Pennsylvania DEP TENORM Study
2013 End of Year Update
• Technologically Enhanced Naturally Occurring Radioactive Material

– Consists of naturally occurring radioactive material whose radionuclide concentrations have been increased above levels encountered in the natural state by human activities.
Generation of TENORM has increased significantly. This is mainly due to the recent expansion in natural gas exploration and production in Pennsylvania.

There are many issues with TENORM that must be managed effectively.

These issues include:

• Potential worker radiation exposure
• Public radiation exposure
• Environmental (water, etc.) contamination
The intention to conduct a comprehensive TENORM study was announced on Jan. 24, 2013.

- **Study Purpose**
  - Evaluate radiation exposure to the public and workers
  - Evaluate environmental impacts
Participants

• Perma-Fix Environmental Services, Inc. - Consultant

• DEP Central Office Program and Regional Office Staff
DEP and Perma-Fix collaborated to develop the TENORM Study Plan.

The Final Study Plan was posted to the DEP website on April 3, 2013.
• One set of comments/questions was received.

• Additional well pads were added to the list of those already scheduled to be sampled based on the comments.
Site Categories

- Waste Water Treatment Plants (WWTPs)
- Landfills
- Sludge Loads to Landfills
- Well Pads
- Underground Natural Gas Storage Sites
Site Categories

- Gas-Fired Electricity Generating Facilities
- Compressor Stations
- Beneficial Use Sites
- Decommissioned Well Casings
2013 Completed Field Work

- 184 Site Visits
- 114 Locations
- 1,000 Samples Analyzed
2013 Completed Field Work

- 25 WWTP’s / 73 Visits (3 Rounds)
- 48 Landfills (9 Extensively Sampled)
- 1 Set of facilities to evaluate the effect of transport on sludge radioactivity
- 20 Well Pads / 41 Visits
2013 Completed Field Work

• 13 Beneficial use sites

• 1 Decommissioned well casings disposal site

• 7 Facilities that compress, store and utilize natural gas
Underground Storage
Underground Storage
Nat. Gas-Fired Pwr. Plant
Sample Types

- Natural Gas Samples
- Liquid Samples (i.e., frac water, flowback water)
- Solid Samples (i.e., drill cuttings, sludge)
- Radiation Surveys
- ‘Swipe’ Samples
Sample Analysis

- The samples are being analyzed for the presence of Alpha, Beta and Gamma Radiation.

- The gas is being sampled for the presence of Radon.
Remaining Field Work

- Well pad sampling (18 visits to 11 pads)
- Continued landfill leachate collection (5 facilities)
- Landfill ‘Bulking’ operations (2 facilities)
- Beneficial use sites (4 sites)
Remaining Field Work

- Gas-fired power plants (1 facility)
- Gas storage facilities (4 facilities)
- Compressor stations (1 facility)
- Gas processing facilities (1 facility)
Remaining Field Work

• Wastewater impoundments (2 facilities)
• Evaluating the effect of transport on sludge radioactivity (5 events)
Lessons Learned

• Well pad field work schedule changes
• Technical challenges
• Science-based study plan additions
Schedule

• Most field work to be completed by the end of February.

• Sample analysis, data analysis, and report preparation (including peer review) from March through August.

• Final study report planned for completion in 2014.
• Study related documents are available at www.dep.state.pa.us, keyword: “TENORM”

• Updates are being provided to the appropriate DEP Advisory Committees
If there are any questions, please contact:
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