



December 15, 2015

Landfill Operator

Re: 2016 TENORM Tracking Spreadsheet

Dear Landfill Operator:

As part of its continuing evaluation of the effectiveness of the TENORM disposal protocol, the Pennsylvania Department of Environmental Protection (DEP) has reviewed all of the 2015 TENORM tracking sheets; identified trends based on actual disposal data; and revisited the assumptions used to formulate the protocol. As a result, some revisions to the TENORM tracking spreadsheet are necessary. DEP has also made several changes to the Residual Waste Codes (RWC), which aims to enhance and improve DEP's waste tracking efforts. DEP has met with the Pennsylvania Waste Industries Association (PWIA) and the Marcellus Shale Coalition to discuss the proposed modifications. The changes will be implemented on January 1, 2016, and include a revised multiplier for wastewater treatment sludge (RWC 804) and a separate multiplier for all other TENORM-containing waste loads. Additionally, each facility's TENORM allocation, which has historically been calculated using the amount of non-TENORM containing waste (cold waste) received for disposal in the preceding year and a factor derived from microrentgens per hour ($\mu\text{R/hr}$), will now be calculated using the average cold waste tonnage from the prior three years and a factor derived from picocuries per gram (pCi/g).

The changes to the tracking spreadsheet and RWCs, along with justification for the changes, are described in further detail below:

TENORM Tracking Spreadsheet

DEP's TENORM disposal protocol, developed in 2002, is based on the concentration of radioactive material in the waste, expressed in pCi/g . The disposal protocol assumes that the relationship between the measured exposure rate in $\mu\text{R/hr}$ and the concentration of radioactive material in pCi/g is directly proportional, meaning that the waste is in a state of radioactive, or secular, equilibrium (i.e. the state at which the rate of radioactive decay and gamma particle emission is constant over time).

Analysis of TENORM reports, Form U reports and other information led to the determination that sludge generated from the processing of oil and gas-related wastewater (RWC 804) is not in a state of secular equilibrium. In 2015, DEP embedded a multiplier of "3" into the tracking spreadsheet for RWC 804 to convert $\mu\text{R/hr}$ to pCi/g and accommodate for the disequilibrium. After additional analysis of data from DEP's TENORM Study, the study conducted jointly by the Marcellus Shale Coalition and the Pennsylvania Independent Oil and Gas Association, and the assumptions used in the development of the "3" multiplier, DEP has determined that a multiplier of "1.5" more accurately represents the relationship between $\mu\text{R/hr}$ and pCi/g for

TENORM spreadsheet. The 1.5 multiplier will also be applied to filters, filter socks, and other filter media used in the treatment of oil and gas-related wastewater. These materials will be reported using the new RWC 812, which is described in greater detail in the section below relating to “residual waste codes.”

The 2015 TENORM disposal protocol assumed that a 1:1 relationship existed between $\mu\text{R/hr}$ readings and radioactive concentration in pCi/g for wastes that are in secular equilibrium. Upon further evaluation, DEP determined that this relationship is not 1:1. In order to accurately account for the estimated pCi/g in all TENORM-containing wastes, $\mu\text{R/hr}$ measurements for all TENORM-containing waste (other than RWC 804 and 812) must also be converted to pCi/g , which can also be accomplished through the use of a multiplier. DEP revisited the assumptions used in the development of the 2002 TENORM disposal protocol and has determined that a multiplier of “0.38” more accurately converts the $\mu\text{R/hr}$ readings recorded by the radiation monitors at the landfill to pCi/g . Therefore, a multiplier of “0.38” will be applied to all TENORM-containing wastes (other than RWCs 804 and 812).

Each facility’s TENORM allocation will also be calculated using a factor derived from pCi/g instead of $\mu\text{R/hr}$. To convert the TENORM allocation, the factor will be changed from $0.7 \mu\text{R} \cdot \text{tons/hr}$ to $0.266 \text{pCi} \cdot \text{tons/g}$. The revisions to the TENORM disposal protocol for 2016 mean that wastewater treatment sludge will reduce the TENORM allocation by a greater percentage compared to the 2015 calendar year.

The process for completing the monthly TENORM spreadsheets in 2016 is largely the same except that facilities will need to input the cold waste tonnages for the prior three years instead of only the prior year as was required by previous disposal protocols. All additional calculations/conversions generated by the revisions for the 2016 TENORM disposal protocol will be completed automatically when the required information is entered into the spreadsheet.

These changes will more accurately account for the radioactive concentrations in the sludge generated from oil and gas activities and non-sludge TENORM to prevent Pennsylvania landfills from exceeding the established design criteria.

Residual Waste Codes

In order to ease the reporting of waste disposal information and enhance the usefulness of the reported data, DEP has also clarified the definitions of many RWCs and added several new RWCs. These changes also become effective on January 1, 2016. Therefore, any waste disposed of on January 1 or thereafter should be categorized using the new/revised RWCs. A list of the RWCs is enclosed with this letter. Additional and electronic copies may be obtained from the DEP’s eLibrary.


The majority of the revisions to the RWCs are to the 800-series codes, relating to non-coal mining, oil and gas, and other well drilling wastes. Some revisions were also made to the 200-series RWCs, relating to sludge, scales and sediment, and the 500-series RWCs, relating to special handling waste. Many of the definitions in the 800-series RWCs were revised for clarity and some new codes were added to the series. Revisions made to the 800-series RWCs include the following:

- A definition of produced fluid and flow-back fluid has been provided.
- RWC 804 now includes only sludge generated during the processing of oil and gas-related wastewater. Fluids previously reported under RWC 804 will be accounted for under the new RWC 805 beginning January 1, 2016.
- New codes, RWCs 806, 811, 812, and 899, have also been created for synthetic liner materials; soil contaminated by oil and gas-related spills; filters, filter socks, and other media used for filtering oil and gas-related wastewater; and other oil and gas-related wastes, respectively.

In implementing the new codes, facilities currently accepting wastes that would fall under a newly created RWC (i.e., RWCs 806, 811, 812, and 899) must submit a new Form U application for each source of waste under RWCs 806, 811, 812, and 899.

Moving forward, DEP will continue to evaluate the effectiveness of the TENORM disposal protocol to ensure the health and safety of Pennsylvania's citizens and the environment. If you have questions or require additional information, please contact your regional waste management program. Alternatively, you may contact Chris Solloway or Ali Tarquino Morris in DEP's central office at 717-783-2388.

Sincerely,



Kenneth Reisinger
Acting Deputy Secretary
Office of Waste, Air, Radiation, Remediation

Enclosures