

Underground Injection (UIC) and Sustainability

TCC EH&S Seminar, Water/Waste
Track

Frank Marine

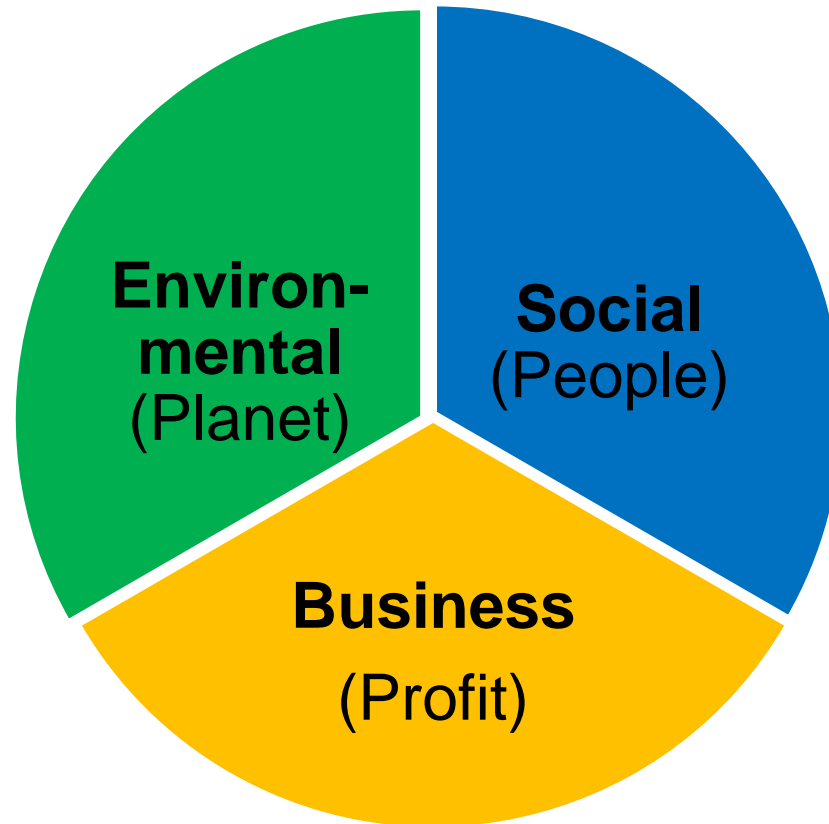
June 7, 2016, 1:50 PM

Class 1 Hazardous Underground Injection (UIC) Wells and Sustainability

- The Triple Bottom Line of Sustainability
- Class 1 Hazardous Underground Injection Triple Bottom Line from EPA perspective and the elements of sustainability
- Requirements for Captive Class 1 Hazardous UIC Wells
- Use of Commercial Class 1 Hazardous UIC Wells
- References on Class 1 Hazardous UIC Wells
- Typical Class 1 Hazardous UIC Well

Class 1 UIC Wells and Sustainability

The Triple Bottom Line of Sustainability



Class 1 UIC Wells and Sustainability

Triple Bottom Line

- “Triple Bottom Line” coined by John Elkington in 1997 Book, “Cannibals With Forks; The Triple Bottom Line of 21st Century Business.”
- 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. They are being used more widely by companies seeking to report and measure sustainability.

Class 1 UIC Wells and Sustainability

Triple Bottom Line

- Triple Bottom Line elements (Planet, People, Profit).
 - Environmental Sustainability (Planet).
 - Social Sustainability (People).
 - Business Sustainability (Profit).

Class 1 UIC Wells and Sustainability Triple Bottom Line

- **Underground Injection and the Triple Bottom Line.**
 - Companies with their own injection wells.
 - Industries who use commercial injection wells

Environmental Sustainability

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.

Environmental Sustainability

Conclusions of EPA Risk Study

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.”

Environmental Sustainability

Conclusions of EPA Risk Study

- “EPA’s study of more than 500 Class I nonhazardous and hazardous wells showed that loss of MI contributed to only 4 cases of significant wastewater migration (none of which affected a drinking water source) over several decades of operation”

Environmental Sustainability

Conclusions of EPA Risk Study

- “The 1988 UIC regulations implementing the HSWA 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.”

Environmental Sustainability

Chemical Industry Comments on EPA Risk Study

- 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”

Environmental Sustainability

Environmental Elements

- Water Discharges.
 - No discharges to waterways by POTW or State PDES.
 - Very low risk to groundwater. Purpose of UIC Program.
- Air Emissions.
 - Low emission technology, low HAPs, NO_x, CO₂, SO_x, etc.
- CO₂ Footprint.
 - Soluble and miscible organics are not oxidized to CO₂.
- Environmental Compliance and Risk.
 - 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 UIC Triple Bottom Line Social Sustainability, 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

Social Sustainability

Social Sustainability Elements

- “Social Permit.”
- Commitment to community.
 - Involvement with community
 - Consideration in decision making.
 - “Environmental Justice.”
- Acceptance by community.
- Commitment to employees.

Class 1 UIC Wells Triple Bottom Line Business Sustainability, 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

Business Sustainability Elements

- General Business Sustainability Issues. Underground Injection reduces cost and risk to industry, increasing profits, reducing capital, reducing cost of treatment and increasing competitive position.
- Profits are necessary to support environmental and social sustainability

Business Sustainability

Business Sustainability Elements

- Cost of Environmental Sustainability. Underground Injection reduces cost and risk of environmental compliance.
- Cost of Social Sustainability. Underground Injection supports the cost of social sustainability.
- Cost of Environmental Sustainability. Underground Injection reduces cost and risk of environmental compliance.
- Cost of Social Sustainability. Underground Injection supports the cost of social sustainability.

Business Sustainability

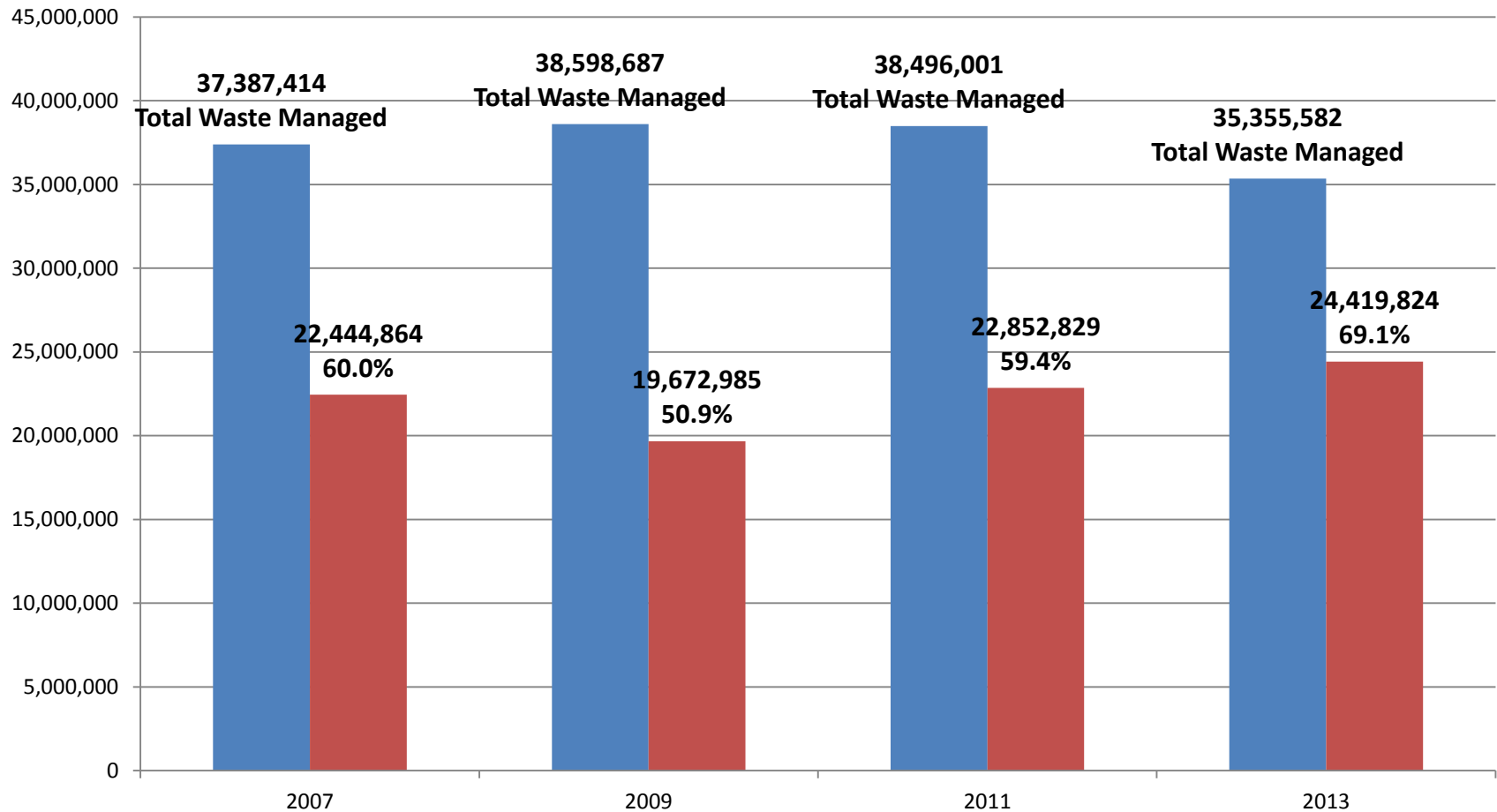
Major Industries with Captive Class 1 Wells

- Chemical Manufacturing
- Oil refineries
- Metal refining
- Pharmaceuticals
- Power Companies

Increased Use of Class 1 Wells for Managing Hazardous Waste. Tons Per Year Total and Deepwell, 2007 through 2013

(EPA Biennial Report,

<http://rcrainfo.epa/rcrainfoweb/action/modules/br/management>)



Captive Class 1 UIC Wells

Requirements for Class 1 Wells

- Volume to Justify Investment.
- Geology. Geology. Geology.
- Injection Formation. Restrict movement of water and porous enough to accept flow.
- 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 UIC Wells and Sustainability

Use of Commercial Class 1 Hazardous Wells

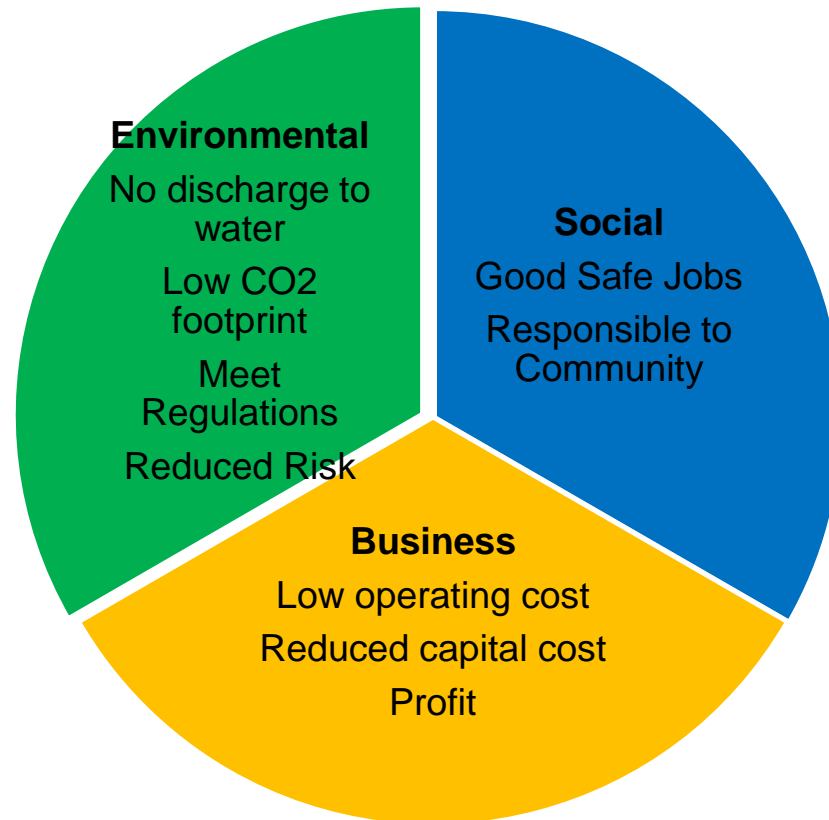
- When volumes or geology do not support a captive well.
- When reliability is important.
- Need “utility” type service to manage water volumes.
When environmental issues are important.
 - Discharges to waterways (pesticides, metals, toxic organics, etc.).
 - Discharges to air (CO₂, organics, etc.).
- When cost issues are important.

Underground Injection and Sustainability Industries Using Commercial UIC Wells

- Chemical companies
- Oil refineries
- Hazardous waste facilities
- Landfills
- Galvanizers
- Plating companies
- US Army Demilitarization Program

Class 1 Underground Injection and Sustainability

Summary, The Triple Bottom Line



Class 1 UIC Wells and Sustainability Summary

- Companies use captive UIC wells to manage very large volumes of waters with environmental, social, and economic benefits. The use of hazardous wells is growing.
- Companies use commercial underground injection to manage smaller or large infrequent waters to obtain proportional triple bottom line benefits.

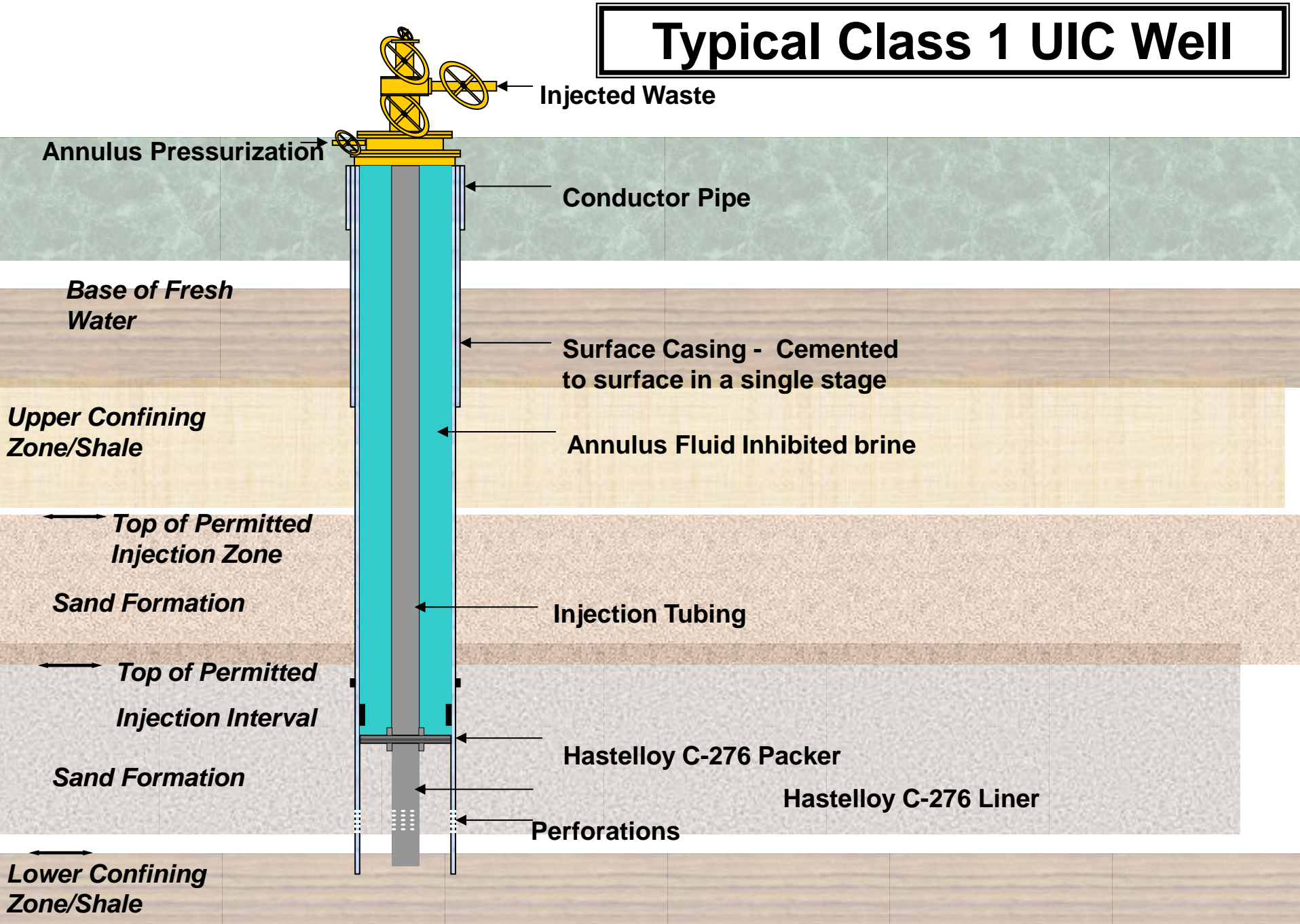
References on Class 1 Underground Injection

- “Class I Underground Injection Control Program: Study of the Risks Associated with Class I Underground Injection Wells” **EPA Report 816-R-01-007, March 2001.**
- “US EPA’s Program to Regulate the Placement of Waste Water and other Fluids Underground,” **EPA 816-F-04-040, June 2004.**

References on Class 1 Underground Injection

- **USEPA Website**, www.epa.gov/uic/general-information-about-injection-wells#how_protect
- **Biennial Report Information**, <https://rcrainfo.epa.gov/rcrainfoweb/action/modules/br/management>
- “Class 1 Underground Injection Wells are safer than virtually all other waste disposal practices”. **EPA Report 570/9-91-031.**
- **Texas Molecular**, www.texasmolecular.com

Typical Class 1 UIC Well



Underground Injection and Sustainability

Thank you

Frank Marine

fmarine@texasmolecular.com

Website: www.texasmolecular.com