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UIC Presentation  
(Movie) with  
Bill Decker



**Environmental Research  
& Education Foundation**  
*Lighting a path to sustainable waste management practices*





# Environmental Research & Education Foundation (EREF) Webinar

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Waste Industry

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Geologist/Engineering Geologist  
28 years Experience





# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## 1. Overview of Shale Gas with a Focus on Pennsylvania

## 2. Drilling Wastes, Wastewater (UIC) and State Regulations

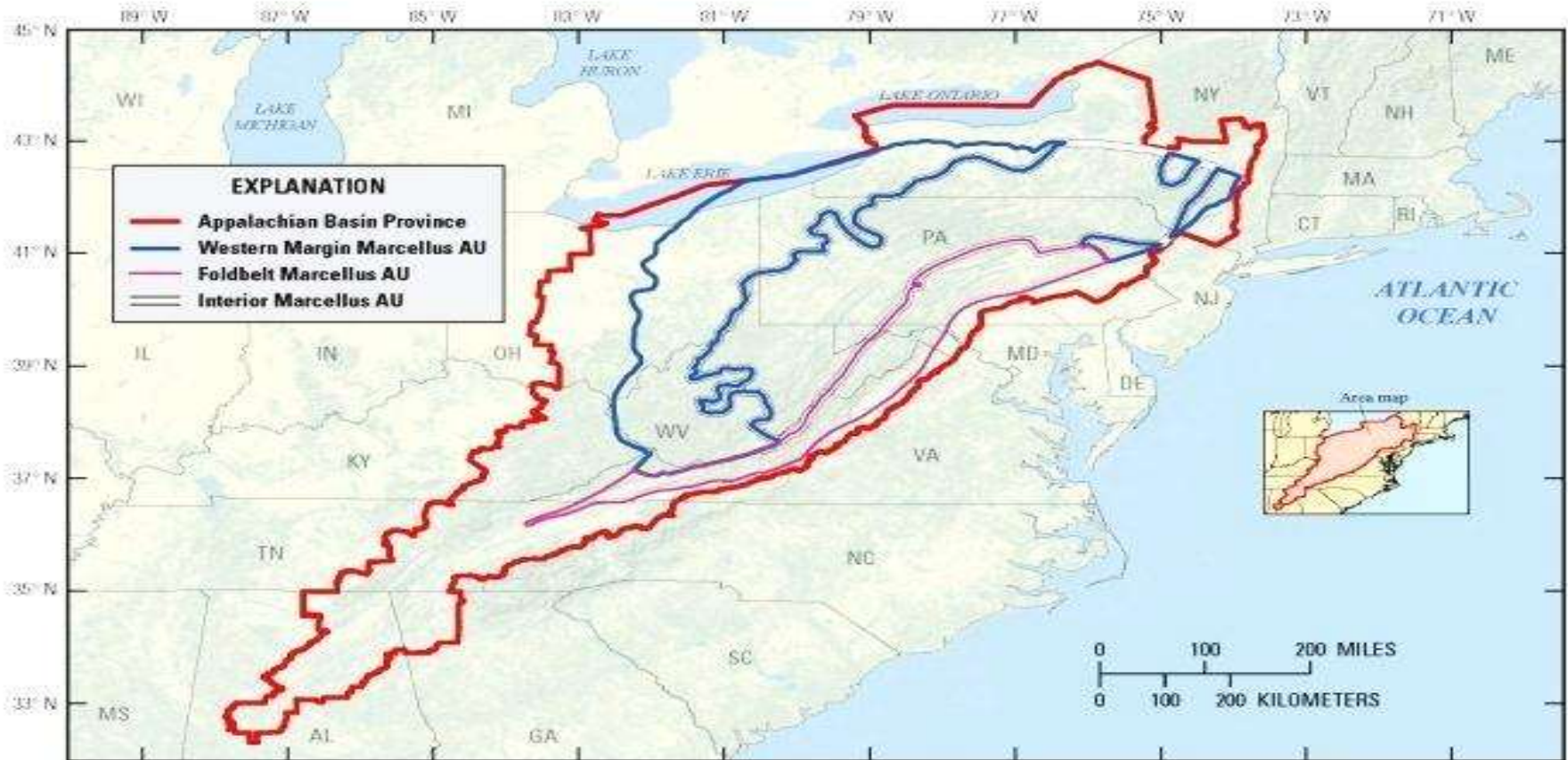
## 3. Waste Management Program



Reference: USGS, Assessment of Undiscovered Oil and Gas Resources of the Devonian Marcellus Shale of the Appalachian Basin Province, 2011



## 1. Overview of Shale Gas

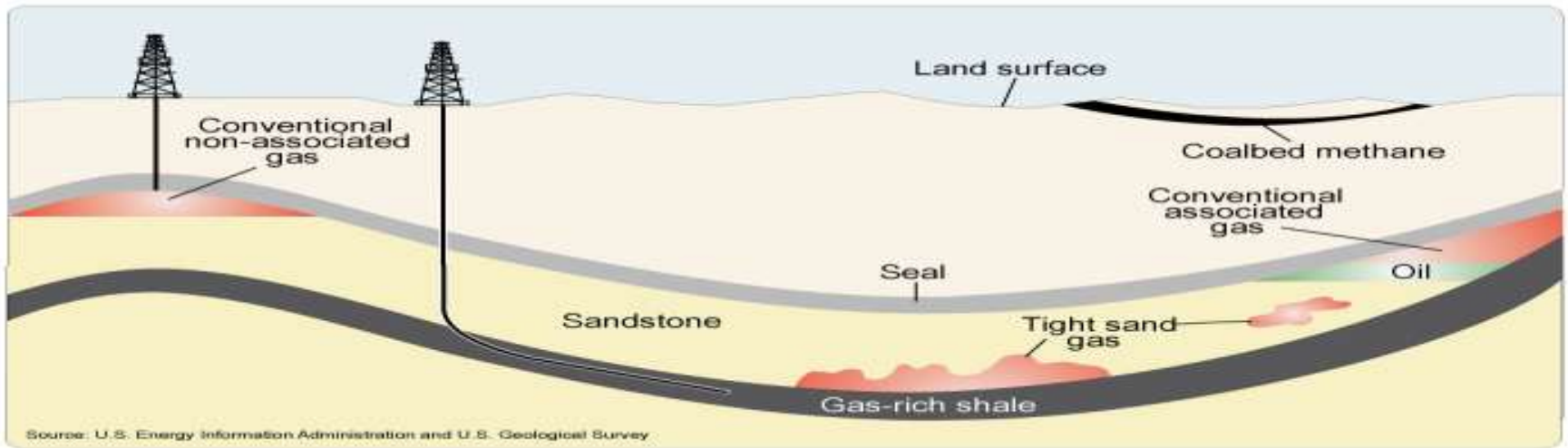




# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## What is unconventional gas?

	Coal	Oil	Natural Gas	Nuclear	Renewables
Type	Anthracite & Bituminous	Oil, shale oils, tar sands	Conventional & Unconventional		Solar, windmills, geothermal
Issues	Strip mines, black lung, acid mine drainage, mine fires, explosions, Sulfur air pollution, groundwater contamination, venting and flaring of gas	Explosions, Drill Cuttings, Lot of leftover drill holes in PA and cleanup, groundwater contamination, venting and flaring of gas	Groundwater contamination, Explosions, Drill cuttings and fracing fluids	Steam and Radioactive material leftover, Meltdown (China Syndrome)	To be identified





# What is natural and unconventional gas?



Gas is the stuff that is leftover!

Source: Internet



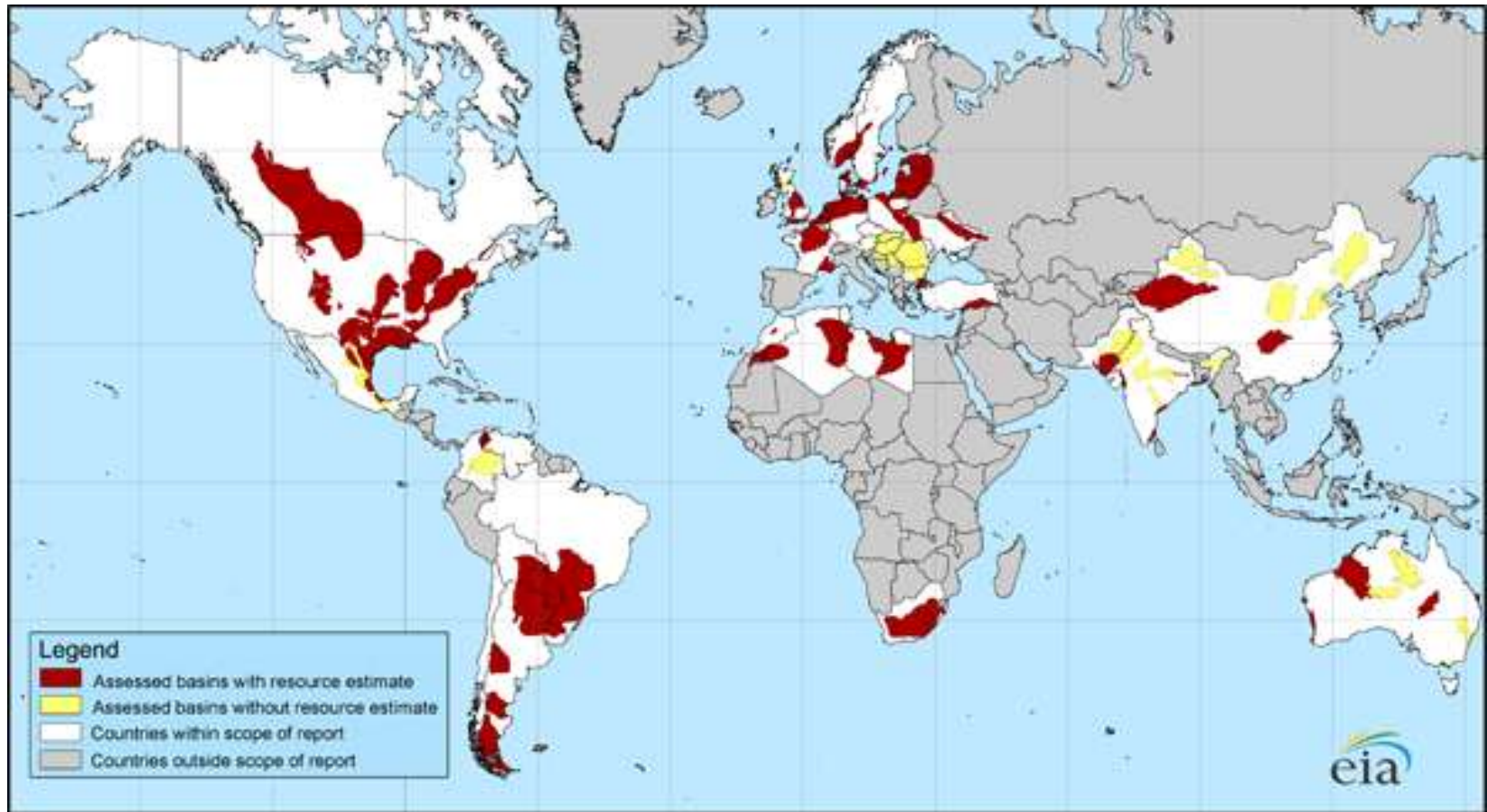
## What is natural and unconventional gas?



Natural Shale and Carbon Shale



# Where is the Gas?

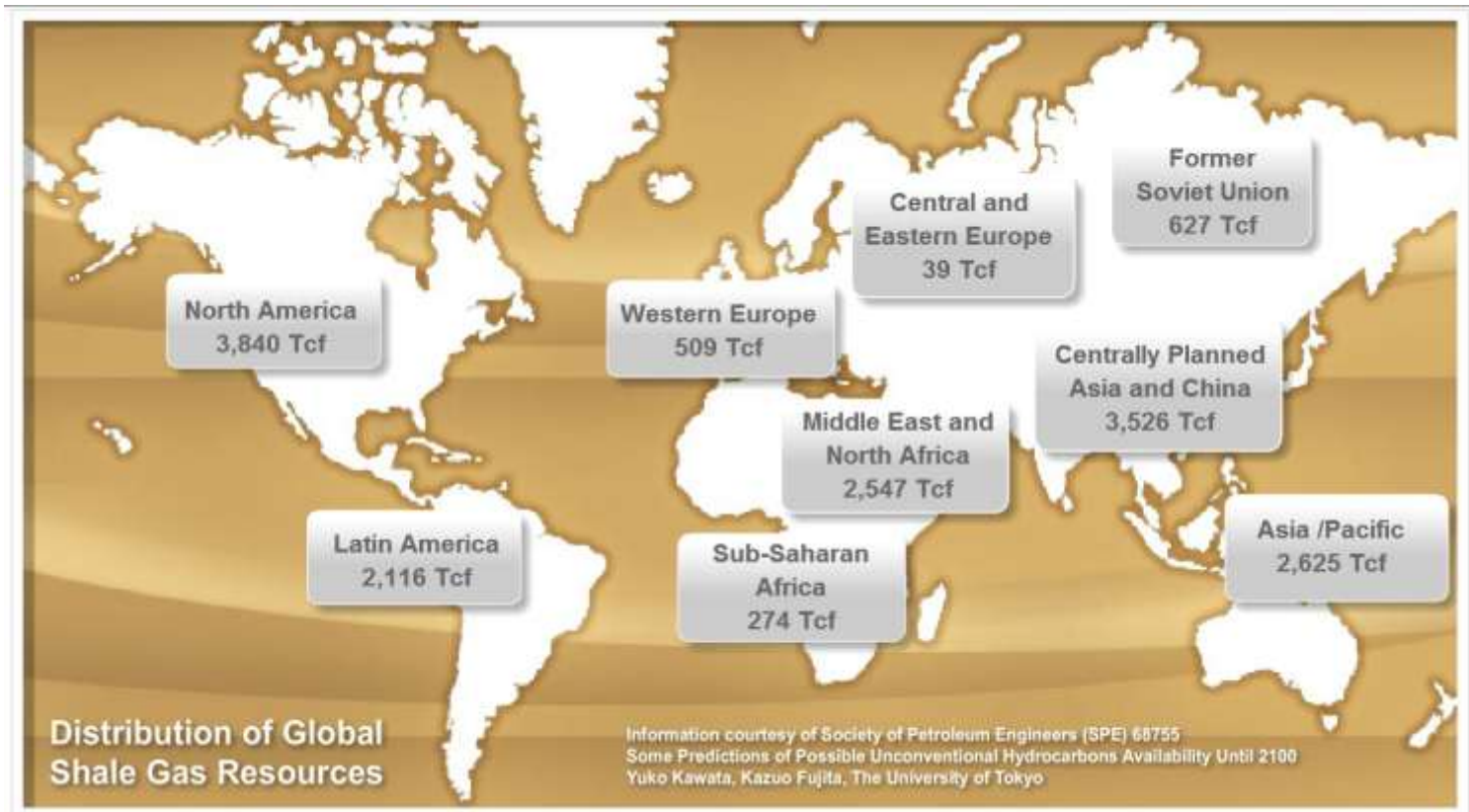






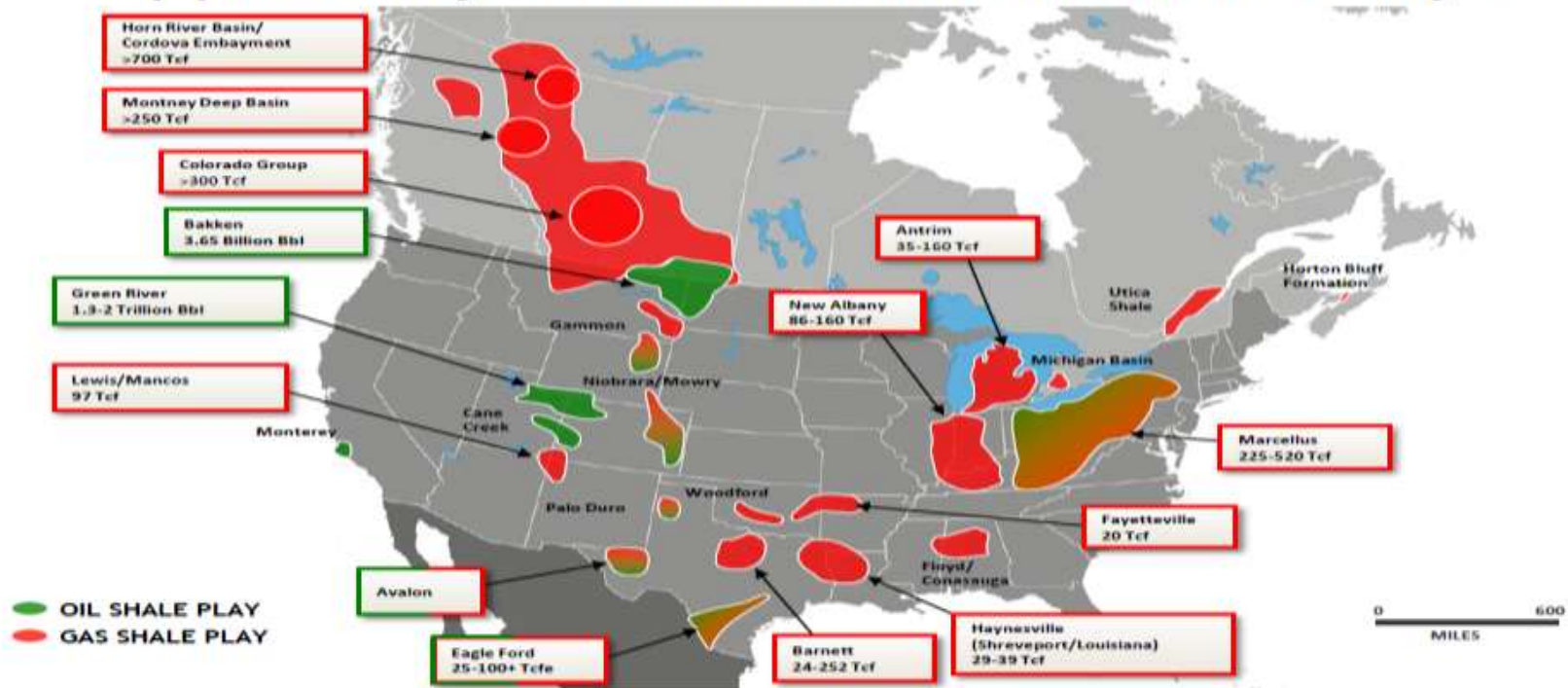
# Environmental Research & Education Foundation (EREF) Webinar

## How much gas is there?



# How much gas is there?

## Opportunity: North American Shale Plays



~2300 TCF (85% Shale Gas)

“100 years of Natural Gas” U.S. Consumption 23 TCF/y

Source: U.S. Energy Information Administration based on data from various published studies.

What can we use the gas for?

- HOME HEATING
- POWER INDUSTRY ... clean burning
- PLASTICS ... polyethylene
- FUEL FOR VEHICLES



Source: Internet



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- UPS - over 900 CNG vehicles
- Waste Management - 1000 trucks 50 fueling stations
- Republic Waste - 226 trucks and fueling stations



Clean Burning Compressed Natural Gas is becoming a larger part of our transportation systems



Sources :  
<http://www.environmentalleader.com/2010/01/20/ups-adds-245-green-cng-trucks/>  
<http://www.chron.com/business/article/The-cargo-is-still-garbage-but-the-fuel-is-3550278.php>  
<http://www.environmentalleader.com/2010/04/05/republic-services-adds-226-natural-gas-trucks/>



# What makes unconventional gas viable?

## Economics

\$100+ /barrel of crude

\$3.50+/gallon at the pump



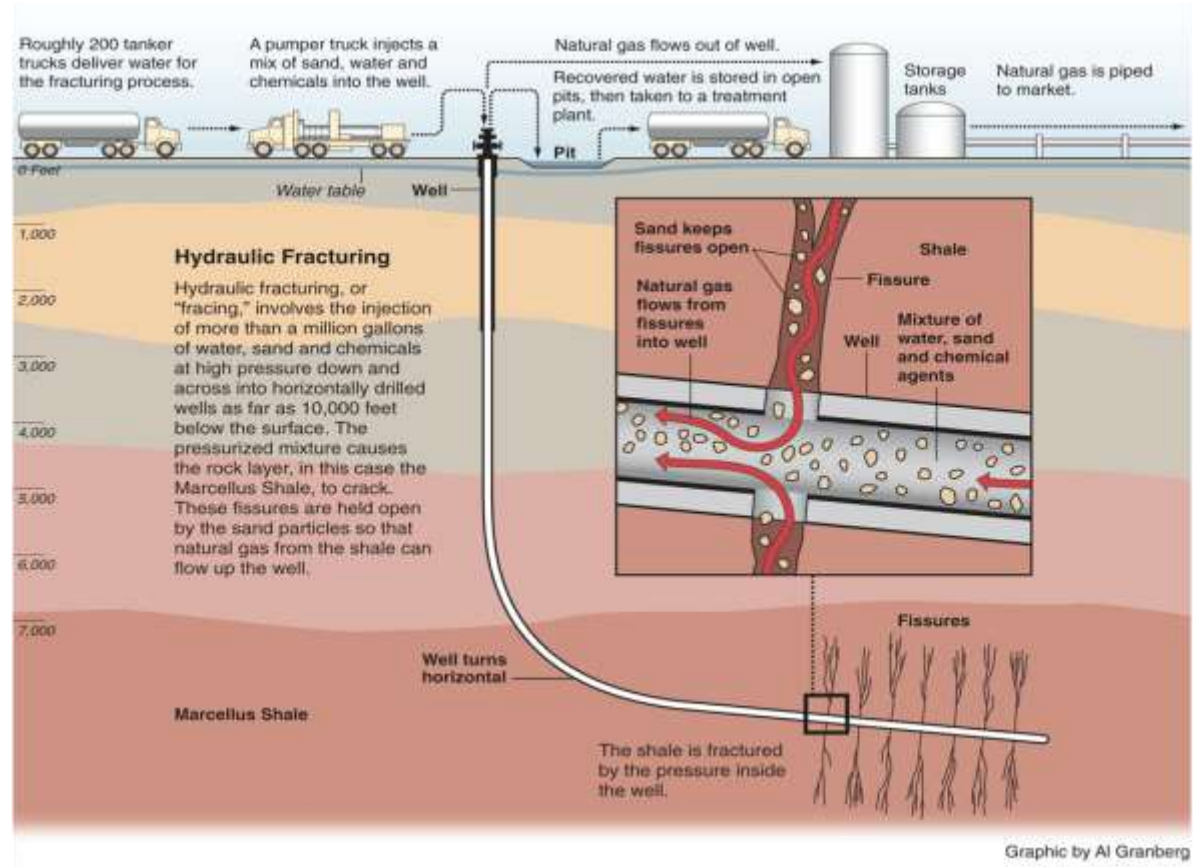
Source: Internet



## What makes unconventional gas viable?

### Fracing

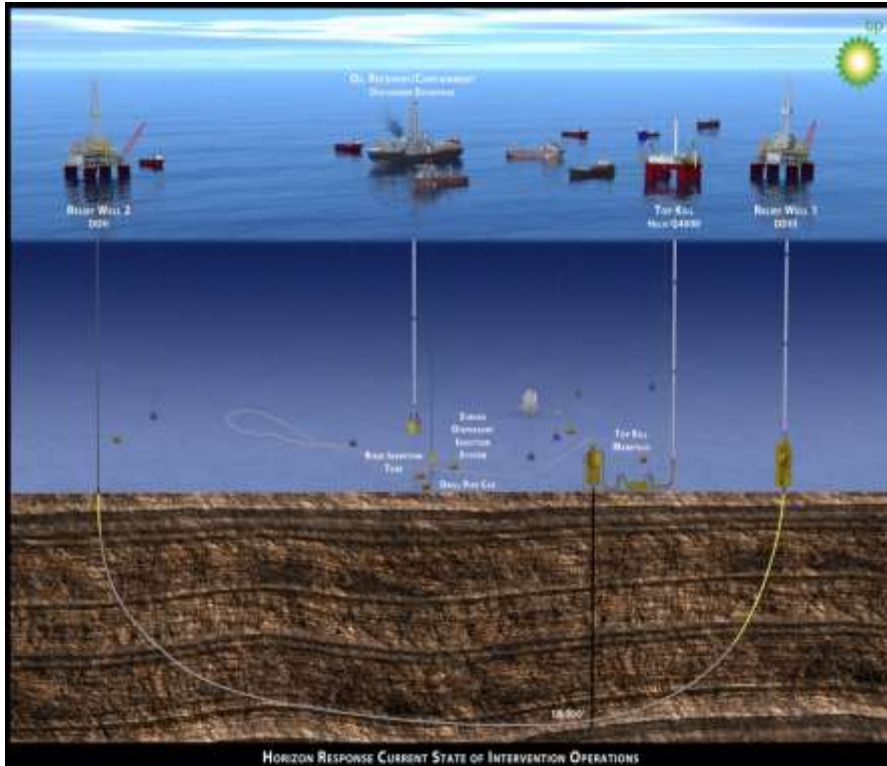
- Hydrofracing ... blasting shale since 50 years
- Fracing used to enhance groundwater regime at landfills
- Each Shale gas well is developed by fracing and utilizes 3 to 4 million gallons of water per well.





## What makes unconventional gas viable?

### Directional Drilling



Gulf of Mexico BP Well 252

### Appalachian Basin Gas Drilling

- There are 5 to 7 wells per one drill pad.
- Up to 1200 tons of drillings per pad
- Up to 11,000 feet deep
- Drilling through many geologic formations
- Vertical and Horizontal Directional Drilling



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## Pennsylvania has been in the heart of our Energy

### Production



Western Pennsylvania Shallow Gas Production



Pennsylvania was once first in Coal production

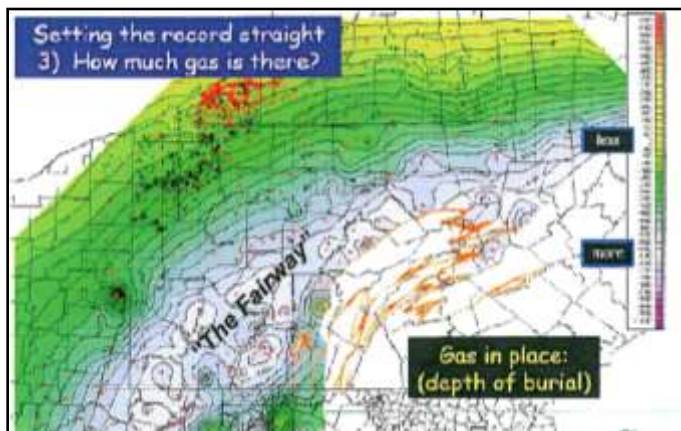
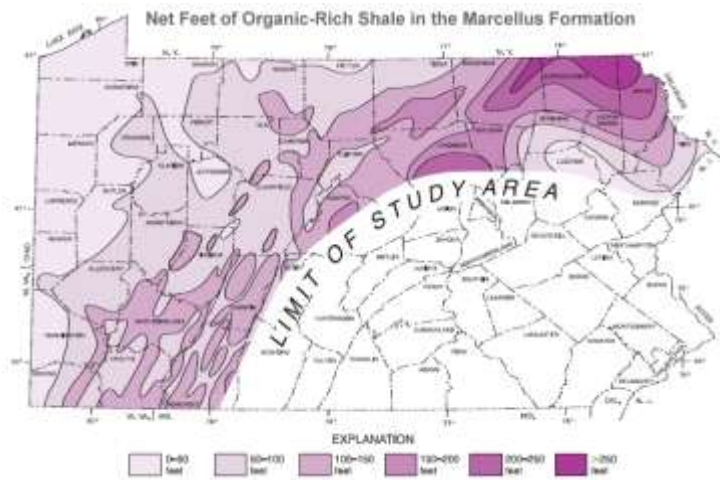


1857 First Oil Well In Pennsylvania

Source: Internet



# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”



## Pennsylvania Shale gas facts:

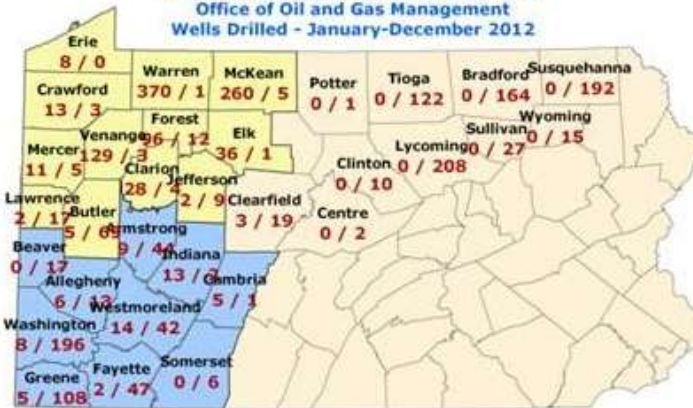
- Under 34 Million Acres of land
- 50 to 586 Trillion CF of gas Marcellus with current estimates of 84 trillion CF Marcellus and Utica 38 Trillion CF gas and 940 million barrels of oil
- Use hydrofracing (fracing) process for gas removal ... Fracing technology since 1940
- Depths to 11,000 feet in Utica formation
- Disposal of Waste drillings covered under PADEP Title 25 regulations

Source: <http://geology.com/articles/marcellus-shale.shtml>

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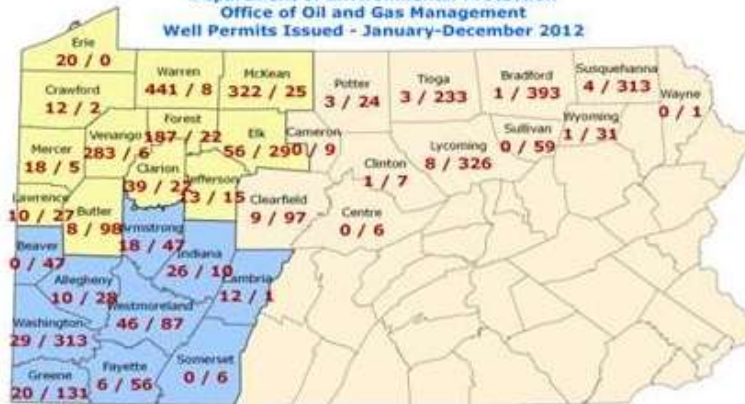


Department of Environmental Protection  
Office of Oil and Gas Management  
Wells Drilled - January-December 2012



(Conventional) - 1025 + (Unconventional) - 1365 = Total - 2390 Updated 01/04/2

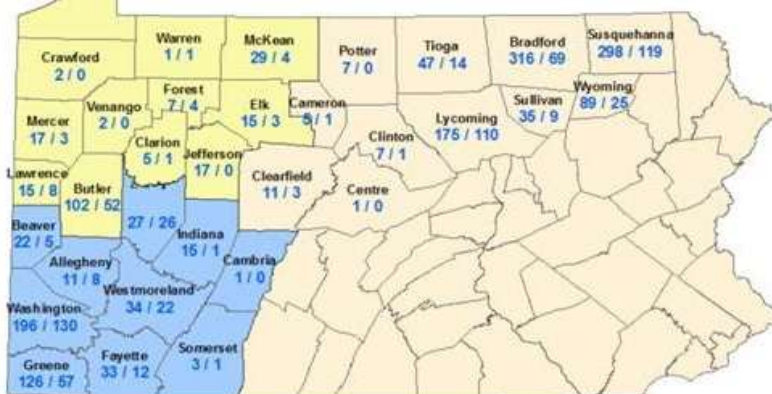
Department of Environmental Protection  
Office of Oil and Gas Management  
Well Permits Issued - January-December 2012



Conventional - 1606 + Unconventional - 2484 = Total - 4090 Updated 01/09/2013

In Pennsylvania in 2012 there were 1365 Shale wells drilled and 2484 permits issued ... 1 year

Department of Environmental Protection  
Office of Oil and Gas Management  
Unconventional Well Permits Issued and Wells Drilled  
January - July 2013



Unconventional Permits Issued - 1671 Unconventional Wells Drilled - 689 Updated 08/16/2013

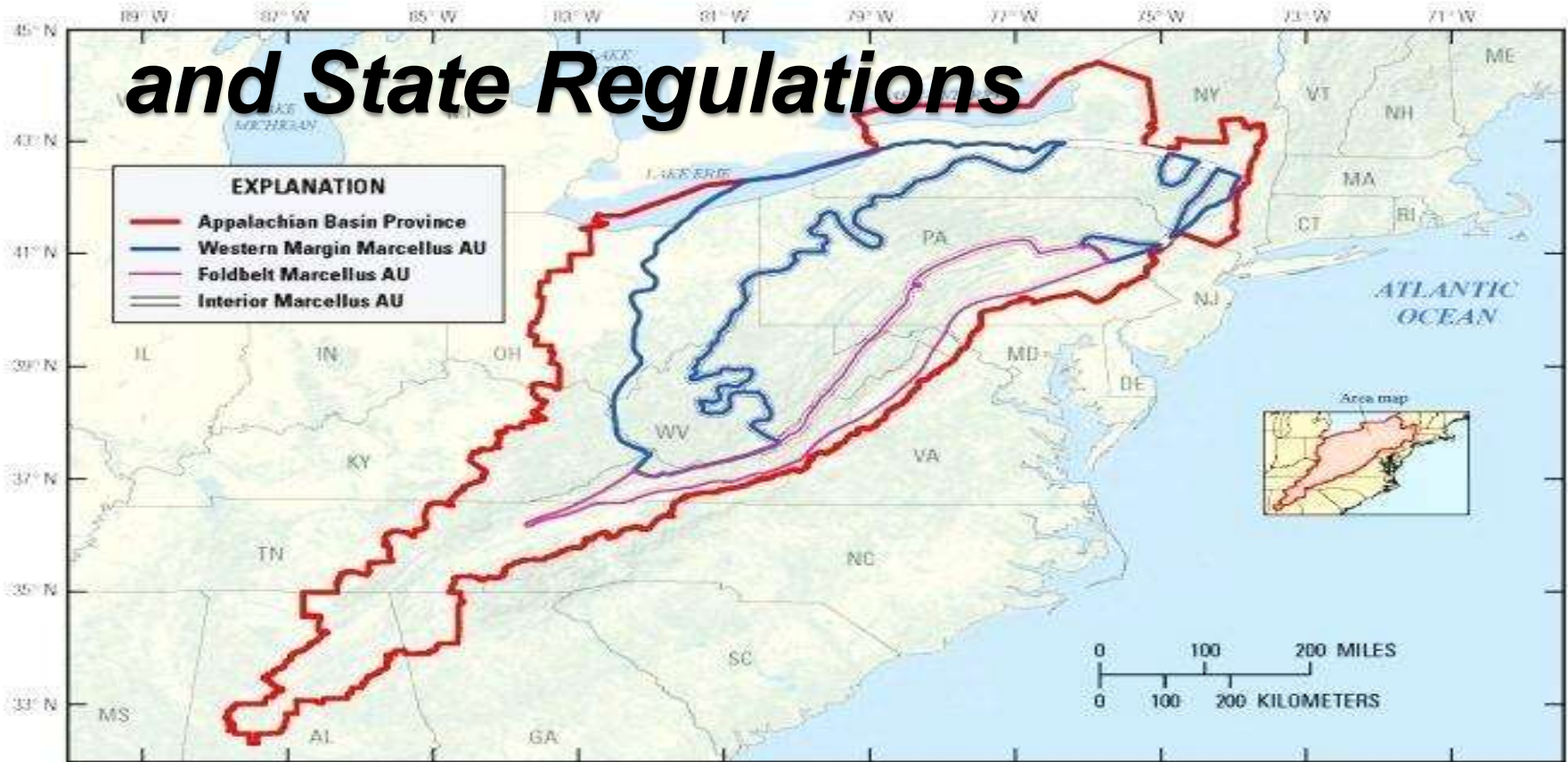
In Pennsylvania in 2013 there were 689 Shale wells drilled and 1671 permits issued ... 6 mos.

Over 350,000 oil and gas wells have been drilled in PA

Source: [http://www.portal.state.pa.us/portal/server.pt/community/marcellus\\_shale/20296](http://www.portal.state.pa.us/portal/server.pt/community/marcellus_shale/20296)



## 2. Drilling Wastes, Wastewater (UIC) and State Regulations

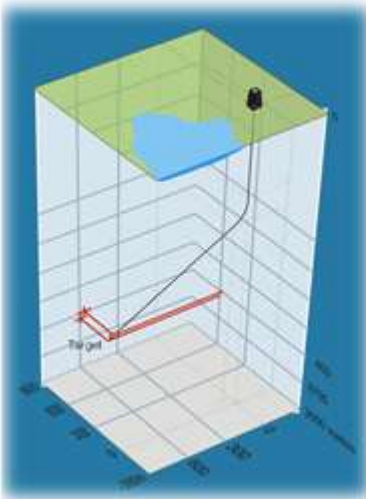




## Drilling Wastes ... *Drill Cuttings*

Analytical Results ... vary greatly but are consistent with vertical or top-hole drillings. Horizontal portion of the wells generally have constituents that need to be landfilled.

Physical properties of top-hole (vertical) drill cuttings include high moisture content but only 11.5% to 15.9% fines (passing the #200 sieve)



Source: Confidential Client



## EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”



### Laboratory testing results

#### Grain size classifications include:

- SW - Well-graded sands, gravelly sands, little or no fines
- SM - Silty sands, sand-silt mixtures
- SP-SM - Poorly graded sands, gravelly sands, little or no fines to silty sands, sand-silt mixtures

Internal Friction Angles 36.5 and 37.8 degrees.

**Conclusion:** This shows that there is a potential for reuse in construction material applications after dewatering.

Source: Confidential Client

## Underground Injection Control (UIC) wells of Shale Wastewater

This has been a hot topic in Pennsylvania as each well develops approximately 1 million gallons of fracing water that is to be treated and/or reused.

- Prevalent in Ohio and other States
- Not prevalent in Pennsylvania





## UIC Overview



### UIC Purpose:

Manage ‘flowback’ or produced water from gas and oil production

### UIC Elements:

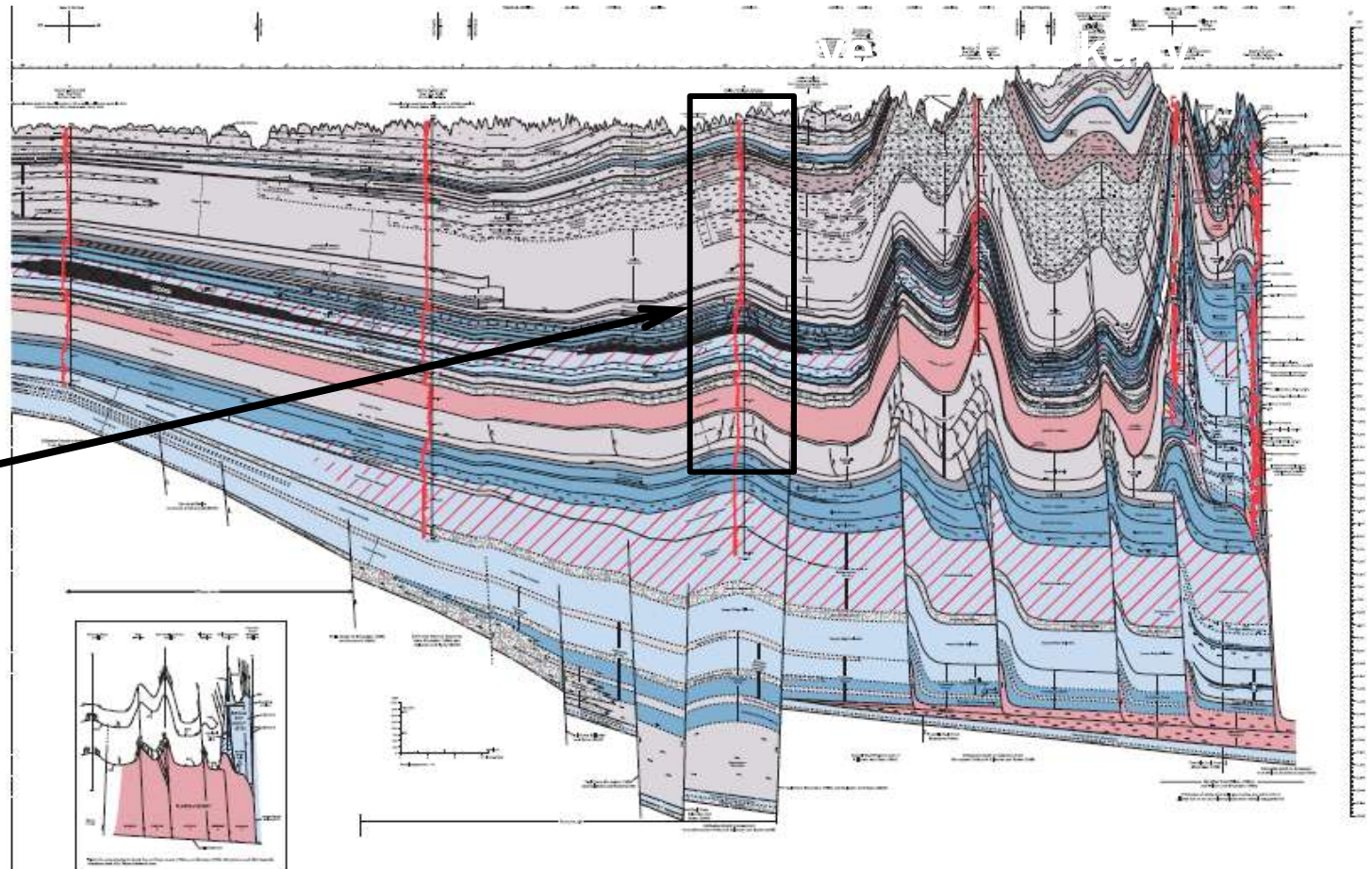
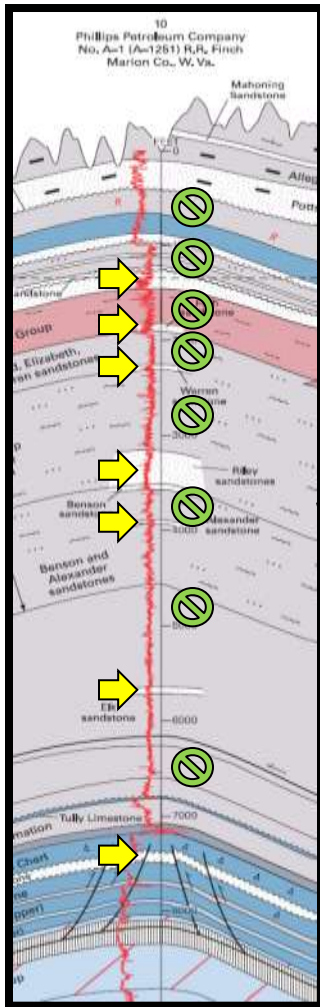
- Injection well infrastructure
- Suitable injection target formation
- Confining layers that serve to contain injected fluids

### Successful UIC Installation:

- Protects public, environment and drinking water resources
- Has the capacity to handle economically feasible volumes of flowback / produced waters
- Meets regulatory requirements



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# Underground Injection Control Wells (Movie)



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## Waste Disposal is being overshadowed by:

- Frac water needs (SRBC & DRBC Watersheds)
- Waste Water issues (Reuse or treat and discharge)
- Infrastructure issues (Roads, Site Planning, Transportation etc.)



**PADEP: “Pursuant to the Solid Waste Management Act, 35 P.S. § § 6018.101 - 6018.1003 gas well fracturing fluids are considered residual waste and must be managed in accordance with applicable laws.”**

208 West Third Street, Suite 101  
 Williamsport, PA 17701-6448  
 December 7, 2009

Northcentral Regional Office

570-327-3740  
 Fax: 570-327-3420

Residual Waste Transporters

Re: Waste Gas Well Fracturing Fluids Waste Transportation Vehicle Inspections

Dear Waste Transporter:

The Department of Environmental Protection (Department) is providing you with information concerning the inspection of waste transportation vehicles that transport gas well fracturing fluids in Pennsylvania to any storage, processing or disposal area or other well site for reuse. Pursuant to the Solid Waste Management Act, 35 P.S. § § 6018.101 - 6018.1003 gas well fracturing fluids are considered residual waste and must be managed in accordance with applicable laws.

The Department will be conducting inspections jointly with the Motor Carrier Safety Awareness Program (MCSAP) team comprised of the Pennsylvania State Police and Penn DOT. Violations that are found during these inspections are subject to civil penalties, with each violation being a separate offense.

I wish to advise you, or the company you are employed by, that the following requirements must be met if you transport gas well fracturing fluids in Pennsylvania.



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## Pennsylvania Waste Regulations

1. Drilling Wastes can be disposed of at the well site under PADEP Title 25, Part 1, Subpart C, Article I, Chapter 78 (Oil and Gas Wells) ... § 78.61, 62, 63 and 83

Allow for drill cuttings to be disposed of:

- At the well drilling site
- By Pit disposal method
- By Land application method
- With Free liquids removed
- Drillings are not contaminated
- Offset Buffer criteria applies
- If classified as residual waste, may dispose of drill cuttings in a onsite lined pit or land applied into the top six inches of topsoil

2. Drilling Waste can be disposed at an offsite landfill permitted under Title 25, Part 1, Subpart C, Article VIII, Chapters 271 to 273 as a Municipal Landfill as a Special Waste or under Title 25, Part 1, Subpart C, Article IX, Chapters 287 to 289 as a Residual Waste Landfill as a residual waste.

3. Drilling waste can be applied to be used a beneficial waste under a PADEP General Permit Title 25 § 271.821 and § 287.621





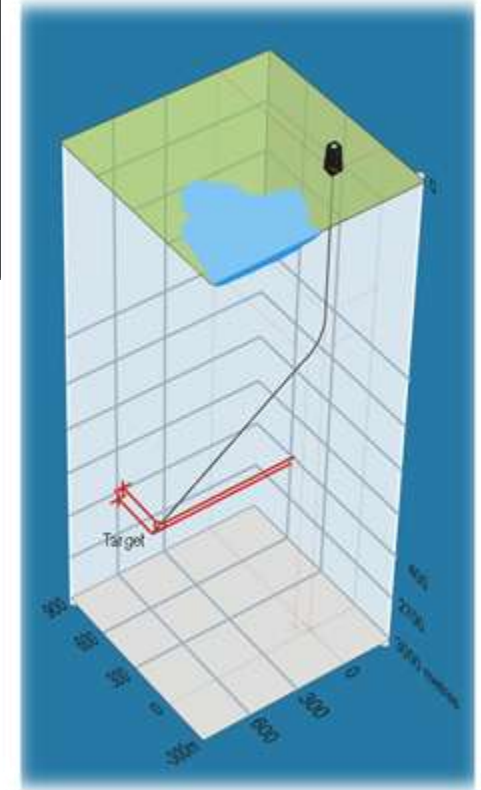
# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## Radiation from Drill Cuttings



Every landfill now has their own radiation detectors that every load has to pass through. The radiation detectors are very sensitive and may be set off by things like the truck driver who has had a medical procedure. Usually, the particles in the load are small and may be the size of a sand grain but this may be different as we are looking at a potential layer of earthen material.

Generally, a contaminated load that has set off the detector is not sent to the landfill but is put in a “time out “ pen or fenced in area until someone can determine what to do with the load. A load will be excavated for the contaminated particles at the landfill or other area, looking for the radioactive particles with a handheld wand. The radioactive material is isolated and goes to a hazardous waste site like Model City and the rest of the load is cleared for landfilling.



Examples of **waste containing radioactive material may include solid waste from naturally occurring radioactive material in soil and rocks,** All radioactive material that is accepted by the solid waste facility for disposal must be managed according to specific DEP regulations.



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## One-Stop-Shop Pennsylvania Regulations

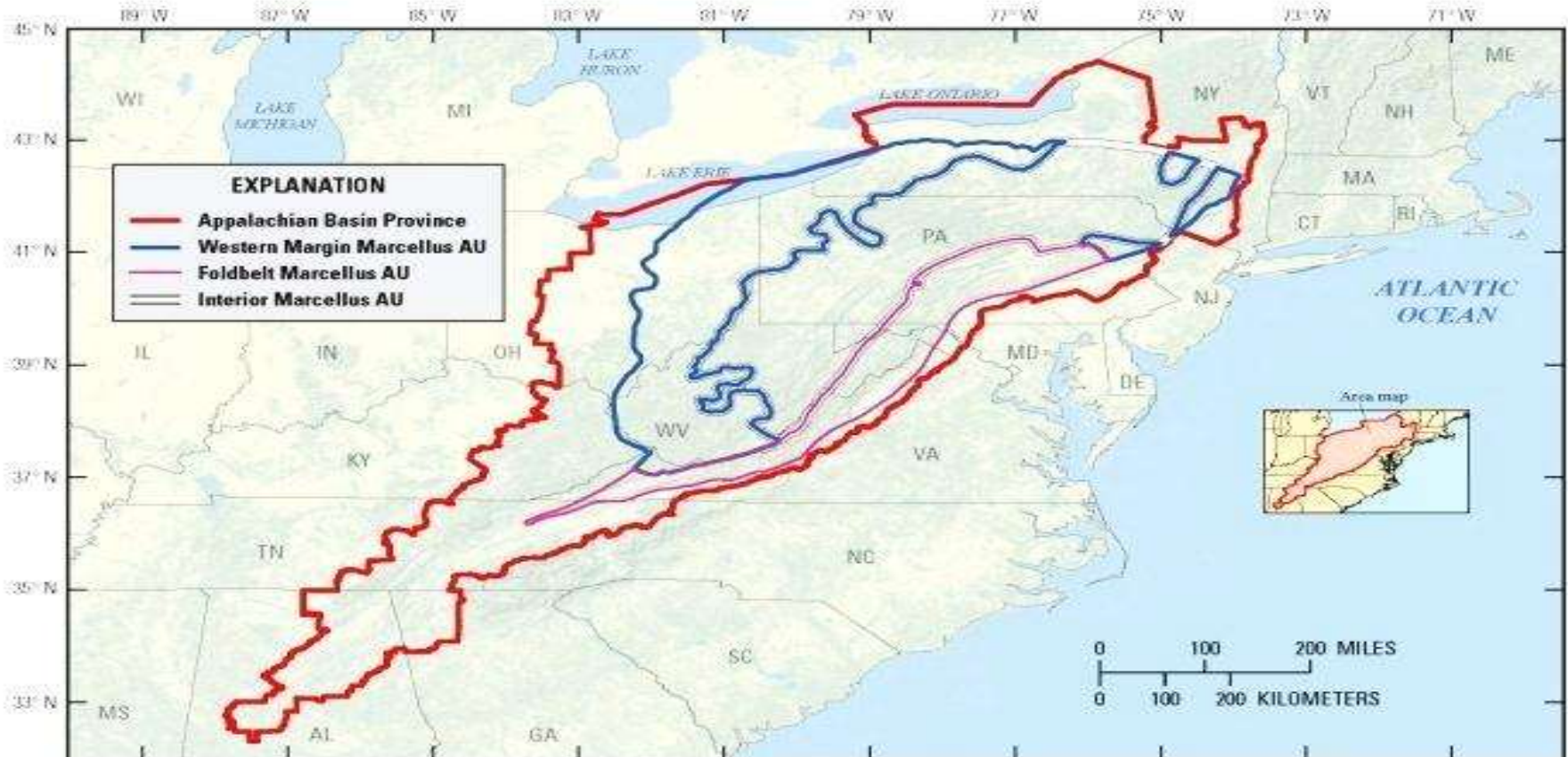


PADEP  
Chapter § 287.132

EPA Method  
9095, The Paint  
Filter Test



## 3. Waste Management Program



Reference: USGS, Assessment of Undiscovered Oil and Gas Resources of the Devonian Marcellus Shale of the Appalachian Basin Province, 2011



## Processes Generating Wastes & Recyclables

1. GAS WELL PAD



2. COMPRESSOR STATIONS



3. METERING STATIONS



4. PIPELINE CONSTRUCTION





## GAS WELL PAD WASTE STREAMS

1. Drilling wastes
2. Well completion wastes
3. Production well wastes







# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## GAS WELL PAD WASTE STREAMS

- **Air Drill Cuttings**  
(Includes drill cuttings, tank cleanouts, and low gravity solids.)
- **Water-based Mud Drill Cuttings**  
(Includes drill cuttings, tank cleanouts, and low gravity solids.)
- **Oil-based Mud Drill Cuttings**  
(Includes drill cuttings, tank cleanouts, and low gravity solids.)
- Cement Returns
- Generated Municipal Waste  
(Includes office and lunchroom waste and refuse, with no oil filters, oily rags or residues.)
- Secondary Containment Water  
(Clean rainwater – sampling and analysis dependent on disposal options.)
- Boiler Water Blowdown
- HDPE Liner  
(Includes all geosynthetics used for secondary containment.)
- Clean Liner Sand  
(Sand associated with HDPE liner and secondary containment on a site that did not experience any spills)
- Potentially Impacted Liner Sand  
(Sand associated with HDPE liner and secondary containment on a site that did experience a spill.)
- Grey Water  
(Includes sewage and septic wastes.)
- Contractor Generated Municipal Waste  
(Includes office and lunchroom waste with no oil filters, oily rags, or residues.)
- Contractor Generated Residual Waste  
(Includes refuse, oil filters, and oily rags.)
- Contractor-Generated Waste Oil
- Spill Cleanup Waste Material  
(Includes soil, liner sand, water, or absorbent material impacted with glycols, boiler blowdown water, oil, waste oil, or fuel oil.)
- Other Spill Residues  
(Includes soil, liner sand, water, or absorbent material impacted with any other chemical compound used onsite.)
- Flowback Sand & Sludge
- **Flowback Water**  
(for reuse in fracing)
- Produced Water  
(to be recycled)

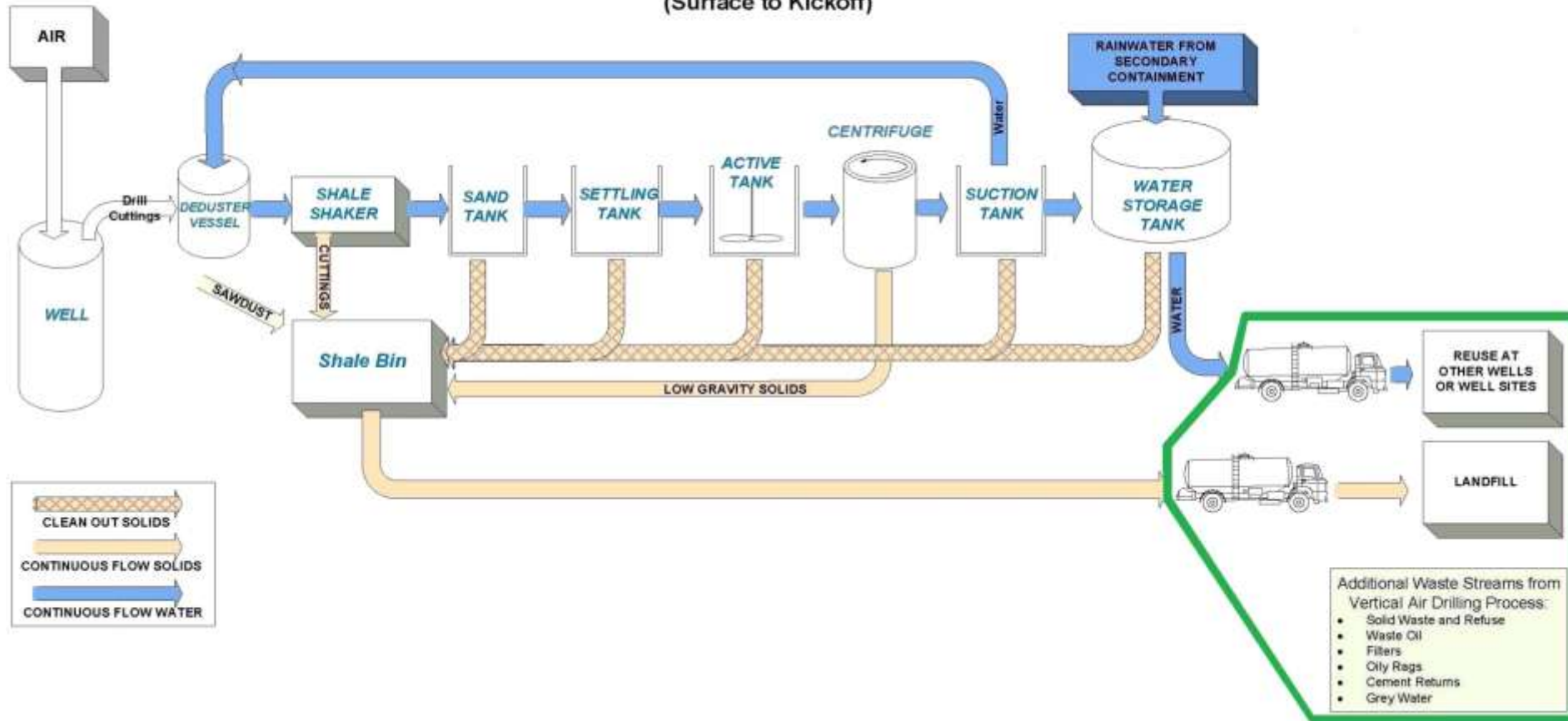




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## AIR DRILLING WASTE DIAGRAM

(Surface to Kickoff)



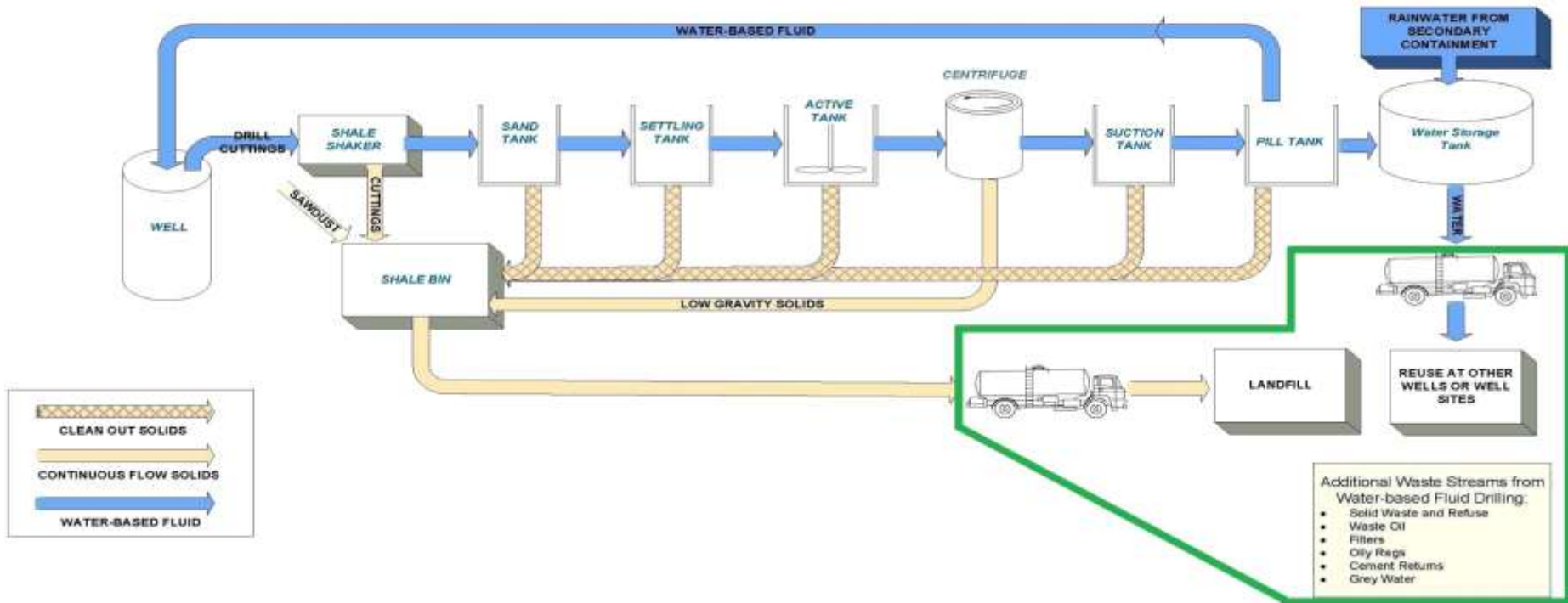


# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## 1. Gas Well Pad Drilling Waste Streams

WATER-BASED FLUID DRILLING WASTE DIAGRAM

(Surface to Kickoff)



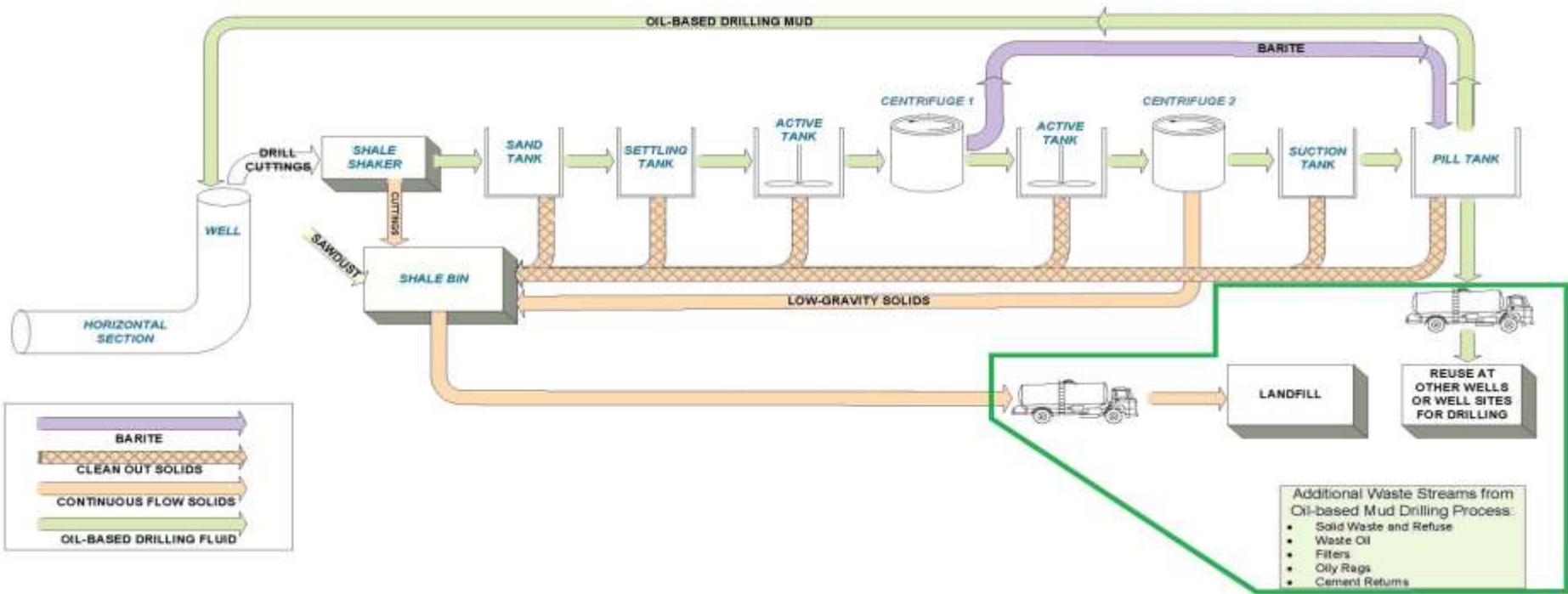


# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## 1. Gas Well Pad Drilling Waste Streams

OIL-BASED MUD DRILLING WASTE DIAGRAM

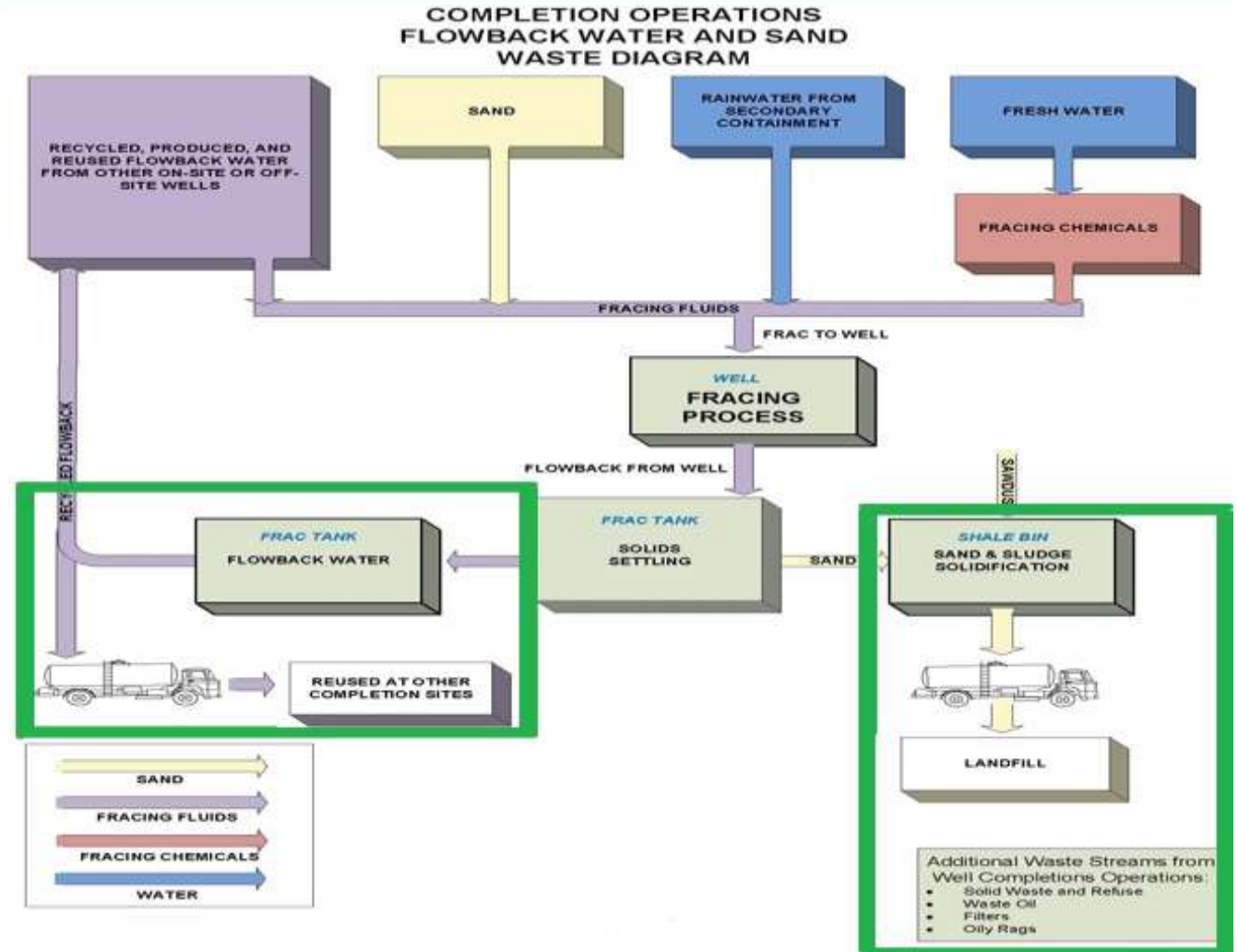
(Kickoff to Total Depth)





# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## 2. Well Completion Wastes Streams

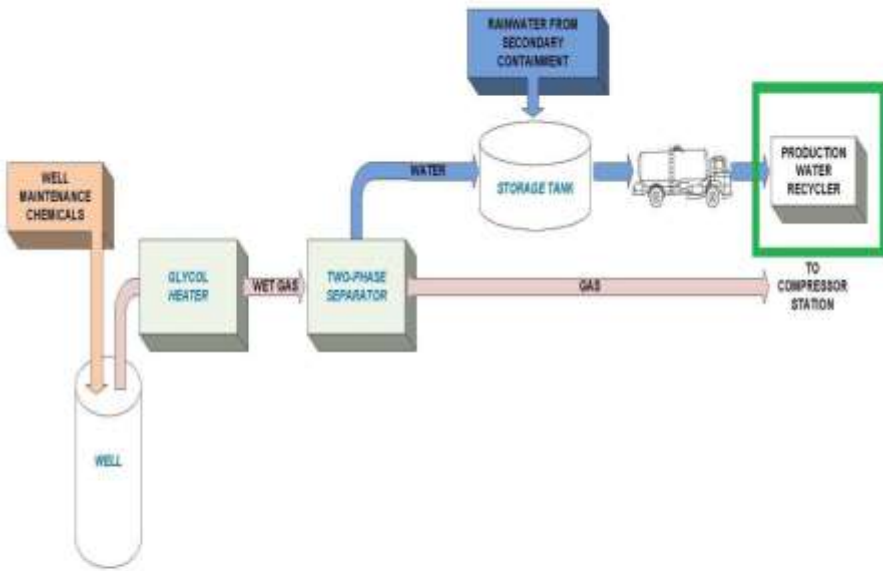




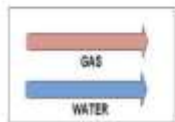
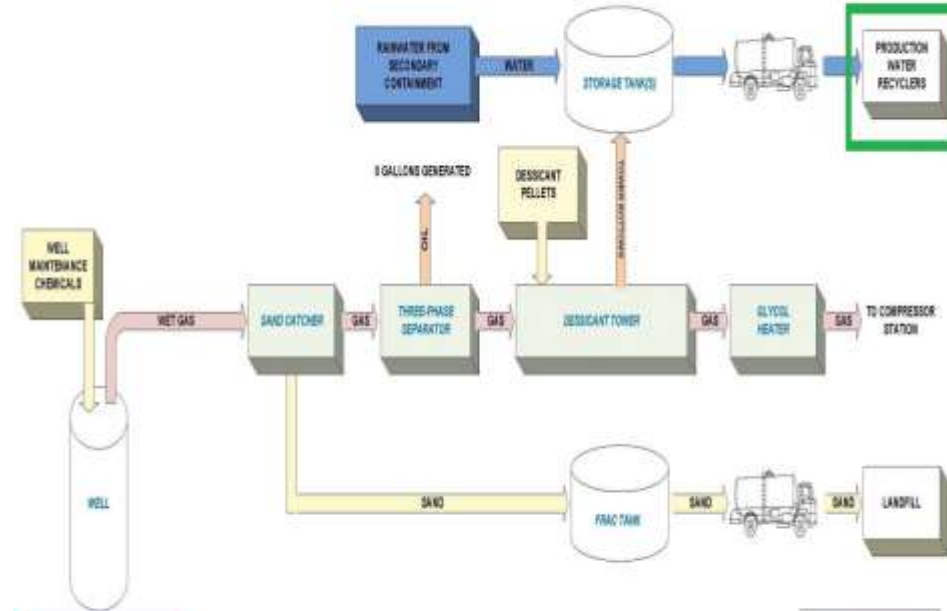
# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## 3. Production Well Wastes Streams

LOW PRESSURE PRODUCTION WELL WASTE DIAGRAM



HIGH PRESSURE PRODUCTION WELL WASTE DIAGRAM

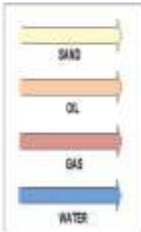


Additional Waste Streams from Low Pressure Production Wells:

- Solid Waste and Refuse
- Waste Oil
- Filters
- City Rags

Additional Waste Streams from Production Well Process:

- Solid Waste and Refuse
- Waste Oil
- Filters
- City Rags



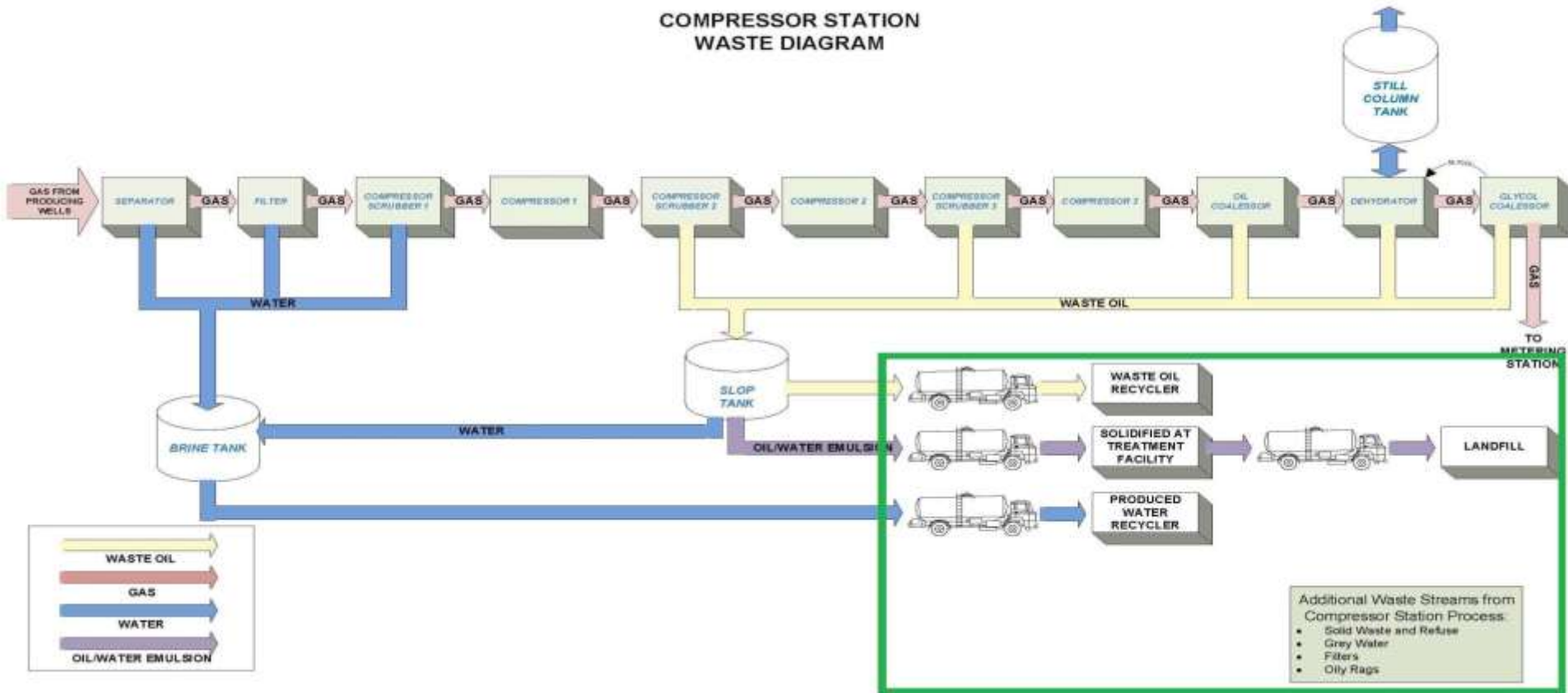
## COMPRESSOR STATION WASTE STREAMS



- Produced Water  
(to be recycled)
- Slop Tank Oil/Water Emulsion
- Waste Oil  
(Waste oil from compressors and engines.)
- Secondary Containment Water  
(Clean rainwater – sampling and analysis dependent on disposal options.)
- Generated Residual Waste  
(Includes plant waste, maintenance waste, filters, and oily rags.)
- Grey Water  
(Includes sewage and septic wastes).
- Spill Cleanup Waste Material  
(Includes soil, water, and absorbent material impacted with produced water, glycols, oil, waste oil, or fuel oil.)
- Other Spill Residues and Impacted Soil  
(Spills from any other chemical compound used onsite.)

# COMPRESSOR STATION WASTE STREAMS

COMPRESSOR STATION WASTE DIAGRAM







# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## METERING STATION WASTES



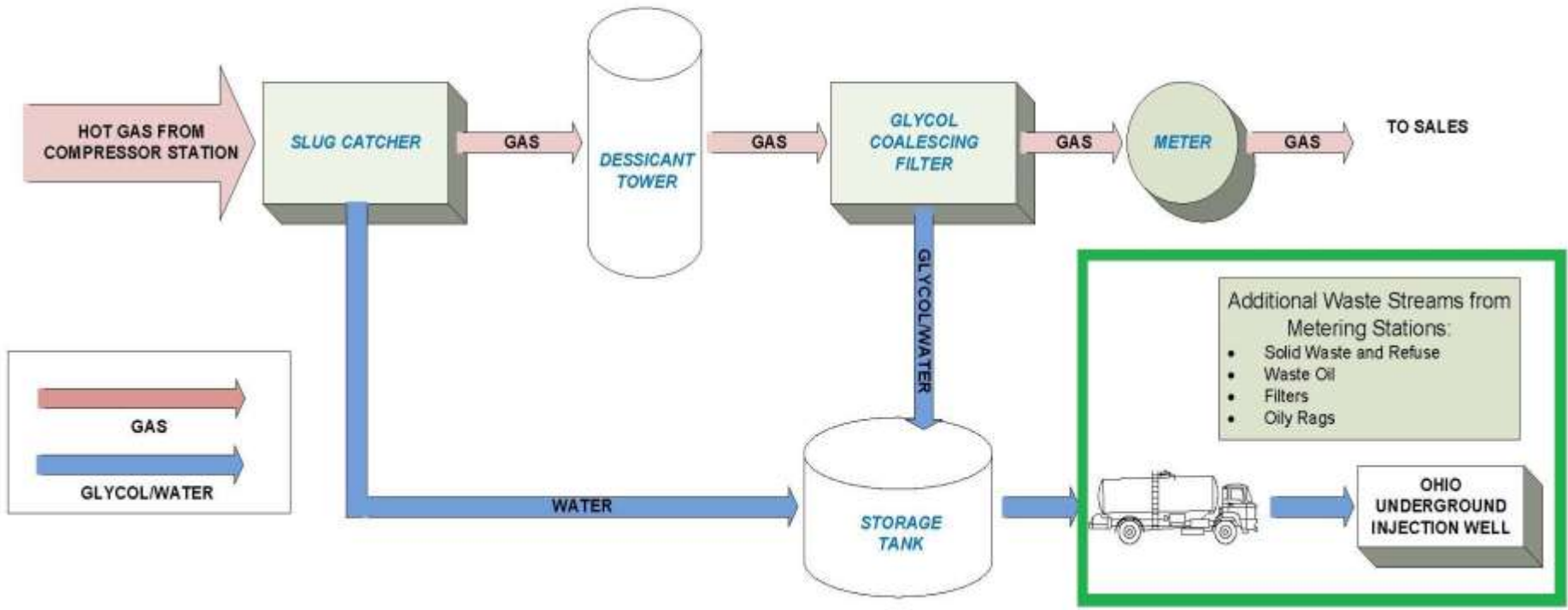
Reference Website: <http://www.diamondkey.com/docs/TAS-009-AN-01.pdf>

- Generated Residual Waste  
(Includes plant waste, maintenance waste, filters, and oily rags.)
- Secondary Containment Water (Clean rainwater – sampling and analysis dependent on disposal options.)
- Grey Water  
(Includes sewage and septic wastes.)
- Spill Cleanup Waste Material  
(Includes soil, water, and absorbent material impacted with glycols, oil, waste oil, or fuel oil.)
- Other Spill Residues and Impacted Soil  
(Spills from any other chemical compound used onsite.)



## METERING STATION WASTE STREAMS

METER STATION  
WASTE DIAGRAM



## PIPELINE CONSTRUCTION & HORIZONTAL DIRECTIONAL DRILLING WASTE STREAMS

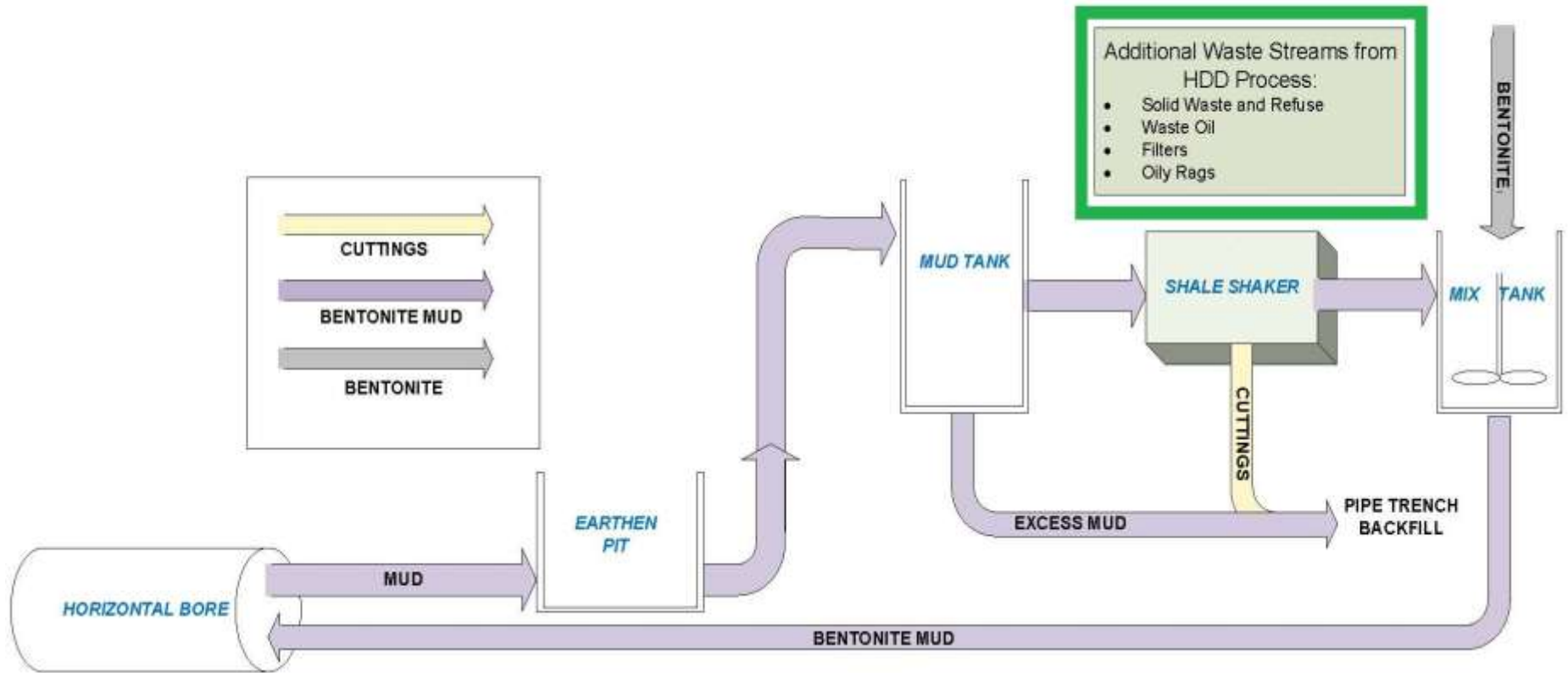


- Drill Cuttings
- Drilling Mud
- Contractor-Generated Waste Oil
- Contractor Generated Residual Waste (Includes filters and oily rags.)
- Contractor Generated Municipal Waste (Includes office and lunchroom waste with no oil filters, oily rags or residues.) Municipal Waste such as office refuse and lunch room waste are not Pennsylvania residual wastes.
- Grey Water (Includes sewage and septic wastes.) This is not a RCRA or Pennsylvania Hazardous Waste or a Pennsylvania Residual Waste. There is no Pennsylvania RWC number.
- Spill Cleanup Waste Material (Includes soil, water, and absorbent material impacted with oil, waste oil, or fuel oil.)
- Other Spill Residues and Impacted Soil (Spills from any other chemical compound used onsite.)



## PIPELINE CONSTRUCTION

### PIPELINE HORIZONTAL DIRECTIONAL DRILLING DIAGRAM





# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## Pennsylvania Waste Management Guide

Date

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# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”

## Glossary of Terms



Term	Definition
Air Drilling	Drilling method that uses compressed air to remove drill cuttings and top hole water.
Cement Returns	Waste cement that returns to the surface during well case cementing operations.
Centrifuge	Equipment that uses centrifugal force to separate drill cuttings and fines from water-based and oil-based drilling mud.
Coalescor	Equipment used to separate oil from water that is in an emulsion.
De-duster Vessel	Equipment used in air drilling process to prevent dust generation at the surface.
Dehydrator	Equipment used to reduce the water vapour concentration in gas.
Desiccant Pellets	Pellets designed to reduce the water vapour concentration in gas.
Desiccant Tower	Tower containing desiccant pellets.
DOT Approved Bulk Shipping Container	Containers approved for over-the-road hauling. Examples include roll-off containers, drums, vac-trucks, and tanker trucks.
Drill Cuttings	Soil and rock fragments generated during drilling operations.
Drilling Mud	Water-based or oil-based drilling fluid delivered to the well under pressure to coat the well bore and flush drill cuttings to the surface.
Floc Water	Water treated with a clarifying agent that forms a flocculent as part of the process to remove suspended solids.
Flowback Water	Used hydraulic stimulation fluid (i.e., fracturing fluid).
Flowback Sand	Sand that was used in the fracturing process that is brought to the surface.
Fracing Fluid	A mixture of water, sand and friction reducing and disinfection compounds that are delivered to wells under high pressure to fracture rock formations and keep the fractures open. Also known as hydraulic stimulation fluid.
Frac Tank	Portable tank used to hold freshwater, fracturing fluid, flowback water, flowback sand, or drilling mud.
Gel Mud	Water-based drilling mud.
HDPE Liner	High-Density Polyethylene liner used at drilling and well completion sites to provide secondary containment.
Horizontal Directional Drilling	Boring method use to install pipelines in shallow bedrock without excavating.
Low Gravity Solids	Fines generated in the drilling process that are separated from the drilling mud.
Metering Station	Station used to measure the amount of gas delivered to the gas transmission pipeline.
Mud Tank	Tank used to contain drilling mud.
Oil-based Mud	Drilling fluid that contains mineral oil and other drilling fluids.
Oily Rags	Rags and other debris that contain residual amounts of waste oil.
Paint Filter Test	Test method used to determine the presence of free liquids in a representative sample of waste. Material is placed in a paint filter, if any

	portion of the material passes through and drops from the filter within a five (5) minute test period, the material is deemed to contain free liquids
Pig Catcher	Equipment connected to a pipeline that catches a “Pig” used for cleaning the pipeline.
Pigging Solids	Solid waste material generated during pipeline cleaning and maintenance.
Pill Tank	Tank used to introduce drilling fluid constituents and additives in the drilling fluid.
Produced Water	Late-stage flowback water with elevated salinity that is captured at production wells, compressor stations and metering stations.
Recycle	The process of regenerating or processing used materials to make them suitable for their original intended use.
Reuse	The process of returning used materials to their original intended use without treatment or processing.
Roll-off Container	Open-topped bulk solid shipping container that can be removed from the tractor trailer that transports it to the site.
Sand Catcher	Equipment used to capture flowback sand from the gas stream.
Sand Tank	Tank used to store flowback sand.
Scrubber	Equipment used to clean the gas stream of undesirable constituents at the compressor station before it is delivered to the metering station or gas transmission line.
Secondary Containment	Any surface structure designed to capture liquid material spills from processes or above ground storage tanks.
Settling Tank	A tank that uses gravity and retention time to separate solids from liquids.
Shale Bin	Tank used to store drill cuttings. Typically used to bulk up cuttings that do not pass the paint filter test.
Shale Shaker	Equipment used to remove drill cuttings from drilling mud.
Slug Catcher	Equipment used at compressor and metering stations that capture large volumes of water traveling in the gas pipeline
Municipal Waste	Refuse and trash that originates from offices, lunch rooms or other facilities that contain no residual chemical contaminants.
Tank Cleanouts	Residues on the bottom of storage tanks that are removed periodically.
Three-phase Separator	Equipment that separates gasses, liquids and solids into their separate phases.
Two-phase Separator	Equipment that separates gasses from liquids.
Waste Oils	Used oil from engines, compressors or other oil sources that cannot be reused. Most waste oil generated is recycled.
Water-based Drilling Mud	Drilling fluid that contains no significant amounts of mineral oil or other organic liquids.
Wet Gas	Gas that has a high concentration of water vapour or other liquids associated with gas exploration and production.

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## Drilling Waste Streams

See Figures for Drilling waste stream flow diagrams.

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Document	Transporters	Disposal, Reuse, or Recycling	Additional Information
<b>Air Drill Cuttings</b> (Includes drill cuttings, tank cleanouts, and low gravity solids.)	This is not a RCRA or PA Hazardous Waste. It is a PA Residual Waste. RWC 810 – Drill Cuttings	Drilling Foreman	Store in shale bin or DOT approved bulk shipping container.	1 sample per pad collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill-specific requirements.	Use a manifest when transporting offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Waste Transporter Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	Contact Sampling Contractor to obtain samples 72 hours prior to hauling.
<b>Water-based Mud Drill Cuttings</b> (Includes drill cuttings, tank cleanouts, and low gravity solids.)	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste. RWC 810 – Drill Cuttings	Drilling Foreman	Store in shale bin or DOT approved bulk shipping container.	1 sample per pad collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill-specific requirements.	Use a manifest when transporting offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	Contact Sampling Contractor to obtain samples 72 hours prior to hauling.
<b>Oil-based Mud Drill Cuttings</b> (Includes drill cuttings, tank cleanouts, and low gravity solids.)	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste. RWC 810 – Drill Cuttings	Drilling Foreman	Store in shale bin or DOT approved bulk shipping container.	1 sample per pad collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill-specific requirements.	Use a manifest when transporting offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	Contact Sampling Contractor to obtain samples 72 hours prior to hauling.
<b>Cement Returns</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste. RWC 810 – Drill Cuttings	Drilling Foreman	Store in shale bin or DOT approved bulk shipping container.	1 sample per pad collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill-specific requirements.	Use a manifest when transporting offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	Contact Sampling Contractor to obtain samples 72 hours prior to hauling.
<b>Generated Municipal Waste</b> (Includes office and lunchroom waste and refuse, with no oil filters, oily rags or residues.)	Municipal Waste such as office refuse and lunch room waste are not Pennsylvania residual wastes.	Drilling Foreman	Store in roll-off container supplied by landfill.	None required	N/A	Use a bill of lading when transporting offsite.	Use an approved hauler with a Pennsylvania Residual Waste Hauler Permit.	Dispose of at an approved Pennsylvania Residual Waste permitted landfill.	Generated municipal waste goes to Landfill.

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Drilling Waste Streams – Continued

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Document	Transporters	Disposal, Reuse, or Recycling	Additional Information
<b>Secondary Containment Water</b> (Clean rainwater – sampling and analysis dependant on disposal options.)	Clean rainwater in secondary containment is not a RCRA or Pennsylvania hazardous waste or a Pennsylvania residual waste.	Drilling Foreman	Store in secondary containment or above ground storage tank.	Collect 1 representative sample.	Field test for pH, specific conductivity, and look for evidence of an oily sheen.	N/A	N/A		See “Discharge of Collected Surface Run-on/Run-off SOP” for specific procedures.
				Collect 1 sample per 50 bbls of contained water.	The fracing company at the receiving pad will test the water for frac water suitability.	Use a bill of lading when transporting the material offsite.	Use an approved hauler with a Pennsylvania Residual Waste Hauler Permit.	Use water at completion locations for <u>hydrofracing</u> .	Contact Water Management to obtain samples 72 hours prior to hauling.
<b>Boiler Water Blowdown</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste.	Drilling Foreman	Store in shale bin or DOT approved bulk shipping container with drill cuttings or mix with drilling fluids.	1 sample (with drill cuttings) per pad collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill-specific requirements.	Use a manifest when transporting offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	Contact Sampling Contractor to obtain samples 72 hours prior to hauling.
	RWC 499 – Other Generic Waste								
<b>HDPE Liner</b> (Includes all geosynthetics used for secondary containment.)	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste.	Drilling Foreman	Cut HDPE liner into sections and store in DOT approved bulk shipping container.	None Required	N/A	Use a manifest when transporting the material offsite.	Use an approved hauler with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill.	
	RWC 409 – Polyethylene Liner								
<b>Clean Liner Sand</b> (Sand associated with HDPE liner and secondary containment on a site that did not experience any spills)	This is not a waste material and can be reused.	Drilling Foreman	N/A	None Required	N/A	Use a bill of lading when transporting offsite.	Use an approved hauler. A Pennsylvania Residual Waste Transporter is not required.	Reuse sand at another drilling or completion site or store	haul and reuse or store



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Drilling Waste Streams – Continued

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Document	Transporters	Disposal, Reuse, or Recycling	Additional Information
<b>Potentially Impacted Liner Sand</b> (Sand associated with HDPE liner and secondary containment on a site that did experience a spill.)	Waste classification depends on test results and a determination by the Environmental Protection Team for compliance with PADEP Management of Fill Policy dated August 7, 2010.	Drilling Foreman	N/A	A minimum of 8 samples (specified in PADEP Management of Fill Policy dated August 7, 2010) collected by Environmental Consultant and sent to approved laboratory.	Test for the parameters specified in PADEP Management of Fill Policy dated August 7, 2010.	Use a manifest for sand that will be disposed of in a landfill. Use a bill of lading for soil that is determined to be acceptable for reuse offsite.	Use an approved hauler. A Pennsylvania Residual Waste Transporter is required for transport to a landfill.	Reuse sand that meets PADEP Management of Fill Policy standards for clean fill at other drilling or completion sites or store at an offsite lay-down yard. Dispose sand that does not meet the standards at an approved Pennsylvania Residual Waste Landfill.	Contact Contractor
<b>Grey Water</b> (Includes sewage and septic wastes.)	This is not a RCRA, Pennsylvania Hazardous Waste, or a Pennsylvania Residual Waste. There is no Pennsylvania RWC number.	Drilling Foreman	Store in polyethylene holding tank.			Use a bill of lading when transporting offsite.	Use an approved hauler registered to transport residential septic waste.	Dispose of at a local sewage treatment plant.	The approved hauler will arrange for and dispose of the grey water at a local sewage treatment plant.
<b>Contractor Generated Municipal Waste</b> (Includes office and lunchroom waste with no oil filters, oily rags, or residues.)	Municipal Waste such as office refuse and lunch room waste are not Pennsylvania residual wastes.	Drilling Contractor	Store in DOT approved bulk shipping container.	None required	N/A	Use a manifest acceptable to PADEP or bill of lading when transporting offsite.	Use an approved hauler of the contractor's choice with Pennsylvania Residual Waste Hauler Transporter Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill of the contractor's choice.	
<b>Contractor Generated Residual Waste</b> (Includes refuse, oil filters, and oily rags.)	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residual Waste. RWC 499 – Other Generic Wastes RWC 472 – Spent Filters RWC 503 – Oil-Containing Waste (Absorbents, Rags)	Drilling Contractor	Store in DOT approved bulk shipping container.	None required	N/A	Use a manifest acceptable to PADEP or bill of lading when transporting offsite.	Use an approved hauler of the contractor's choice with Pennsylvania Residual Waste Hauler Permits.	Dispose of at an approved Pennsylvania Residual Waste Landfill of the contractor's choice.	



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Well Completion Waste Streams									
Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Documents	Transporters	Disposal, Reuse, or Recycling	Additional Information
<b>Flowback Sand &amp; Sludge</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 504 - Flowback Sand	Completion Personnel	Store in a flat tank or DOT approved bulk shipping container	1 sample per well collected by Sampling Contractor and sent to approved laboratory	Testing is required. See description.	Use a manifest when transporting offsite.	Use an approved tanker with a Pennsylvania Residential Waste Header Permit.	Dispose of at an approved Pennsylvania Residential Waste Landfill.	Contact Sampling Contractor to obtain a suitable 55 gallon pail to handle. Sampling contractor will obtain landfill approval for disposal prior to loading offsite.
<b>Flowback Water (In case of leaking)</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 504 - Leaking Fluid Waste	Completion Personnel	Store in flat tank or above ground storage tank	Contact Water Management to arrange for sampling	The fracing company at the receiving end will test the water for free water solubility.	Use a manifest when transporting offsite.	Use an approved tanker with a Pennsylvania Residential Waste Header Permit.	Reuse water at completion location for <b>subfracing</b> .	
<b>Produced Water (In le required)</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 502 - Sewage	Completion Personnel	Store in flat tank or above ground storage tank	The truck contents are sampled by the produced water	The truck contents are tested for the produced water monitor by pH and salinity.	Use a manifest when transporting offsite.	Use a tanker with an approved Pennsylvania Residential Waste Transporter Permit.	Take water to produced water monitor for monitoring prior to reuse at other completion sites.	Transportation and recycling to be coordinated.
<b>REDP Liner (Includes all generated used for secondary containment.)</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 402 - Polyethylene Liner	Completion Personnel	Call REDP team into site if a REDP fracture and store in DOT approved bulk shipping container	N/A	N/A	Use a manifest when transporting the material offsite.	Use an approved tanker with Pennsylvania Residential Waste Transporter Permit.	Dispose of at an approved Pennsylvania Residential Waste Landfill.	
<b>Clean Liner Sand (Sand associated with REDP liner and another component on a stored oil separator and spill.)</b>	This is not a waste material and can be reused.	Completion Personnel	N/A	None required	N/A	Use a bill of lading when transporting offsite.	Use an approved tanker with Pennsylvania Residential Waste Transporter Permit.	Reuse sand at another drilling or completion site or reuse.	Refr and reuse or store offsite.

See Figure for Well Completion waste stream flow diagrams.

Well Completions Waste Streams – Continued									
Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Documents	Transporters	Disposal, Reuse, or Recycling	Additional Information
<b>Potentially Repaired Liner Sand (Sand associated with REDP liner and another component on a stored oil separator and spill.)</b>	Waste classification depends on test results and a determination by the Environmental Protection Team for compliance with PADEP Management of PD Policy dated August 1, 2015.	Completion Personnel	N/A		Test for the parameters specified in PADEP Management of PD Policy dated August 1, 2015.	Use a manifest for sand that will be shipped off site. If a manifest is not required, use a bill of lading for the sand. If a manifest is required, use a bill of lading for the sand.	Use an approved tanker with Pennsylvania Residential Waste Transporter Permit.	Reuse sand that meets PADEP Management of PD Policy standards for reuse in or other drilling or completion site or store. Dispose of sand that does not meet the standards at an approved Pennsylvania Residential Waste Landfill.	Contact contractor.
<b>Contractor Generated Residual Waste (Includes sludge at filters and oily rags.)</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 402 - Spent Filters, RCWC 502 - Contaminated Sludge, RCWC 402 - Spent Filters, RCWC 402 - Spent Filters	Completion Rig Contractor	Store in DOT approved bulk shipping container	None required	N/A	Use a manifest accessible to PADEP or 50 of lading when transporting offsite.	Use an approved tanker of the contractor's choice with Pennsylvania Residential Waste Header Permit.	Dispose of at an approved Pennsylvania Residential Waste Landfill at the contractor's choice.	
<b>Contractor Generated Municipal Waste (Includes office and uniform waste and all other, oily rags, or residue.)</b>	Municipal Waste such as office papers and lunch items waste and not hazardous waste.	Completion Rig Contractor	Store in DOT approved bulk shipping container	None required	N/A	Use a manifest accessible to PADEP or 50 of lading when transporting offsite.	Use an approved tanker of the contractor's choice with Pennsylvania Residential Waste Header Permit.	Dispose of at an approved Pennsylvania Residential Waste Landfill at the contractor's choice.	
<b>Contractor Generated Waste Oil</b>	This is not a RCRA or Pennsylvania Hazardous Waste. It is a Pennsylvania Residential Waste. RCWC 503 - Waste Oil	Completion Rig Contractor	Store in DOT approved bulk shipping container	Sampling is performed by waste oil monitor and based on their permit and operating requirements.	Analytical testing is performed by waste oil monitor and based on their permit and operating requirements.	Use a bill of lading of lading of lading appropriate to PADEP when transporting offsite.	The contractor shall use a tanker with Pennsylvania Residential Waste Header Permit.	The contractor shall reuse or dispose of the waste oil in accordance with the waste oil monitor's permit and operating requirements.	



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## Production Well (High and Low Pressure) Waste Streams

See Figures for Production Well waste stream flow diagrams.

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Occupant	Transporters	Disposal, Reuse, or Recycling	Additional Information
Produced Water (to be recycled)	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste) RCSC 602 - 50mg	Operator	Store in flow tank or above ground storage tank.	The truck contents are sampled by the produced water recycler.	The truck contents are tested by the produced water recycler for pH and salinity.	Use a manifest when transporting effluents.	Use a hauler with an approved Pennsylvania Recycled Waste Hauler Permit.	Take water to produced water recycler for conditioning prior to reuse or other completion sites.	Contact water management team to coordinate transportation and recycling.
Flowback Sand & Sludge	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste) RCSC 602 - Flowback Sand	Operator	Store in an above ground storage tank, a flow tank, or DOT approved bulk shipping container.	1 sample per job collected by Sampling Contractor and sent to approved laboratory.	Testing is required. See landfill specific requirements.	Use a manifest when transporting effluents.	Use an approved hauler with Pennsylvania Recycled Waste Hauler Permit.	Dispose of at an approved Pennsylvania Recycled Waste Landfill.	Contact Sampling Contractor to obtain samples 12 hours prior to loading. The sampling contractor will characterize the material and obtain landfill approval for disposal prior to loading effluents.
Secondary Containment Water (Clean rainwater - sampling and analysis dependent on disposal option.)	Clean rainwater in secondary containment is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste)	Operator	Store in secondary containment or above ground storage tank.	Collect 1 representative sample.	Field test for pH, specific conductivity, and test for existence of an oily sheen.	N/A	N/A	Send over unfiltered, unregarded area in accordance with Surface Runoff Run-off SOP for specific procedures.	See Discharge of Collected Surface Runoff Run-off SOP for specific procedures.
				Collect 1 sample per 50,000 of contained water. Contact Waste Management or above ground storage for testing.	The testing company at the receiving job will test the water for the water suitability.	Use a bill of lading when transporting the material offsite.	Use an approved hauler with a Pennsylvania Recycled Waste Hauler Permit.	Use water at completion of drilling.	Contact Waste Management to obtain samples 12 hours prior to loading.

## Compressor Station Waste Streams

See Figure for Compressor Station waste stream flow diagrams.

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping Occupant	Transporters	Disposal, Reuse, or Recycling	Additional Information
Produced Water (to be recycled)	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste) RCSC 602 - 50mg	Operator	Store in an above ground storage tank.	The truck contents are sampled by the produced water recycler.	The truck contents are tested by the produced water recycler for pH and salinity.	Use a manifest when transporting the material offsite to the treatment facility.	Use a hauler with an approved Pennsylvania Recycled Waste Hauler Permit.	Take water to produced water recycler for conditioning prior to reuse or other completion sites.	Contact water management team to coordinate transportation and recycling.
Shop Tank Oil/Water Emulsion	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste) RCSC 602 - Oil/Water Emulsion	Operator	Store in an above ground storage tank.	The truck contents are sampled by the treatment facility.	The truck contents are tested by the treatment facility for PCBs.	Use a manifest when transporting the material offsite to the treatment facility.	Use an approved hauler with Pennsylvania Recycled Waste Hauler Permit.	The wastewater emulsion will be utilized by the treatment facility and disposal of a landfill.	
Waste Oil (Sludge or from compressors and engines.)	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste) RCSC 602 - Waste Oil	Operator	Store in waste oil above ground storage tank.	Sampling is performed by the waste oil recycler and tested at their permit and sampling requirements.	Individual testing is performed by the waste oil recycler and tested at their permit and sampling requirements.	Use a manifest when transporting the material offsite to a waste oil recycler.	Use an approved hauler with Pennsylvania Recycled Waste Hauler Permit.	Recycle the waste oil in accordance with the waste oil recycler's permit and sampling requirements.	Send over unfiltered, unregarded area in accordance with Surface Runoff Run-off SOP for specific procedures.
Secondary Containment Water (Clean rainwater - sampling and analysis dependent on disposal option.)	Clean rainwater in secondary containment is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Recycled Waste)	Operator	Store in secondary containment or above ground storage tank.	Collect 1 sample per 50,000 of contained water. Contact Waste Management or above ground storage for testing.	Field test for pH, specific conductivity, and test for existence of an oily sheen.	Use a bill of lading when transporting the material offsite.	Use an approved hauler with a Pennsylvania Recycled Waste Hauler Permit.	Use water at completion of drilling.	Contact Waste Management to obtain samples 12 hours prior to loading.



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**Metering Station Waste Streams**  
See Figure for Metering Station waste stream flow diagrams.

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping (Occasional)	Transporters	Disposal, Reuse, or Recycling	Additional Information
Produced Water (in its entirety)	Not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Residual Waste) RWC 603 – Other Not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Residual Waste) RWC 472 – Spent Fluids RWC 603 – Oil Containing Gases (Hydrocarbons, Light Hydrocarbons, Vapor) RWC 701 – Paper RWC 702 – Plastic	Operator	Store in an above-ground storage tank	The tank contents are sampled by the production water receiver for pH and salinity.	The tank contents are separately characterized water receiver for pH and salinity.	Use a tanker with an emergency spillage kit in the immediate vicinity.	Use a tanker with an approved Pennsylvania Residual Waste Hauler Permit	Take water to produced water receiver for conditioning prior to reuse at other completion sites.	Contract water management team to coordinate transportation and recycling.
Consolidated Residual Waste (includes spent work completion water, bleach, and oil spill)	RWC 701 – Paper RWC 702 – Plastic RWC 703 – Other RWC 704 – Other RWC 705 – Other RWC 706 – Other RWC 707 – Other RWC 708 – Other RWC 709 – Other RWC 710 – Other RWC 711 – Other RWC 712 – Other RWC 713 – Other RWC 714 – Other RWC 715 – Other RWC 716 – Other RWC 717 – Other RWC 718 – Other RWC 719 – Other RWC 720 – Other	Operator	Store in DOT approved bulk shipping containers	None required	None	Use a tanker with an approved Pennsylvania Residual Waste Hauler Permit	Use an approved tanker with a Pennsylvania Residual Waste Hauler Permit	Disposal of all oil and non-hazardous Residual Waste permitted as well as certain waste.	Approved residual waste goes to Northern Tier landfill. Shipping containers and disposal provided to Northern Tier landfill.
Secondary Containment Water (clean concrete – sampling and analysis segments are stored onsite.)	Clean concrete is normally considered to not a RCRA or Pennsylvania Hazardous Waste or a Pennsylvania Residual Waste.	Operator	Store in secondary containment to allow internal storage tank	Collect 1 container per 200 gal of contained water. Conduct proper management to prepare for testing.	Test each for pH, salinity, and other parameters, and test for oil content if not oil free.	Use a tanker with an approved Pennsylvania Residual Waste Hauler Permit	Use a tanker with an approved Pennsylvania Residual Waste Hauler Permit	Disposal of all oil and non-hazardous Residual Waste permitted as well as certain waste.	See “Storage of Contaminated Water” section of EOP for specific procedures.

**Pipeline Construction & Horizontal Directional Drilling Waste Streams**

Waste Name	Waste Classification	Responsible Party	Onsite Storage Requirements	Sampling Requirements	Analytical Testing Required	Shipping (Occasional)	Transporters	Disposal, Reuse, or Recycling	Additional Information
Drill Cuttings	HDD drill cuttings are not a RCRA or Pennsylvania Hazardous Waste or a Pennsylvania Residual Waste. Pennsylvania RWC Number:	HDD Contractor	Drill cuttings can be stored on the ground.	None required	N/A	N/A	N/A	HDD cuttings are used as pipeline backfill.	
Drilling Mud	HDD drill cuttings are not a RCRA or Pennsylvania Hazardous Waste or a Pennsylvania Residual Waste. There is no Pennsylvania RWC Number.	HDD Contractor	Drilling mud can be stored in surface impoundments or earthen tanks.	None required	N/A	N/A	N/A	HDD drilling mud is used as pipeline backfill, reused on subsequent jobs, or physically separated via centrifuge.	
Contractor-Generated Waste Oil	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Residual Waste). RWC 603 – Waste Oil	HDD Contractor	Store in DOT approved drums.	Sampling is performed by waste oil recycle and based on their permit and operating requirements.	Analytical testing is performed by waste oil management based on their permit and operating requirements.	The contractor shall use a manifest acceptable to PADEP when transporting offsite.	The contractor shall use a tanker with Pennsylvania Residual Waste Hauler and New York Waste Transporter Permits.	The contractor shall recycle or dispose of the waste oil in accordance with the waste oil recycler's permit and operating requirements.	
Contractor Generated Residual Waste (includes bleach and oil spill)	This is not a RCRA or Pennsylvania Hazardous Waste (i.e. a Pennsylvania Residual Waste). RWC 472 – Spent Fluids RWC 603 – Oil Containing Gases (Hydrocarbons, Vapor)	HDD Contractor	Store in DOT approved bulk shipping containers.	None required	N/A	Use a list of bulking when transporting the material offsite.	The contractor shall use a tanker with Pennsylvania Residual Waste Hauler and New York Waste Transporter Permits.	The contractor shall dispose of waste oil at a Pennsylvania Residual Waste or New York Municipal Waste permit landfill if the contractor's choice.	

See Figure for Pipeline HDD waste stream flow diagrams.



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## Appendix A – Waste Manifesting Procedures Manifesting Procedures for Drilling Foreman

### 1. Complete Manifest

- Complete Section 1.

Information of the Waste Transport Manifest. See below for a completed example.  
**Note: Each truck load that leaves location requires a manifest.**

WASTE TRANSPORT MANIFEST			
1. INFORMATION		AFE: <input type="text"/>	Manifest No. <b>1001</b>
Generating Location Information:	Shipping Date:	02 12 2011	
	Estimated Quantity Shipped:	15	
Rig Name & No.:			
Waste Description (See General Description):	1. Air Drill Cuttings	3. Frac Flow Back Sand	5. Used Liners from Pac 7. Other, Please Describe Below
	2. Oil Based Drill Cuttings	4. Lease Clean Up Soil	6. General Refuse
Approval / Permit No.:			
Billing Address:			
Drilling Foreman:	Rig Email:		
Foreman Signature:	Rig Phone No.:		

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- Have the truck driver complete Section 2. Transporter information before leaving location. See diagram below.

2. TRANSPORTER INFORMATION			
Trucking Company:	<input type="text"/>		Transporter Permit No.:
Address:	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>
Driver's Name:	<input type="text"/>		Driver's Signature:
License Plate No.:	Truck No.:	<input type="text"/>	Truck Ticket No.:

- Provide top three (white, yellow, and pink) copies of the manifest to the truck driver. Staple these three copies together before giving them to the truck driver.
- Stamp and code time ticket (truck ticket) from truck driver before leaving location.
- Enter costs for transport into Wellview.

### Notes:

- The AFE is critical to being able to properly track the costs of landfill disposal and to have invoicing completed properly.
- Each truck load leaving location must be accompanied by a manifest.
- For spill clean up material, select #7 in the Waste Description section and identify what the material is (e.g., Invert Contaminated Soil). See below for an example.

Waste Description (See General Description):	1. Air Drill Cuttings	3. Frac Flow Back Sand	5. Used Liners from Pac 7. Other, Please Describe Below
	2. Oil Based Drill Cuttings	4. Lease Clean Up Soil	6. General Refuse
			Invert Contaminated Soil

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## Pennsylvania Waste Management Guide

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# EREF Webinar “Managing Wastes from Oil and Gas Fields in Shale Formations”



## Conclusions

- Shale Gas has presented new waste streams to the waste industry
- For Pennsylvania a concise waste management program has been used to properly dispose of the shale wastes within the current waste regulations

**What is next ...**

**Be prepared for additional disposal needs as the Marcellus and Utica play develops further.**



Reference: USGS, Assessment of Undiscovered Oil and Gas Resources of the Devonian Marcellus Shale of the Appalachian Basin Province, 2011





# Environmental Research & Education Foundation (EREF) Webinar

The **Utica Shale Formation** underlies the Marcellus Formation with land purchases, exploration and well drilling has already commenced in Ohio.

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Thank You!

