
 - » Environmental Sustainability (Planet).
 - » Social Sustainability (People).
 - » Business/Economic Sustainability (Profit).
- Underground Injection and the Triple Bottom Line.
 - » Companies with their own injection wells.
 - » Industries who use commercial injection wells.

Class 1 Underground Injection Triple Bottom Line Environmental Sustainability Benefits

- **Water Discharges.**

- » No discharges to waterways by POTW or State PDES.
- » Very low risk to groundwater. The expressed purpose of the Underground Injection (UIC) program is to protect Underground Sources of Drinking Water (USDW).
- » Meet future requirements which are likely to get more restrictive.

- **Air Emissions.**

- » Low emission technology, low HAPs, NOx, CO2, SOx, etc.
- » No thermal or combustion processes except for vapor control device, e.g. thermal oxidizer.
- » Meet future requirements.

- **CO2 Footprint.**

- » Soluble and miscible organics are not oxidized to CO2.
- » Very low compared to other waste treatment methods like wastewater treatment and incineration.

- **Environment Compliance and Risk.**

- » Reduce risk of on-site management.
- » Lower environmental risk for all stakeholders.
- » See March 2001 EPA Report 816-R-01-007 “Class 1 Underground Injection Program: “Study of Risks Associated with Class 1 Underground Injection Wells.”

Class 1 Injection, Environmental Sustainability Benefits, EPA Perspective

- “The UIC Program Reduces Human Exposure to Organic and Inorganic Chemicals by removing them from the environment; eliminates more than 9 billion gallons of hazardous waste ...from the environment each year”
“....reduces pollution inrivers, streams, lakes....” EPA 816-F-04-040
June 2004.
- EPA Commissioned a Risk Study to outline the progress of the UIC Program 10 years after the “No Migration Petition” rules on injection of hazardous waste went implemented in 1988. EPA Report 816-R-01-007
“Class 1 Underground Injection Program: “Study of Risks Associated with Class 1 Underground Injection Wells.”
 - » “An internal or external MI (Mechanical Integrity) failure does not imply failure of the injection well or loss of confinement. Rather, they indicate that one of the protective elements may have malfunctioned.”
 - » “Many early Class I failures were a result of historic practices that are no longer permissible under the UIC regulations.”

Class 1 Injection Environmental Sustainability Benefits, EPA Perspective, continued

- » “EPA’s study of more than 500 Class I nonhazardous and hazardous wells showed that loss of MI (mechanical integrity) contributed to only 4 cases of significant wastewater migration (none of which affected a drinking water source) over several decades of operation”
- » “The 1988 UIC regulations implementing the HSWA (Hazardous and Solid Waste Amendments) offer additional protection by requiring operators of Class 1 hazardous wells to complete a no-migration petition to demonstrate that the hazardous constituents of the wastewater will not migrate from the injection zone for 10,000 years, or as long as the wastewater remains hazardous.”
- » “The EPA has no reason but to conclude that existing Class I regulatory controls are strong, adequately protective, and provide an extremely low-risk option in managing the wastewaters of concern.”

Class 1 Injection, Environmental Sustainability Benefits, EPA Perspective, continued

- » Chemical Manufacturer's Association (CMA) Comments on EPA risk study
 - “underground injection of hazardous waste is particularly low risk compared to other waste management practices”
 - “there have not been any instances of USDW contamination at a facility in compliance with the current UIC program regulations, and the malfunctions cited in the EPA study involved facilities that had not yet been required to comply with the UIC program requirements”

Class 1 Underground Injection Triple Bottom Line Social Sustainability Benefits

- “Social Permit.”
- Contributions to community.
 - » Good paying jobs.
 - » Growth.
 - » Multiplier effect on local economy.
- Commitment to community.
 - » Involvement with community, e.g CAP, CAC.
 - » Consideration in decision making.
 - » “Environmental Justice.”
- Acceptance by community.
 - » Trust.
 - » Low environmental impact.
- Commitment to employees.
 - » Safe workplace.

Class 1 Injection, Social Sustainability Benefits, EPA Perspective

The UIC Program “reduces human exposure to organic and inorganic chemicals....avoids cost of....medical monitoring for health effects”

“Enables communities to make wise local land use decisions”

EPA 816-F-04-040 June 2004

Class 1 Injection Triple Bottom Line Business/Economic Sustainability Benefits

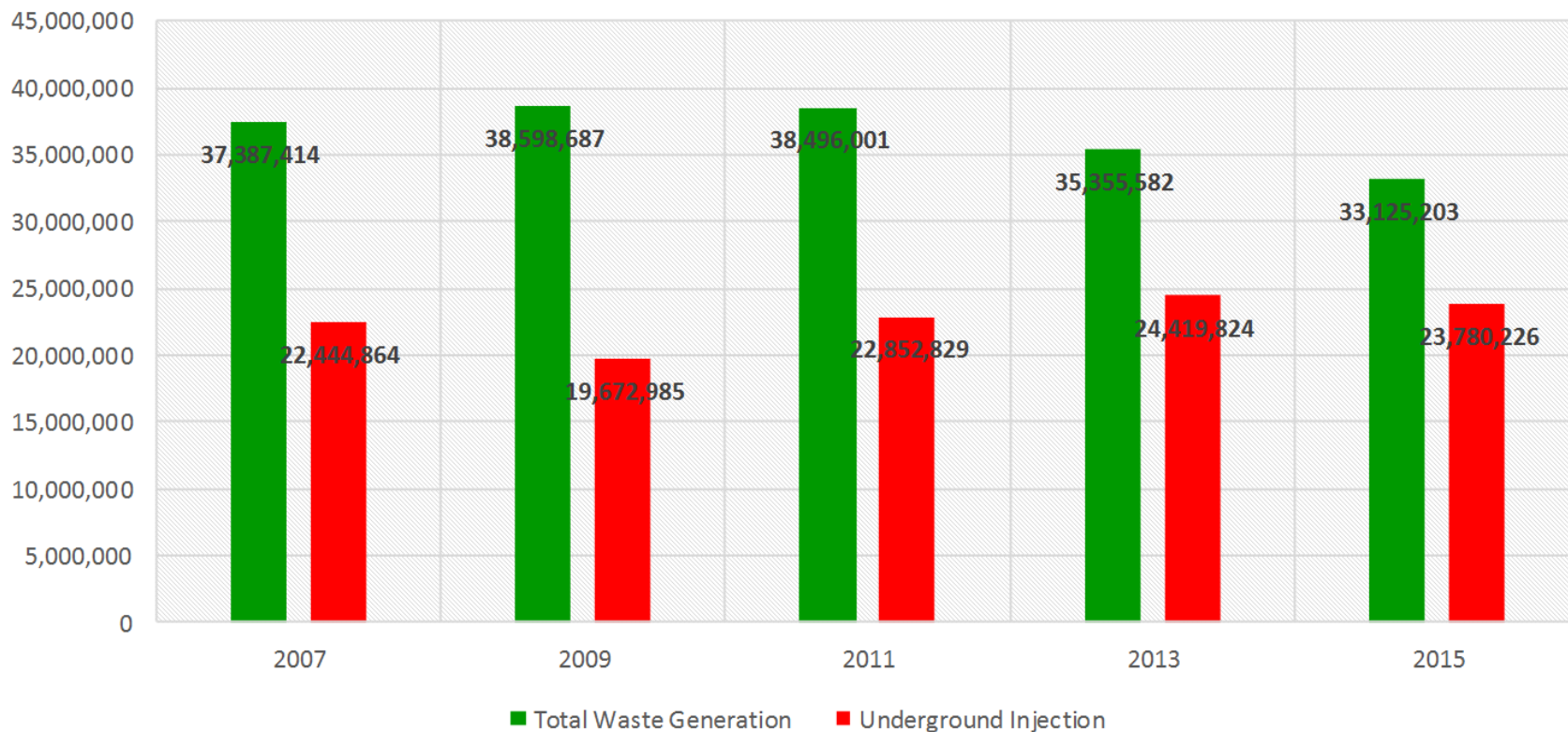
- **General Sustainability Issues.** Underground Injection reduces cost and risk to industry, increasing profits, reducing capital, and increasing competitive position.
 - » Profit. Must have profitable business to support environmental and social sustainability.
 - » Capital Conservation. Capital is directed to core businesses. Capital is reduced for waste related investments with poor or uncertain financial payback.
 - » Reduces cost of treatment chemicals and supplies, both on-site and off-site as Class 1 Hazardous Injection Permits allow injection without treatment or neutralization of waters (depending on specific permit).
 - » Growth. Reduces bottlenecks in production associated with waste issues.
- **Cost of Environmental Sustainability.** Underground Injection reduces the cost and risk of environmental compliance.
 - » Regulation.
 - » Meeting Regulations.
- **Cost of Social Sustainability.** Underground Injection supports the cost of social sustainability.
 - » Employment.
 - » Contributions to community.
 - » Acceptance by community.

Class 1 Injection, Economic Sustainability Benefits, EPA Perspective

- “Our way of life would be quite different without injection wells. Agribusiness and the chemical and petroleum industries as we know them today, could not exist. While treatment technologies exist, it would be cost prohibitive to treat and release the trillions of gallons of wastes that industries produce each year.” EPA 816-F-04-040 June 2004.

Business Sustainability, Use of Class 1 Hazardous Wells Increases to 71.6% of all U.S. Hazardous Waste

Use of Hazardous UIC Wells in US from 2007 to 2015 (EPA Biennial Reports), Tons/Yr.



Captive Class 1 Underground Injection Wells

Major Industries with Captive Class 1 Wells

- Chemical companies.
- Oil refineries
- Metal refining
- Terminals

Class 1 Injection Inventory, 2016 EPA Data, Selected States (Class 2 included for reference)

State	Class 1 Haz	Class 1 Non Haz	Class 2 Disposal
Missouri	0	0	10
Kansas	5	64	5,039
Oklahoma	0	6	4,400
Kentucky	0	2	109
Arkansas	4	8	836
Illinois	3	8	1,100
Texas	82	96	13,418
USA Total	140	692	38,169

Captive Class 1 Underground Injection Wells Requirements for Class 1 Hazardous Wells

- Volume to Justify Investment.
- Geology.
 - » Confining Layers above and below injection site.
 - » No geology which would allow significant lateral or vertical movement of water outside permitted injection interval, low seismic risk, and few fissures.
 - » Location of water sources and artificial penetrations.
- Injection Formation. Contain water movement and porous enough to accept flow.
- Strict Permit Requirements.
 - » Construction of well (multiple barriers).
 - » Limits on injection pressures.
 - » Annulus pressure requirements.
 - » Mechanical Integrity Tests (Annual).
 - » Federal EPA No Migration Petition for Class 1 Hazardous Wells.

Class 1 Underground Injection and Sustainability

Use of Commercial Class 1 Hazardous Wells

- When volumes do not support a captive well.
- When geology doesn't support a Class 1 Hazardous captive well.
- When reliability is important.
 - » Need “utility” type service to manage water volumes.
- When environmental issues are important.
 - » Discharges to waterways (pesticides, metals, toxic organics, etc.).
 - » Special projects such as “zero discharge.”
 - » Discharges to air (CO₂, organics, etc.).
- When cost issues are important.
 - » Compliance costs (permits, discharges, fines, alternate disposal).
 - » Capital costs (on-site treatment systems).
 - » Operations cost (labor, maintenance, chemicals).
 - » Disposal costs (expensive alternatives such as incineration).

Class 1 Injection and Sustainability

Industries Using Commercial Underground Injection

- Chemical companies
- Oil refineries
- Metal refineries
- Chemical storage facilities
- Hazardous Waste facilities
- Others
 - » Power plants
 - » Galvanizers
 - » Plating companies
 - » US Army demilitarization
 - » Landfills

Class 1 Underground Injection and Sustainability Summary

- Use of Class 1 hazardous underground injection helps companies with their triple bottom line.
- Many companies use captive underground injection wells to manage very large volumes of waters with environmental, social, and economic benefits.
- Many companies and industries use commercial underground injection to manage smaller or large infrequent waters to obtain proportional triple bottom line benefits.
- The studies commissioned, and brochures published by the EPA tend to support the use of hazardous injection wells to help industry meet the environmental, business, and social components of sustainability.

Class 1 Underground Injection and Sustainability Summary, The Triple Bottom Line



References and Links on Class 1 Underground Injection

- “Class I Underground Injection Control Program: Study of the Risks Associated with Class I Underground Injection Wells” EPA Report 816-R-01-007, http://water.epa.gov/type/groundwater/uic/wells/_class_1.cfm
- EPA Produced Animation “Protective Aspects of Class I Hazardous Waste Disposal Wells” , http://www.texasmolecular.com/_tm/includes/display_objects/custom/classes1wellanimation/InjectionWell.html
- EPA 816-K-10-004, March 2012, Protecting Drinking Water through Underground Injection Control, http://water.epa.gov/type/groundwater/uic/upload/pocketguide_uic_protecting_dw_thru_uic.pdf
- EPA Report 570/9-91-031, “Class 1 Underground Injection Wells are safer than virtually all other waste disposal practices”
- Texas Molecular website, www.texasmolecular.com

Underground Injection and Sustainability

Thank you

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