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Oil and Gas Management

EPA's Underground Injection Control Program Overview

Solid Waste Advisory Committee Meeting

June 5, 2014

Presentation Outline

Underground Injection Control (UIC) Program Background

- 1974 Safe Drinking Water Act and Protection of Underground Sources of Drinking Water (USDWs)
- UIC Well Classes

UIC Program in Pennsylvania

- History
- Current Inventory
- Common Well Designs
- Site Layout
- Permitting Process

Emerging Issues

- EPA Guidance for Hydraulic Fracturing with Diesel Fuel Component
- Long Term Waste Management Planning

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UIC Program Background

1974 Safe Drinking Water Act (SDWA)

- Requires EPA to promulgate regulations to protect drinking water sources from contamination by underground injection of fluids
- Defines:
  - Underground injection
  - What constitutes endangerment to drinking water sources
- Designed to be implemented by states

EPA (2012)

UIC Program Background

The UIC Program:

- Protects Underground Sources of Drinking Water (USDWs) from contamination
- Regulates subsurface fluid emplacement
- Is codified under 40 CFR part 124 and parts 144 through 147
- Administered by EPA in Pennsylvania

EPA (2012)

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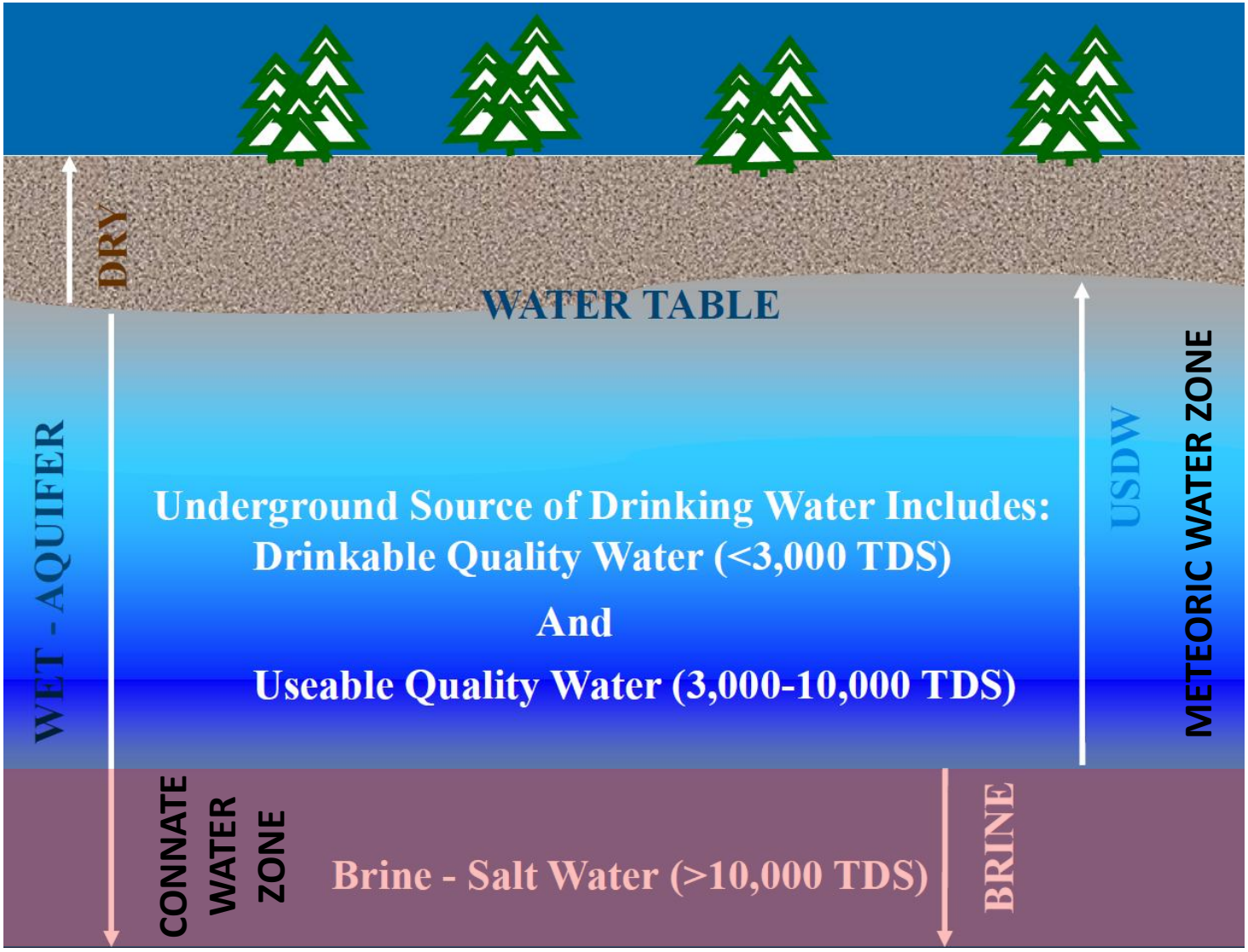
UIC Program Background



Modified from EPA (2012)

UIC Program Background

5 UIC Well Classes

- Class I: Deep Hazardous Waste Injection Wells
- Class II: Associated with Oil and Natural Gas (IIR – enhanced recovery and IID – brine disposal)
- Class III: Associated with Mineral Recovery
- Class IV: Shallow Hazardous or Radioactive Waste Injection Wells (prohibited since 1985)
- Class V: Other Injection Wells
- Class VI: Carbon Sequestration (Proposed)

EPA (2012)

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UIC Program in Pennsylvania

History

- UIC Program regulations promulgated in July 1980
- EPA began direct implementation of Pennsylvania program in June 1985
- State-specific requirements codified in 40 CFR Part 147.1950-1955 address:
  - Aquifer exemptions
  - Injection pressure limitation
  - Casing and cementing criteria

EPA (2012)

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UIC Program in Pennsylvania

Current Inventory

- Class I: 0
- Class IIR: 2,000+
- Class IID: 11 (8 active, 1 in appeal period, 2 pending)
- Class IV: 0
- Class V: 14,000+
- Class VI: 0

EPA (2012) & PADEP (2014)

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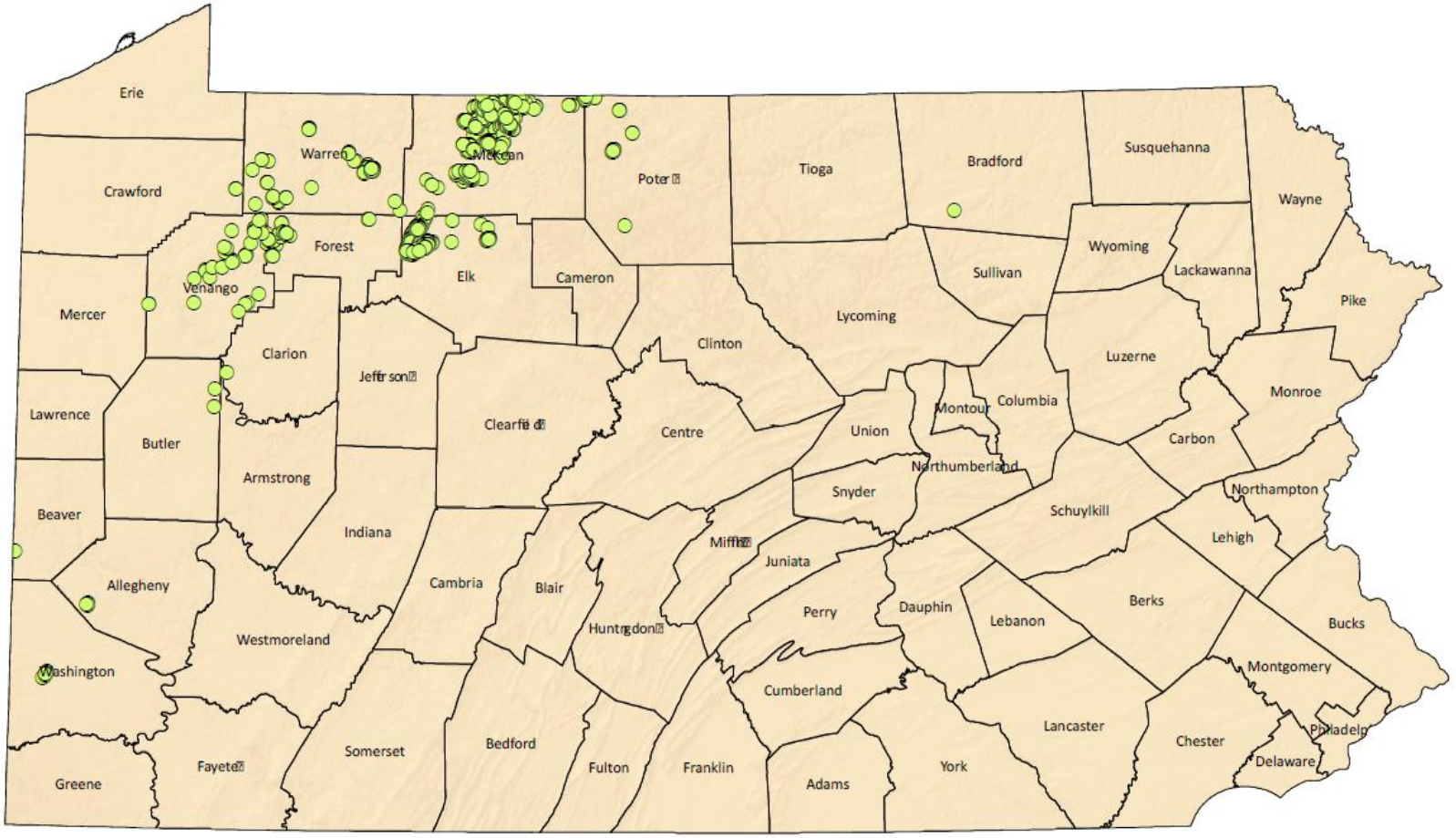
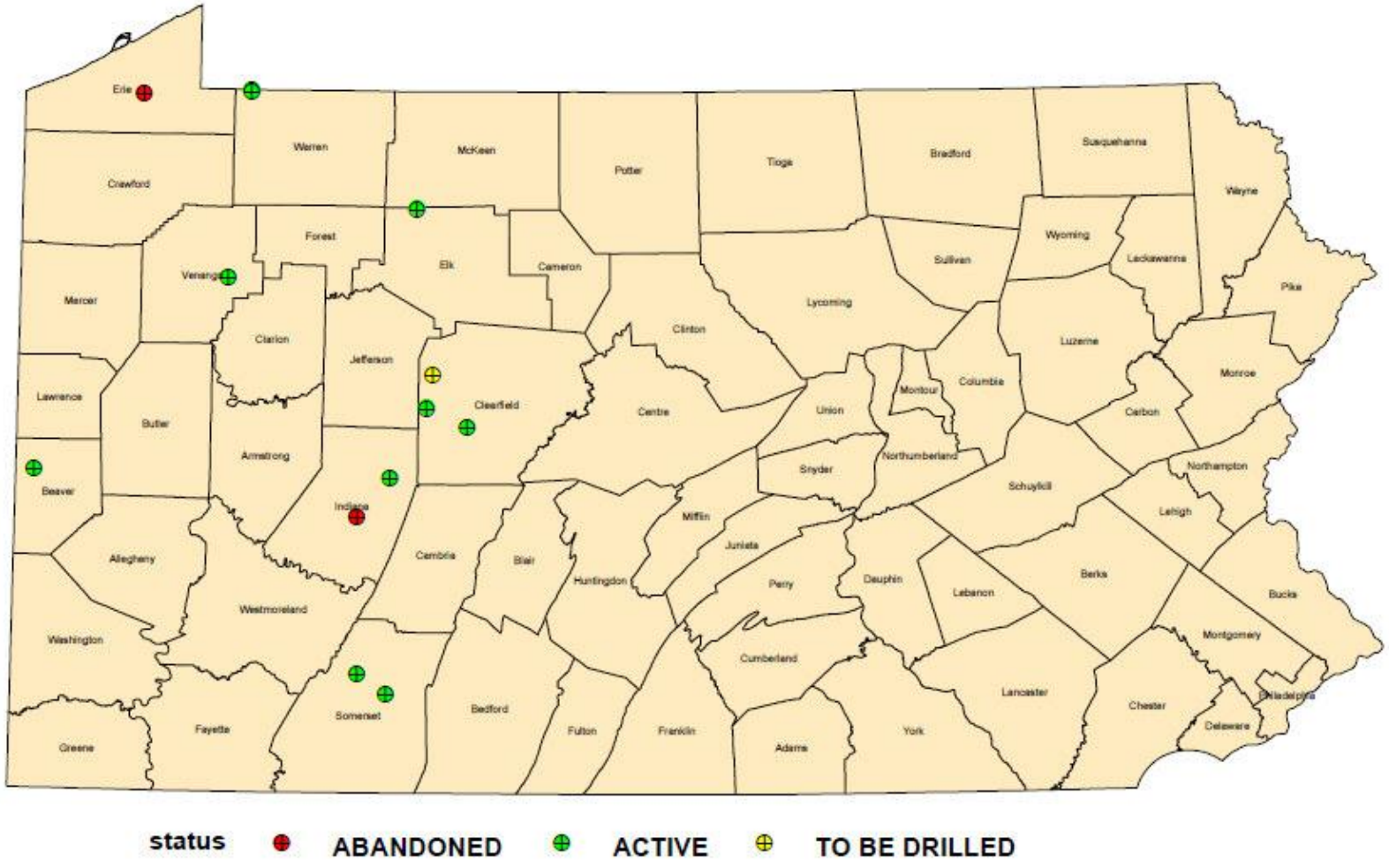
UIC Program in Pennsylvania

Distribution of Class IIR Wells



UIC Program in Pennsylvania

Distribution and Status of Class IID Wells



UIC Program in Pennsylvania

Class IID Inventory Details

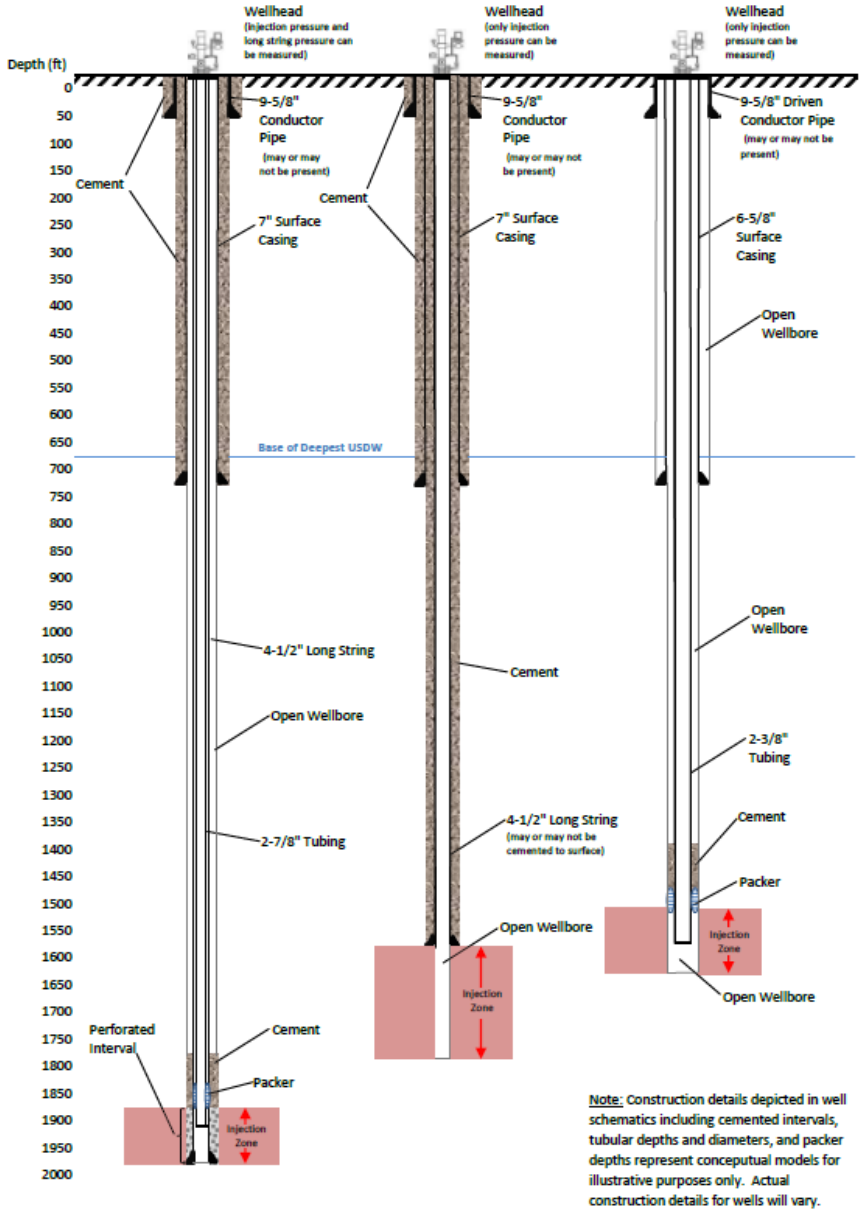
EPA UIC Permit Number	Operator	Status	Facility Type	County
PAS2D251BERI	Range Resources*	abandoned	private	Erie
PAS2D322BIND	XTO Energy*	abandoned	private	Indiana
PAS2D041BBEA	Columbia Gas	active	private	Beaver
PAS2D205BCLE	EXCO Resources PA	active	private	Clearfield
PAS2D010BVEN	Stonehaven Energy	active	private	Venango
PAS2D561BSOM	Cottonwood	active	private	Somerset
PAS2D902BCLE	EXCO Resources PA	active	private	Clearfield
PAS2D912BSOM	CNX Gas Company	active	private	Somerset
PAS2D215BWAR	Bear Lake Properties	active	commercial	Warren
PAS2D216BWAR	Bear Lake Properties	active	commercial	Warren
PAS2D025BELK	Seneca Resources	active	private	Elk
PAS2D013BIND	PA General Energy	active	private	Indiana
PAS2D020BCLE	Windfall Oil & Gas	to be drilled	commercial	Clearfield

EPA UIC Permit Number	Operator	Injection Formation	Surface Injection Pressure PSI	Volume Bbls/M
PAS2D251BERI	Range Resources*	Gatesburg	1570	45,000
PAS2D322BIND	XTO Energy*	Balltown	1930	3600
PAS2D041BBEA	Columbia Gas	Huntersville/Oriskany	1300	21,000
PAS2D205BCLE	EXCO Resources PA	Oriskany	3240	27,000
PAS2D010BVEN	Stonehaven Energy	Speechley	1358	4,500
PAS2D561BSOM	Cottonwood	Oriskany	3250	27,000
PAS2D902BCLE	EXCO Resources PA	Oriskany	1450	4200
PAS2D912BSOM	CNX Gas Company	Huntersville/Oriskany	3218	30,000
PAS2D215BWAR	Bear Lake Properties	Medina	1726	30,000
PAS2D216BWAR	Bear Lake Properties	Medina	1696	30,000
PAS2D025BELK	Seneca Resources	Elk 3 Sand	1416	45,000
PAS2D013BIND	PA General Energy	Huntersville Chert	2933	30,000
PAS2D020BCLE	Windfall Oil & Gas	Huntersville/Oriskany	2443	30,000

UIC Program in Pennsylvania

Common Class IID/IIR Well Designs

- Disposal wells in the state are exclusively former oil and gas production wells located in depleted portions of fields



UIC Program in Pennsylvania

Typical Class II Site Layout

- Off-loading area
- Storage tanks
- Site with berm and HPDE liner with sump
- Filters and pumps
- Injection well
- Site fenced to prevent unauthorized access

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UIC Program in Pennsylvania

Class II Permitting Process: EPA Highlights

- No application fee
- Pre-application conference available for operators
- All forms available on Regional website
- “One-stop shopping”: permit issued for construction, operation, monitoring and reporting
- Processing generally takes from 3-6 months
- Public notification and opportunity for public hearing required

EPA (2012)

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UIC Program in Pennsylvania

Class II Permitting Process: Major Federal Requirements

- Defining Area of Review/Zone of Endangering Influence
- Injection well construction (depth of surface casing critical)
- Well operation (maximum injection pressure and injection rates)
- MIT (once every 5 years)
- Plugging and abandonment
- Financial responsibility

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UIC Program in Pennsylvania

Class II Permitting Process: Federal Monitoring Requirements (two-year frequency)

- pH
- Specific gravity
- Specific conductance
- Sodium
- Iron
- Magnesium
- Chloride
- TOC
- Manganese
- TDS
- Barium
- Hydrogen sulfide
- DO
- Alkalinity
- Hardness

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UIC Program in Pennsylvania

Class II Permitting Process: State's Role Defined Under 25 Pa. Code Chapter 78, Section 78.18

- Operator must obtain a DEP well permit – usually this involves a "change in use" request, i.e., from production to injection
- Copy of EPA UIC Permit and Application must be included in permit submittal package
- Preparedness, Prevention and Contingency (PPC) Plan required
- Erosion and Sediment Control Plan required

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UIC Program in Pennsylvania

Class II Permitting Process: PPC Plan

- Description of operation
- Pollution prevention measures
- Site chemicals and additives including waste generated and characteristics
- Waste disposal methods
- Incident response plans and corrective action

UIC Program in Pennsylvania

Class II Permitting Process: Erosion and Sediment Control/Stormwater Management

- Must implement BMPs
- Must prepare and implement erosion and sediment control/stormwater management plan
- Must obtain ESCGP as applicable
- Anti-degradation BMPs and anti-degradation criterion apply in Special Protection watersheds

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Emerging Issues

EPA Guidance for Oil or Gas Wells Using "Diesel" Component in Stimulation Fluids

- Oil or gas wells where diesel fuel is used during the stimulation must be permitted as Class IID wells under the UIC Program
- EPA has defined "diesel" using CASRNs:
  - Fuels, diesel (68334-30-5)
  - Fuels, diesel, No. 2 (68476-34-6)
  - Fuel oil No. 2 (68476-30-2)
  - Fuel oil, No. 4 (68476-31-3)
  - Kerosene (8008-20-6)

Emerging Issues

EPA Guidance for Oil or Gas Wells Using "Diesel" Component in Stimulation Fluids

- EPA guidance is designed for UIC Program Directors and permit writers
- Topics covered in guidance include
  - Considerations in submission and review process
  - Components of permit application
  - Duration of permit considering transient nature of stimulation activities
  - Applicability of Area of Review, construction, operational, MIT, monitoring, reporting and financial responsibility requirements at new and existing wells
- Coordination with states is strongly advocated
- Discretionary flexibility is supported

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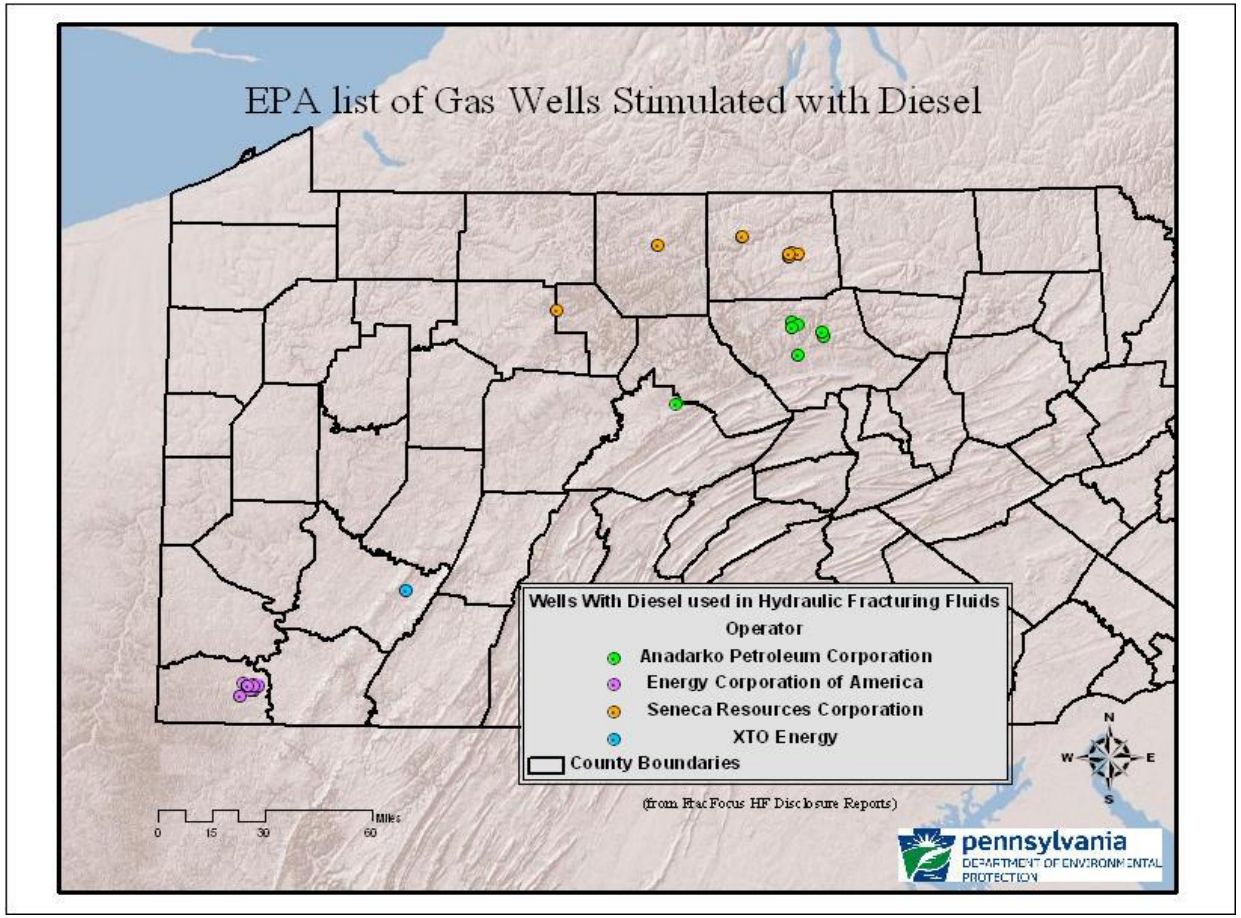
Emerging Issues

EPA Guidance for Oil or Gas Wells Using "Diesel" Component in Stimulation Fluids

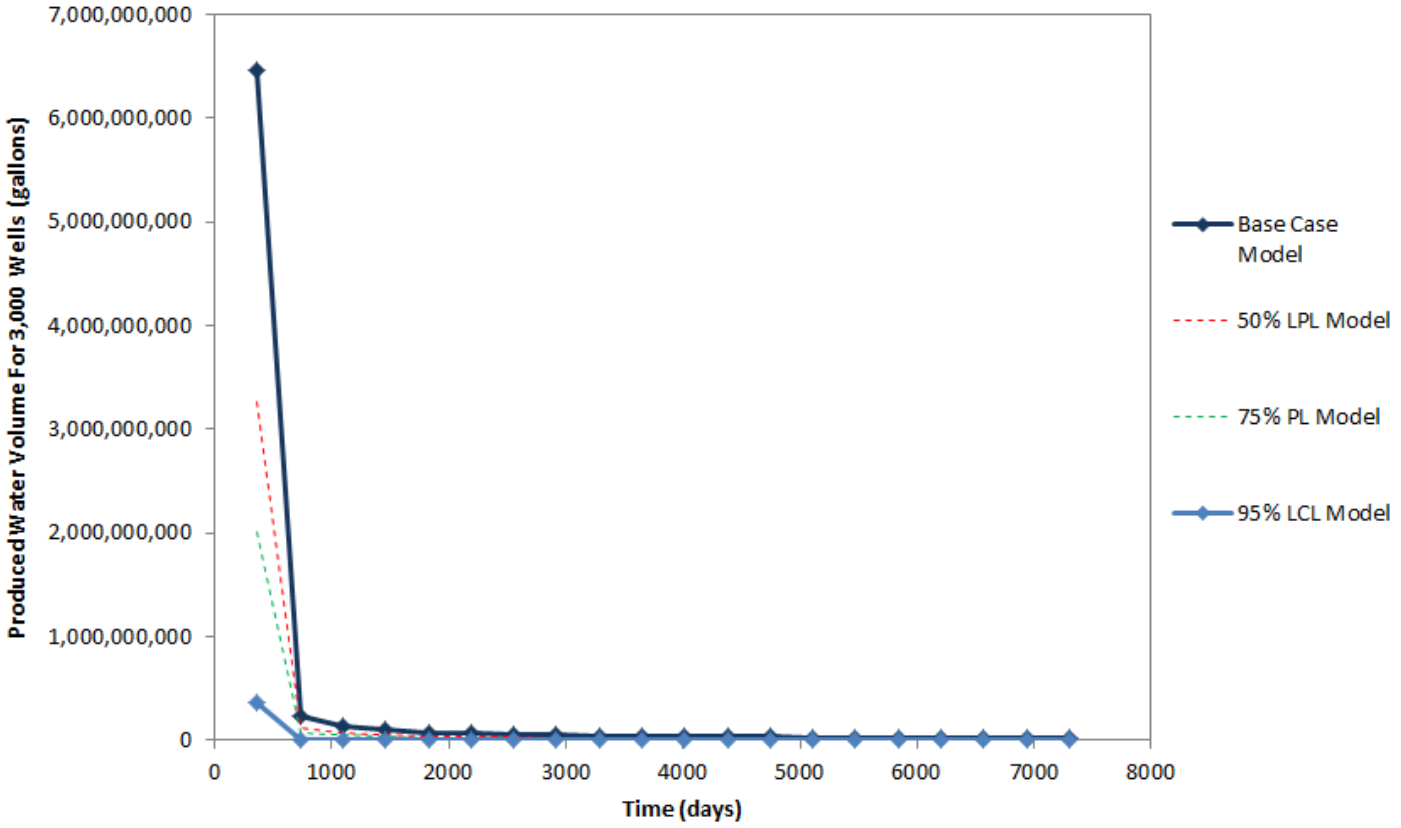
- Practice of using diesel fuel as additive in hydraulic fracturing fluid has not been observed since 2011 (FracFocus went live in April 2011)



Emerging Issues

Long Term Waste Management Planning

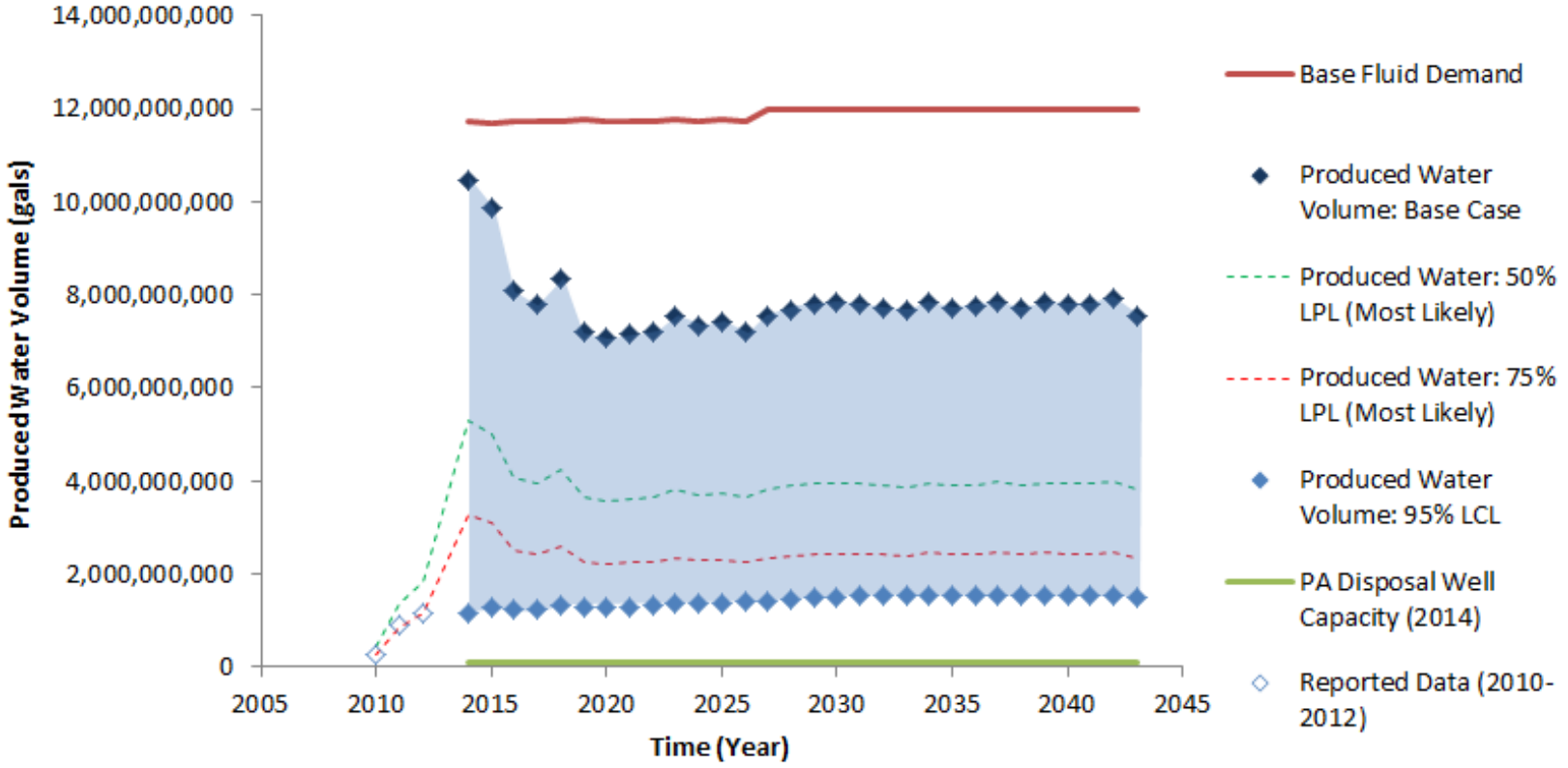
- Oil and Gas Program has utilized existing produced fluid/flowback data trends to develop a predictive model for waste generation in association with the Marcellus shale play



Emerging Issues

Long Term Waste Management Planning

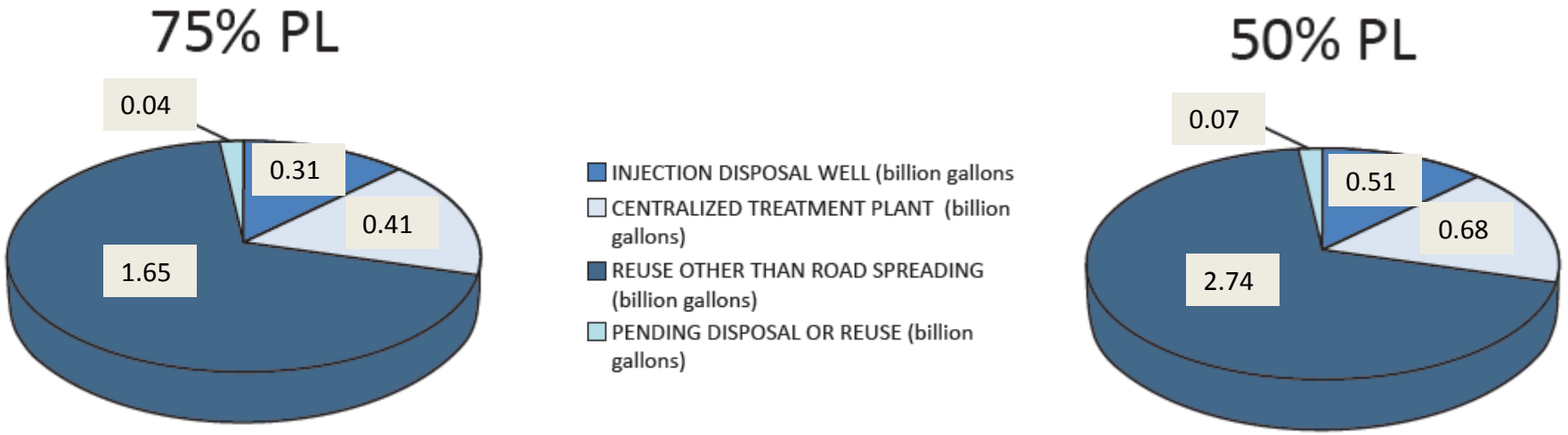
- Model calibration using actual waste data for 2010 through 2012 suggests that under an aggressive development schedule (3,000 wells per year) peak waste water generation could occur by 2034 and would likely fall between 2.2 and 3.6 billion gallons of produced fluid per year
- This is well under the demand for hydraulic fracturing base fluids



Emerging Issues

Long Term Waste Management Planning

- If 2013 trends continue, approximate stabilized waste stream volumes for 2034 can be estimated
- To accommodate all of this waste in Pennsylvania, approximately 22 to 36 Class IID wells would need to active and operating at full capacity that year



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Questions?

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