TENORM: Management & Disposal

People and Technology
Creating a Safer, Cleaner Environment

May 12th, 2014
Mike Hall - Presenter
Meeting Objectives

- Come to a better understanding of TENORM waste, it’s management & proper disposal.

- TENORM market and Clean Harbors Capabilities.
  - Deer Trail, CO, RCRA/TSCA/NORM, Subtitle C
  - Buttonwillow, CA, RCRA/NORM /Cal wastes, Subtitle C

- Improved ability to manage company, and client environmental risk, as it relates to TENORM & RCRA waste, treatment, and disposal.
TENORM Market, Clean Harbors poised to manage the risk

- Oil and Gas E&P activities connected with the Domestic Shale Plays will generate more NORM and TENORM

- We should see more state rules and regulations connected with the management of NORM and TENORM from these activities.

- Several States including ND, WY, CA, PA and NY are in the process of developing NORM and TENORM Rules in response to the dramatic increase of E&P activities within the currently worked Shale Plays.

- CA’s Monterey Shale Play will soon be open for more E&P activity as Gov. Brown supports safe and environmentally responsible development of the Play

- Drilling pipe, transmission pipeline, filter socks, filter cake, pit clean outs can all be NORM contaminated. Clean Harbors has managed all of them.
OKLAHOMA CITY, April 28, 2014 – Continental Resources, Inc. announced today the Bakken field of North Dakota and Montana recently reached the milestone of 1 billion barrels of light, sweet crude oil produced.

- According to data from IHS, the Bakken's cumulative oil production reached the billion barrel mark in the First Quarter of 2014.

- "This milestone validates the immense potential of the Bakken field and development is just beginning," said Jack Stark, Senior Vice President of Exploration for Continental. "Two-thirds of this oil was produced in the last three years. This is something our country can celebrate as the oil and natural gas industry continues to create jobs, grow our economy and secure America's energy future."

- Horizontal drilling technology has spurred the discovery of vast new resources of oil in America. Much of this potential has yet to be accounted for in our nation's proved reserves of crude oil. The Bakken field alone appears to be the largest oil field discovered in the world in more than 40 years.

- Continental is the largest producer, driller and leaseholder in the Bakken field.
Abandoned NORM Filter Socks in the Bakkens
There is a corporate responsibility to do the right thing!

Generators of E&P waste may claim exemption status. Exempt E&P wastes might be harmful to human health and the environment, and many non-exempt wastes might not be as harmful. The following simple rule of thumb can be used to determine if an E&P waste is exempt or non-exempt from RCRA subtitle C status:

- Has the waste come from down-hole, i.e., was it brought to the surface during oil and gas E&P operations?

- Has the waste otherwise been generated by contact with the oil and gas production stream during the removal of produced water or other contaminants from the product?

If the answer to either question is yes, then the waste is likely considered exempt from RCRA Subtitle C regulations. It is important to remember that all E&P wastes require proper management to ensure protection of human health and the environment.

Clean Harbors has facilities to manage all of these wastes!
7 types of Protective Barriers

1. Location
2. Geology
3. Climate
4. Secure perimeter
5. Multi HDPE & clay liners
6. Air & water monitoring with, multi leachate collection systems
7. Indemnification
Deer Trail, CO Landfill

- Deer Trail - Fully permitted Subtitle C Landfill. RCRA/TSCA (mega rule for PCB's)
- Permitted for NORM/TENORM waste for U-238, U-235 & Th-232 decay series. Permitted for up to 2000 pCi/g
- Facility located 75 miles east of Denver
- Rocky Mountain Low Level Radioactive Waste Compact
- Can handle liquids, sludge's and solids
- Can accept in bulk, drums, totes and special containers.
- Specialize in waste water haz stream.
- Can also take mixed RCRA/TENORM waste
- Radiation monitor for incoming loads and outgoing NORM free released loads. Full time Certified Radiation Safety Officer (RSO) on-site
- Employee radiation safety monitoring program, personal dosimeters with 3rd party testing of findings at both Deer Trail & Buttonwillow
Check in: weight and radioactive monitoring
Deer Trail is a daily cover Landfill
What Deer Trail Requires

If waste is generated outside of NM, CO or NV, Generator will need to apply to RMLLRB compact.

Need waste profile sheet.
Need 1000 gram sample, independent of any analytical generator has
Need radiation questionnaire

Below is the minimum analysis we will run on the sample:

1. Total Uranium (mg/kg) by ICP; alternate Isotopic Uranium by Alpha Spec.
2. Total Thorium (mg/kg) by ICP; Alternate Isotopic Thorium by Alpha Spec.
3. Gamma spectrum and Ra-226 quantization pCi/g
4. Gross alpha (pCi/g)
5. Gross beta (pCi/g)
6. Pb-210 if applicable (pCi/g) (Natural Gas Processing Waste Only)
7. Percent Moisture

Instrumentation:

Ludlum Gate Monitor - Model 4525, 7000, 37520 & 3502
Thermal Fisher Scientific - hand held gamma spectrometer
Buttonwillow California Landfill

- Located in Central California. Approximately 40 miles West of Bakersfield
- Deep water table with, < 5 inches of rain per year
- NORM TENORM Waste up to 1800 pCi/g  U & Th decay series
- Offer treatment of liquids, solids, and sludge's, RCRA & NORM materials
- Can handle waste in bulk liquids, and solids and in a variety of containers
- Up to 1500 drum storage and transport permit
- Permitted capacity of in excess of 10 million cubic yards
- Industries served; Oil & Gas, General Manufacturing, Coal combustion Mining of uranium, and metals, Phosphate production, Municipal water treatment.
Typical Cell Construction

Liner Cross Section

- 1 1/2' Minimum Protective Soil Layer
- Primary Leachate Collection and Removal System
- Bentonite Clay Mat
- 3' Minimum (at Landfill Base) Primary Clay Layer
- Secondary 80 Mil High-Density Polyethylene Liner
- 3' Minimum Secondary Clay Layer
- Prepared Subgrade
- Primary 80 Mil High-Density Polyethylene Liner
- Secondary Leachate Collection, Detection and Removal System
How to start the disposal process

• Waste must have a completed E-profile, sample (COC) and analysis (if you have it), LDR, MSDS. For Deer Trail NORM sample required.

• Credit & Service Agreement

• Waste Must be approved into the Clean Harbors System
  ➢ Facility Approval
  ➢ CPG Approval

• Signed quote

• Waste must be scheduled via Customer Service
Submitting an e-profile assures the proper review.
Proper preparation now, reduces liability in the future

- Demand for proper management is only going to increase

- Prepare to understand the waste & the risk, Clean Harbors can help navigate the risk.

- Clean Harbors has over 30 years experience can manage mixed waste; RCRA/TENORM/TSCA

- Indemnification only as strong as the company financials

- Choose wisely, joint and several liability