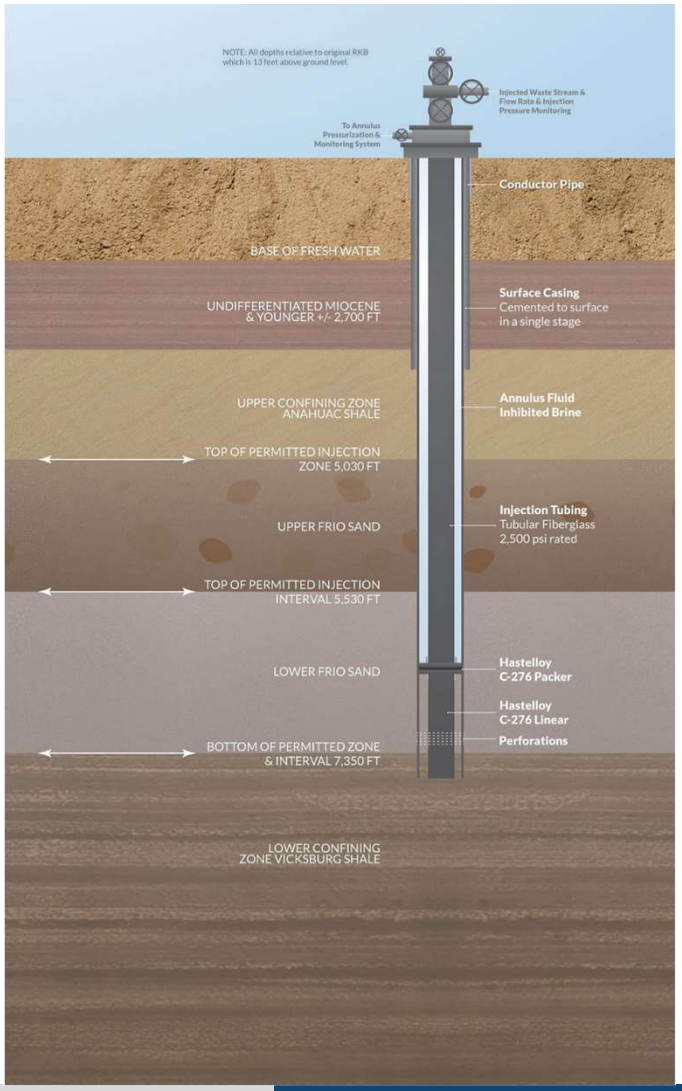

# 2025 ANNUAL EPAZ CONFERENCE

PRESENTED BY: JIMMY BRACHER

DATE: March 3rd 2025

# CLASS I HAZARDOUS INJECTION WELL

# INJECTION WELL DESIGN



# SIGNIFICANT ABOVE GROUND ASSETS

## (ALL RCRA PERMITTED)

# EPA on Hazardous Waste Underground Injection

## Over 33 Years of Safely Managing Hazardous Waste and Constituents of Concern
## March 2025



# THE EPA ON UNDERGROUND INJECTION

- Purpose of Underground Injection Program
- Low Risk Solution
- Sustainability from EPA Perspective
- % of all Hazardous Waste is Injected into Class 1 Hazardous Underground Injection Wells
- EPA Interim Guidance on PFAS Destruction and Disposal
- Case Study
- References



# PURPOSE OF UNDERGROUND INJECTION PROGRAM
## EPA UNDERGROUND INJECTION CONTROL (UIC) PROGRAM

- **Purpose of the UIC Program: Protect Underground Sources of Drinking Water (USDW)**
    - **Regulated under Safe Drinking Water Act (SDWA)**
- UIC regulations promulgated in 1980.
- EPA amended UIC regulations in 1988 to address the land bans of the Hazardous and Solid Waste Amendments (HSWA) of 1984. These new rules instituted the 10,000 year No Migration Petition for wells injecting hazardous wastewaters.
- A major study of risks associated with Class I Underground Injection Wells was undertaken and reported in March 2001.
- The UIC program for managing hazardous wastewater has been very successful in protecting USDWs for over 45 years.
- The EPA is proud of the success of the UIC program as evidenced by the risk study, publications, and animations to support Class I Hazardous injection wells.

# LOW RISK SOLUTION
## CLASS I HAZARDOUS 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
Quotations excerpted from this report:

### REQUIREMENTS

- "the hazardous constituents of the wastewater will not migrate from the disposal site for 10,000 years or as long as the wastewater remains hazardous"
- "Geologically stable areas that are free of transmissive fractures or faults through which injected fluids could travel to drinking water sources"
- "sophisticated multi-layer construction has many redundant safety features"
- "injection pressures will not initiate new fractures or propagate existing fractures in the injection or confining zones"
- "operators also must periodically test the well's mechanical integrity"

# LOW RISK SOLUTION
## CLASS I HAZARDOUS INJECTION

Risk Assessment study by W.A. Rish, ***"A Probabilistic Risk Assessment of Class I Hazardous Waste Injection Wells"***
Draft 1998.

- "The study assumed that ,given the redundant safety systems in a typical Class I well, loss of containment requires a string of improbable events to occur in sequence. For example, a leak develops in the packer, followed by a drop in annulus pressure that is undetected due to a simultaneous malfunction of the pressure monitoring system, followed by a leak in the long string casing between the surface casing and the upper confining layer, resulting in a loss of waste isolation"
- The probability of containment loss resulting from each of the scenarios examined ranges from one-in-a-million to one-in-ten-quadrillion."

# LOW RISK SOLUTION
## CLASS I HAZARDOUS INJECTION

Conclusions of ***EPA March 2001 Report:***

- "An internal or external MI 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."
- "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"
- "The 1988 UIC regulations implementing the 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."**

# SUSTAINABILITY
## FROM EPA PERSPECTIVE

### Environmental

"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 in ….rivers, streams, lakes…."

### Social

"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"

### Business

"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."

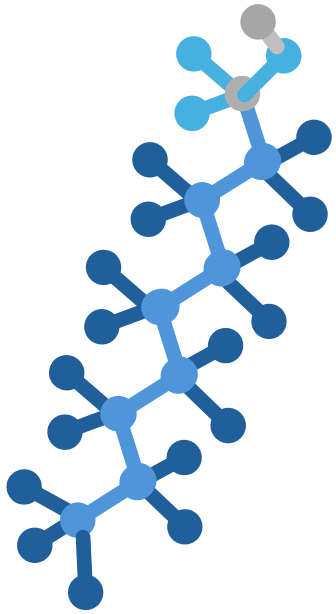
# EPA INTERIM GUIDANCE ON PFAS DESTRUCTION AND DISPOSASL

## RECENT AFFIRMATION OF THE EFFECTIVENESS OF UNDERGROUND INJECTION

- PFAS management is perhaps the most significant environmental challenge in decades. There are significant concerns about health and the environment. It has  significant political, discharge, air transport, environmental justice, and litigation components.

- EPA published interim guidance on available technologies for the destruction and disposal of PFAS waste in December 2020 and updated in 2024. It included underground injection, landfill, and incineration. It ranked them from least to highest uncertainty. Hazardous waste Underground Injection was listed as “least uncertain” and requires almost no research on data gaps to prove effectiveness vs landfill and incineration

- **It is no small matter that the EPA guidance document listed hazardous waste injection wells as the technology with the least “uncertainty”. The reasons included the affirmation of the low risk, no discharge, and no emissions aspects of hazardous waste underground injection which the EPA has said for decades.**

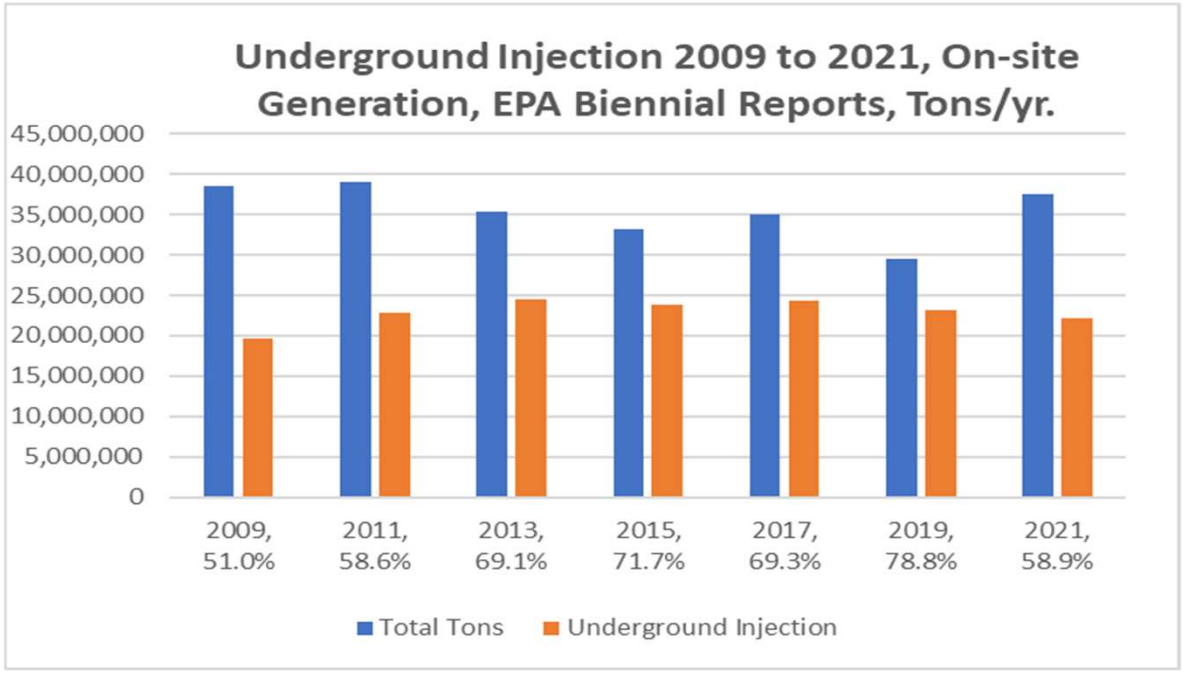


# CASE STUDY
## 2023 OHIO TRAIN DERAILMENT

- **During a spill in the Midwest, VLS provided crisis waste management services for both hazardous and non-hazardous waste. Over a 12- month period, VLS successfully tackled multiple tasks, including:**
- Management of large waste volumes
  - 33 million gallons of PFAS waste with RCRA Listed Codes
  - 4,000 truck loads and 500 railcars
- Coordination of intermodal logistics
  - Waste was transported by rail and transloaded to truck at VLS rail facilities
- Managed active media and political interest in project

# CLASS I HAZARDOUS WASTE INJECTION WELLS

## 59% OF ALL HAZ WASTE DISPOSAL (5 BILLION GAL/YR)



# REFERENCES
## ON CLASS I UNDERGRUOND 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.**

Class 1 Underground Injection Wells are safer than virtually all other waste disposal practices".

**EPA Report 570/9-91-031.**

EPA Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances, December 18, 2020. https://www.texasmolecular.com/wp-content/uploads/2020/12/EPA-Interim-Guidance-on-Disposal-and-Destruction-of-PFAS-12-18-20.pdf

# RCRA
## PERMITTED WASTE CODES

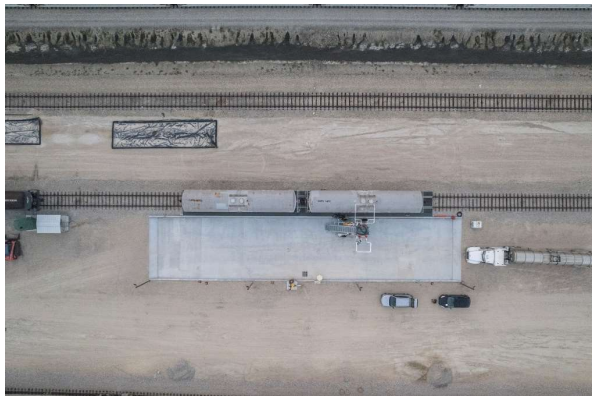
**Table IV.B.1 – EPA Hazardous Waste Numbers for Wastes Managed in Permitted Units**

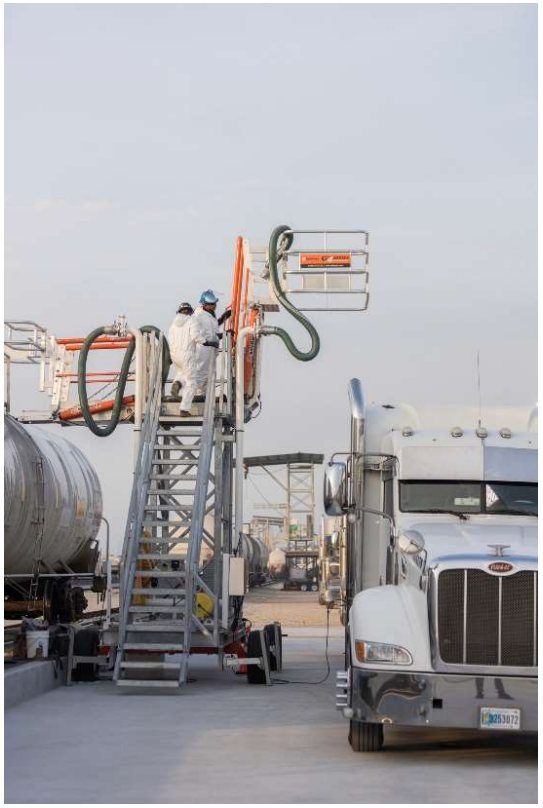
| Type of Waste | EPA Hazardous Waste Numbers for Wastes Managed in Permitted Units |
|---|---|
| Characteristically Hazardous Wastes | D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 D012 D013 D014 D015 D016 D017 D018 D019 D020 D021 D022 D023 D024 D025 D026 D027 D028 D029 D030 D031 D032 D033 D034 D035 D036 D037 D038 D039 D040 D041 D042 D043 |
| Hazardous Waste from Non-specific Sources | F001 F002 F003 F004 F005 F006 F007 F008 F009 F010 F011 F012 F019 F020 F021 F022 F023 F024 F025 F026 F027 F028 F032 F034 F035 F037 F038 F039 |
| Hazardous Wastes from Specific Sources | K001 K002 K003 K004 K005 K006 K007 K008 K009 K010 K011 K013 K014 K015 K016 K017 K018 K019 K020 K021 K022 K023 K024 K025 K026 K027 K028 K029 K030 K031 K032 K033 K034 K035 K036 K037 K038 K039 K040 K041 K042 K043 K044 K045 K046 K047 K048 K049 K050 K051 K052 K060 K061 K062 K069 K071 K073 K083 K084 K085 K086 K087 K088 K093 K094 K095 K096 K097 K098 K099 K100 K101 K102 K103 K104 K105 K106 K107 K108 K109 K110 K111 K112 K113 K114 K115 K116 K117 K118 K123 K124 K125 K126 K131 K132 K136 K141 K142 K143 K144 K145 K147 K148 K149 K150 K151 K156 K157 K158 K159 K161 K169 K170 K171 K172 K174 K175 K176 K177 K178 K181 |
| Acutely Hazardous Wastes | P001 P002 P003 P004 P005 P006 P007 P008 P009 P010 P011 P012 P013 P014 P015 P016 P017 P018 P020 P021 P022 P023 P024 P026 P027 P028 P029 P030 P031 P033 P034 P036 P037 P038 P039 P040 P041 P042 P043 P044 P045 P046 P047 P048 P049 P050 P051 P054 P056 P057 P058 P059 P060 P062 P063 P064 P065 P066 P067 P068 P069 P070 P071 P072 P073 P074 P075 P076 P077 P078 P081 P082 P084 P085 P087 P088 P089 P092 P093 P094 P095 P096 P097 P098 P099 P101 P102 P103 P104 P105 P106 P108 P109 P110 P111 P112 P113 P114 P115 P116 P118 P119 P120 P121 P122 P123 P127 P128 P185 P188 P189 P190 P191 P192 P194 P196 P197 P198 P199 P201 P202 P203 P204 P205 |
| Toxic Wastes | U001 U002 U003 U004 U005 U006 U007 U008 U009 U010 U011 U012 U014 U015 U016 U017 U018 U019 U020 U021 U022 U023 U024 U025 U026 U027 U028 U029 U030 U031 U032 U033 U034 U035 U036 U037 U038 U039 U041 U042 U043 U044 U045 U046 U047 U048 U049 U050 U051 U052 U053 U055 U056 U057 U058 U059 U060 U061 U062 U063 U064 U066 U067 U068 U069 U070 U071 U072 U073 U074 U075 U076 U077 U078 U079 U080 U081 U082 U083 U084 U085 U086 U087 U088 U089 U090 U091 U092 U093 U094 U095 U096 U097 U098 U099 U101 U102 U103 U105 U106 U107 U108 U109 U110 U111 U112 U113 U114 U115 U116 U117 U118 U119 U120 U121 U122 U123 U124 U125 U126 U127 U128 U129 U130 U131 U132 U133 U134 U135 U136 U137 U138 U140 U141 U142 U143 U144 U145 U146 U147 U148 U149 U150 U151 U152 U153 U154 U155 U156 U157 U158 U159 U160 U161 U162 U163 U164 U165 U166 U167 U168 U169 U170 U171 U172 U173 U174 U176 U177 U178 U179 U180 U181 U182 U183 U184 U185 U186 U187 U188 U189 U190 U191 U192 U193 U194 U196 U197 U200 U201 U203 U204 U205 U206 U207 U208 U209 U210 U211 U213 U214 U215 U216 U217 U218 U219 U220 U221 U222 U223 U225 U226 U227 U228 U234 U235 U236 U237 U238 U239 U240 U243 U244 U246 U247 U248 U249 U271 U278 U279 U280 U328 U353 U359 U364 U367 U372 U373 U387 U389 U394 U395 U404 U409 U410 U411 |

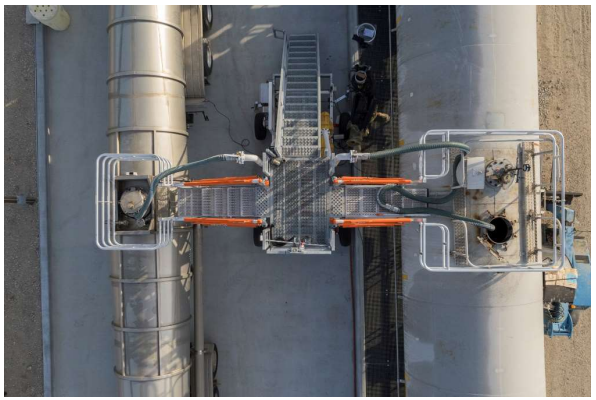
# 6 UNLOADING PADS
## ALL SAMPLING DONE UNDER SUPPLIED AIR

# AERIAL VIEW

# VLS – TRANSLOADING FACILITY







# THANK YOU

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