Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities
(DEP ID: 250-3100-001)

COMMENT RESPONSE DOCUMENT

June 11, 2022

Pennsylvania Department of Environmental Protection
Bureau of Radiation Protection

INTRODUCTION

Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities

This guidance document aids the regulated community and the Department of Environmental Protection (DEP or Department) with protecting the environment and public health, safety and welfare from the possible dangers of radioactive material that is delivered to solid waste processing and disposal facilities or generated by oil and gas processing operations. This guidance assists the regulated community with developing Radiation Protection Action Plans as required by DEP. On October 19, 2019, DEP published a notice of availability of the draft Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities (250-3100-001) with a 30-day public comment period.

The Department received comments from 35 organizations and individuals listed below. Each comment submitted on the proposed revisions to this policy is summarized below, followed by DEP's response.

LIST OF COMMENTERS

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30. Elissa Weiss, M.D.
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31. John Detisch
PA National Director for Izaak Walton of America

32. Jan Milburn
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LIST OF ACRONYMS

ALARA – As Low As Reasonably Achievable

ANSI – American National Standards Institute

ARAR – Applicable or Relevant and Appropriate Requirements

Bq – Becquerel

BRP – Bureau of Radiation Protection

BWM – Bureau of Waste Management

CFR – Code of Federal Regulations

CIH – Certified Industrial Hygienist

CHP – Certified Health Physicist

CRCPD – Conference of Radiation Control Program Directors

CSP – Certified Safety Professional

DEP – Department of Environmental Protection

DOE – U.S. Department of Energy

DOT – U.S. Department of Transportation

EPA – U.S. Environmental Protection Agency

E&S – Erosion and Sediment Control

ESCGP – Erosion and Sediment Control General Permit

GP – General Permit

HAZMAT – Hazardous materials

HMR – Hazardous materials regulations

LLRW – Low-level radioactive waste

µCi – microcurie

µR – micro roentgen

µSv – micro Sievert

mrem – millirem

NARM – naturally occurring and accelerator-produced radioactive material

NORM – naturally occurring radioactive material

NPDES – National pollutant discharge elimination system

NRC – U.S. Nuclear Regulatory Commission

O&G – Oil & gas

OSHA – Occupational Safety and Health Administration

pCi/L – picocurie per liter

pCi/g – picocurie per gram

PIOGA – Pennsylvania Independent Oil & Gas Association

POTW – Publicly Owned Treatment Works

RAM – Radioactive material

RP Action Plan – Radiation Protection Action Plan

RSO – Radiation Safety Officer

SWMA – Solid Waste Management Act

TENORM – Technologically enhanced naturally occurring radioactive material

2016 TENORM Study – DEP's extensive TENORM Study, the results of which are published: http://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx.

TGD – Technical Guidance Document

COMMENTS AND RESPONSES

1. **Comment:** Several commenters requested a comment period extension. **(3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 16, 20, 21, 25, 28, 30, 31, 32, 33, 35)**

   Response: DEP recognizes this is an important TGD. During the development of this TGD, DEP engaged with stakeholders from several advisory committees and received extensive feedback from 35 commentators during the public comment period. Given this, DEP believes there was strong public participation and that the comment period length was adequate.

2. **Comment:** The term "oil" throughout the document is unnecessary as it would suggest applicability beyond the cited 78a.58 provision. **(34)**

   Response: References to "oil" within the TGD are consistent with 25 Pa. Code §78a.58(d), which requires an operator that is processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation, or plugging of "oil or gas wells" to develop a RP Action Plan to monitor and manage radioactive material produced by the processing activity. The RP Action Plan must be consistent with the TGD or in a manner substantially equivalent. Although § 78a.58(d) applies to unconventional well operators, it is recommended that conventional well operators implement the same protective measures as a best management practice (BMP). Additionally, the Department will now require all UIC wells, which are subject to the provisions of 40 CFR Part 144 (relating to underground injection control program), to develop a RP Action Plan.

3. **Comment:** A commenter stated there are definitive words or phrases such as "required" or "must be" imbedded within the text. The last sentence of Section A (p. 8) specifically states: "This guidance is intended to assist the solid waste and O&G (oil and gas) regulated communities with the development of RP Action Plans." Since this is a guideline, wording that makes aspects mandatory need to be removed. **(34)**

   Response: If a user of this TGD implements a RP Action Plan, there are mandatory elements that are codified in regulation. To further clarify what aspects of the TGD represent regulatory requirements and those that are recommended as a best management practice, the Department inserted the word, "shall," in cases where there is a regulatory requirement. Additional edits have been made throughout the TGD to further illustrate recommendations versus requirements, including the insertion of applicable regulatory citations.

4. **Comment:** Commenters state that specific references and requirements exclusively targeting O&G activities should be removed from this guidance document. The purpose of this "Solid Waste Processing and Disposal Facility" Guidance Document is to create uniformity across all industries regarding radioactivity monitoring. O&G, nor any one industry, should be separately emphasized throughout the guidance document, and further the manner in which O&G references have been inserted is not consistent with Chapter 78a.58 or WMGR123 permit conditions. The level of radioactivity should be the

critical determinant, rather than the source of the waste. Additionally, DEP should add a bullet point listing the other facilities that are required to develop an RP Action Plan. Facilities. **(6, 15, 18, 22, 34)**

Response: Although the oil and gas industry is one of many industries that generate TENORM-containing waste, certain O&G activities are regulated under the Oil and Gas Act, rather than the SWMA. Under § 3273.1 of the Oil & Gas Act, the obligation to obtain a permit and post a bond under SWMA for activities on a well site is satisfied if the operator has complied with similar requirements under the Oil and Gas Act and other applicable environmental laws and regulations. This streamlined approach is also included in the residual waste regulations at 25 Pa. Code § 287.2(g), which clarifies that O&G activities on the well site are regulated under O&G regulations in lieu of the residual waste regulations, provided certain conditions are met. Because there are statutory and regulatory provisions that specifically apply to the O&G industry and its management of residual waste, the Department believes that it is appropriate to refer to this industry within the TGD to avoid any confusion in its application. The level of radioactivity is an important component of the TGD, along with the way residual waste is generated, stored, processed, transported, and disposed of under all applicable laws and regulations O&G references have been revised to be consistent with § 78a.58.

5. **Comment:** The proposed revisions that focus on O&G in the guidance document should only be applicable to "processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of oil and gas wells" (as described in Chapter 78a.58) or facilities with a Pennsylvania DEP Solid Waste Management Permit ("Processing and Beneficial Reuse of Wastewater from Oil and Gas Wells" Memo, dated September 26, 2012) that requires an RP Action Plan as part of the facilities permit. Several sections within the Guidance Document propose new requirements that are beyond the scope of the O&G regulations contained in Chapter 78a.58(d). Updating the document to only reference the requirements in 78a.58 is recommended. **(6, 15, 18, 22)**

Response: The TGD revisions that specifically relate to processing O&G fluids or drill cuttings, as described in § 78a.58(d), under an approval issued pursuant to § 78a.58(a), or a permit issued pursuant to the SWMA are consistent with the requirement to develop a RP Action Plan in accordance with the TGD or in a manner substantially equivalent. For O&G waste streams other than fluids and drill cuttings, § 78a.58(f) requires compliance with the SMWA. Although § 78a.58 applies to unconventional well operators, it is recommended that conventional well operators implement the same protective measures as a best management practice. For clarity, additional language has been added to clarify the aspects of the TGD that apply to well sites where processing of fluids or drill cuttings occur, versus facilities operating under a general permit for the beneficial use of wastes, versus processing or disposal facilities operating under a permit issued pursuant to the SWMA.

6. **Comment:** Several sections within the Guidance Document propose new requirements that are beyond the scope of the unconventional well site regulations contained in

Chapter 78a.58 and the WMGR123 permit requirements. The commenter recommends updating the document to not include specific references and requirements associated with O&G activities, as this Guidance Document is intended to be utilized by many industries throughout Pennsylvania. **(6, 18)**

Response: Please see DEP's responses to Comments #4 and #5.

7. **Comment:** The scope of the Proposed Guidance with respect to O&G facilities should be limited to the regulatory authority established by the Department in 25 Pa. Code 78a.58: "An operator processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of oil or gas wells shall develop an RP Action Plan specifying procedures for monitoring for and responding to radioactive material produced by the treatment processes, as well as related procedures for training, notification, recordkeeping and reporting." The applicability of this Proposed Guidance to waste generators is not clear; and, some of the procedures specified in the Proposed Guidance may not be applicable or relevant. **(23, 24)**

Response: The TGD applies to well sites where processing of fluids or drill cuttings takes place, facilities permitted to process or dispose of solid waste, certain facilities permitted to process waste prior to beneficial use of waste, or facilities that are otherwise required by regulation or a term or condition of a permit to have a RP Action Plan. Generators of residual waste, unless also engaged in any of the above listed activities, are not generally required to develop and implement a RP Action Plan. However, generators of residual waste are responsible for characterizing the chemical and physical composition of the waste that is generated prior to transportation to a processing or disposal facility that is permitted to receive the generator's waste. The requirements applicable to residual waste generators are included in the residual waste regulations at 25 Pa. Code Chapter 287, Subchapter B. Please also see DEP's responses to Comments #4 and 5.

8. **Comment:** Dumping of radioactive O&G drilling waste whether from conventional or unconventional wells into Pennsylvania waters should not be permitted under any circumstances. Radioactive fracking waste has not been permitted since 2016 and yet this practice persists. (https://stateimpact.npr.org/pennsylvania/2019/09/11/how-did-fracking-contaminants-end-up-in-the-monongahela-river-a-loophole-in-the-law-might-be-to-blame/) In addition, a 2018 Duke University study found high levels of radioactivity persist in stream sediments at three disposal sites. The contamination is coming from the disposal of conventional, or non-fracked, O&G wastewater, which, under current state regulations, can still be treated and discharged to local streams. This practice should not be allowed to continue. Radioactive contamination lasts, as far as the PA public is concerned, forever. Radioactive waste elements in our waters not only contaminate the water itself but also the organisms that depend upon it for life. All loopholes which allow for the dumping of radioactive waste into our waters whether directly or indirectly must be banned and the ban must be strictly enforced. Clean life supporting water is not a renewable source. **(1)**

Response: The guidance document does not authorize or otherwise apply to land application or illegal dumping of oil and gas-derived waste. The guidance document applies to facilities that accept waste for processing or disposal to ensure monitoring for and appropriate management of radioactive materials that may be present in waste, and identify information needed in a RP Action Plan, when required, such that workers, the public and the environment remain protected.

This TGD, along with applicable laws and regulations, is designed to protect the public health, safety, and welfare and the environment of the Commonwealth. The Department conducted an extensive TENORM Study, and in June 2016, published the results of the study at https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx. The Department continues to follow-up on the recommendations outlined in the study, and as such has commenced an effort aimed at sampling and evaluating of landfill leachate for radium-226 and radium-228.

9. **Comment:** The guidance states requirements for 'licensees.' The term applies normally to possession and use of radioactive materials other than TENORM but permit holders could be licensees when the potential for radiation exposure could exceed an annual radiation dose of 100 mrem. A separate report, the TENORM Study Report, has suggested that most activities do not result in occupational exposures requiring licensing.

However, the TENORM Study Report does not calculate radiation doses from activities such as drilling O&G wells, an activity being added to the guidance. Drillers' work involves nearly continuous occupancy while the well is being drilled and following completion the very same individuals may subsequently show up at a second (third, fourth) O&G well during a year.

Drillers' exposure time to direct radiation is much more than 2,000 hours in a year, typically used in calculated exposure potential from direct radiation. In addition, exposure pathways should include ingestion as well as inhalation as credible and complete. However, many permit holders contract out drilling and other elements involving O&G to other companies. Radiation safety programs for support contractors may not be as rigorous as those written and scrutinized with the review of the RP Action Plan, if the RP Action Plan tends to focus more on operations after wells have been completed. **(2)**

Response: In its 2016 TENORM study, DEP did not identify any activity where a worker would exceed the annual public dose limit of 100 mrem/year. DEP recognizes the possibility for uses of highly regulated radioactive sources in the O&G industry that have potential to cause workers to exceed 100 mrem/yr, and those activities are strictly regulated and licensed to maintain worker exposure ALARA. The federal government has not directly regulated O&G operations or the TENORM they may generate, leaving regulation to each state. The applicable laws and regulations in the Commonwealth as

referenced in this TGD are designed to protect public health, safety and welfare and the environment in the Commonwealth. While the TGD and the regulatory requirements of § 78a.58 do not directly apply to well sites where no processing of fluids or drill cuttings occurs, the Department continues to follow-up on the recommendations of the 2016 TENORM Study regarding worker radiation exposure, environmental contamination from radium, and public dose from these operations.

10. **Comment:** A commenter suggested DEP add a section on what kind of program is needed if the permit holder does not have the potential to exceed 100 mrem in a year but should self-perform DOT functions for radioactive material transportation as opposed to having a Special Permit. **(2)**

Response: All generators and shippers of radioactive materials offering such materials for conveyance on a public road are required to characterize the waste, including identification of radioisotopes and quantifying the concentration of radioactivity, prior to shipment and follow federal DOT requirements in 49 CFR.

As noted in DEP's responses to Comments #8 and #9, the Department has not yet identified any activity where a worker would exceed the annual public dose limit of 100 mrem/year. Therefore, the entirety of the TGD is applicable to operations that do not exceed 100 mrem/year and contains procedures to address radioactive material should a load of solid waste arrive at a waste facility and set off a radiation alarm. This would include issuing a DOT Special Permit to ultimately route the material to a facility that is appropriately permitted and designed to manage it. The DOT Special Permit, DEP's regulations, and this TGD are designed to appropriately manage this scenario.

11. **Comment:** Any changes to the groundwater, leachate monitoring, and post-closure care standards should undergo a regulatory process that complies with the Commonwealth Documents Law and Regulatory Review Act, and other relevant principles of administrative law. It should also be addressed in technical discussions with the industry first. The regulations identify the Guidance as intended to address the use of radiation detectors on incoming waste loads, and the response to such loads. See 25 Pa. Code 273.140a; 30 Pa.B. 6685. Extending the Proposed Guidance to address general leachate and groundwater monitoring is not consistent with or authorized by the regulations. Because the regulation does refer to and specifically incorporates the Guidance Document with respect to "specifying procedures for monitoring for and responding to radioactive materials entering the facility, as well as related procedures for training, notification, recordkeeping and reporting," it should be limited to its specified, regulatory-identified purposes. These purposes do not include leachate and groundwater monitoring, which is addressed in other Department regulations and forms.

At a technical level, these issues have been addressed and continue to be addressed cooperatively between the waste industry and Pennsylvania DEP. The information obtained to date on leachate and groundwater monitoring does not support the statement suggesting long-term monitoring is appropriate for landfill leachate (the

information about leachate includes but is not limited to the 2015 and 2016 reports on TENORM including landfill leachate sampling). Therefore, the referenced statements in the Proposed Guidance seems premature and not advisable from a public health communication standpoint, given the risks previously analyzed and the conclusions reached by the Department regarding the 2015 TENORM Study. The blanket TENORM restrictions to date have utilized extremely conservative assumptions and the Department's study confirms the protectiveness of the Department's programs. "Large volumes" and "high concentrations" are not permitted under the Department's blanket authorization. Site specific authorizations utilizing the RESRAD model will also provide for reasonable levels of protectiveness. *NOTE: In the 2015 TENORM Study, the Department did not conclude there was a risk with respect to the leachate and groundwater pathways. As to that pathway, the solid waste regulations specify the requirements for post-closure certification at the relevant point of compliance. As to radon inhalation risk to a future resident farmer, that is a separate risk pathway and subject, and is addressed further within this comment letter.* **(23, 24)**

Response: After it was discovered and for the past 15 years, the Department has required all Pennsylvania landfills to monitor leachate for radioactive hydrogen-3 (tritium) and report those results to the Department annually. During a Senate hearing in 2006, our analysis noted there was little potential to exceed the US EPA's drinking water standard for tritium.

Based on a 1,600-year half-life of radium-226, DEP's modeling of public dose, which forecasts for 1,000 years, shows it will take 16,000 years for all the Ra-226 to decay in place, resulting in a long-term potential for groundwater contamination. Therefore, it is prudent that the Department begin analysis for Ra-226 and Ra-228 for all landfills. This is also prudent in that radium is naturally occurring, and even landfills that haven't accepted TENORM-containing waste may generate leachate that contains radium at measurable concentrations. Please refer to EPA's ISCORS studies published in 2004 at http://www.iscors.org/library.htm.

The Department is committed to maintaining a productive partnership with industry stakeholders. Should ongoing groundwater or leachate monitoring, or changes to post-closure care standards be deemed necessary, DEP will ensure that any changes to regulatory requirements are managed through the established regulatory process and in compliance with all applicable laws and regulations.

12. **Comment:** A commenter states the Department has suggested that some of the O&G activities could result in wastes being treated as 'radioactive' DOT Rad under the DOT rules. When waste materials are defined as radioactive under DOT, there are obligations for the personnel preparing the materials for shipment on public roads to properly classify, describe and provide markings and labels as required by DOT rules. In addition, the personnel handling the materials should receive HAZMAT training also as required by DOT rules. Lastly, the process that results in a suitable form for disposal, which is described under the Form U is similar to a process control program that results in a waste

suitable for burial. Waste concentrations of sludge do not generally appear to exceed both criteria to be classified as radioactive by DOT and radiation surveys of sludge in containers can determine whether they should be considered DOT radioactive material. **(2)**

Response: The Department agrees that any waste exceeding DOT concentrations for radioactivity in 49 CFR 173 should be prepared for shipment by an individual who has been properly trained in the procedures and obligations of shipping materials in compliance with DOT Class 7 HAZMAT. However, there may be a significant portion of waste derived from O&G activities that are not subject to DOT regulations. It is incumbent upon the shipper of the waste to quantify the concentrations of radium, TENORM or other radioactive elements and follow DOT's requirements. All materials that are transported on public roads must be shipped in accordance with DOT regulations. This TGD is intended to emphasize the existing federal requirements.

13. **Comment:** The commenter requests clarification regarding the DOT Special Permit for transport. In various sections of the guidance, Pennsylvania DEP will issue a "DOT Special Permit" for those loads that exceed an alarm level one or are otherwise rejected at the receiving facility and require further transportation for disposition that may not have been properly characterized as DOT regulated RAM or NORM/TENORM. It appears that the intent with this provision is to address unexpected RAM situations and not more typical O&G waste. However, the impact on what may be considered improperly classified O&G waste is not clear. In some cases, O&G waste that are "not DOT regulated" may in fact set off an alarm as the threshold is only 10 µR/hr above background. Hence a load could be rejected or held for a "special permit" needlessly. Accordingly, the guidance should make the expectations for O&G operators clearer. The commenter provided the following suggested language: "NOTE: Oil and gas well processing and wastewater treatment operators are expected to evaluate the level of RAM (e.g., radium-226) in fluids and sludges. Transport of these materials on public roads shall comply with the Federal DOT regulations in Title 49 of the Code of Federal Regulations as related to Class 7 HAZMAT "radioactive material" (e.g., see 49 CFR 173.403 and 173.436). Or, as an alternative, when prohibited or licensed RAM is detected, and the waste load is rejected because its prohibited or licensed RAM, a DOT Special Permit must be issued in order for the load to travel public roads to the destination unless the waste load is transported as Class 7 Radioactive Material. **(6, 18, 27, 29, 34)**

Response: The Department agrees that the process for determining whether a DOT Special Permit is necessary can be complex. In response, DEP revised the TGD to clarify the circumstances under which the issuance of a DOT Special Permit is warranted. DEP recommends that shipments of waste with the potential to be subject to DOT's rules regarding Class 7 radioactive materials be evaluated in consultation with a DEP radiation health physicist.

14. **Comment:** The commenter is concerned the Proposed Guidance may create confusion about when a DOT Special Permit should be required during instances

when loads of TENORM are rejected by a landfill. We believe the Proposed Guidance should refer to and be consistent with the Federal Regulations governing the applicability of the Hazardous Materials Regulation, 49 CFR Parts 171-180. The Proposed Guidance should refer specifically to DOT threshold for requiring a special permit, and that is calculated based on 49 CFR § 173.436. For total radium the exempt value is approximately 270 pCi/g, but the calculation depends on the specific elements detected in the sample (e.g., thorium-228 [Th-228] needs to be considered if detected, see 49 CFR 173.436, footnote b). ***NOTE:*** *There are also exemptions that may apply to natural material and ores containing naturally occurring radionuclides which are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in 49 CFR § 173.436. Waste Management does not contend that this exemption applies to processing of fracking water and does not rely on the 1Ox NORM factor in connection with determining the applicability threshold for a DOT Special Permit.*

In some sections, the Proposed Guidance suggests a DOT Special Permit is needed for any TENORM load that has been rejected by a disposal facility. However, Pennsylvania DEP itself has acknowledged that TENORM loads can be rejected for reasons that are unrelated to the DOT regulations, see Pennsylvania DEP Supplemental Waste Tracking Form, revised December 14, 2015.

The Proposed Guidance indicates a Federal DOT Special Permit is required for any "unexpected and unidentified radioactive material or contamination." This would include any TENORM that triggered an alarm, even if, for example, total radium concentrations were much lower than 270 pCi/g, or the other applicable thresholds in 173.436, or a landfill might have allocated its TENORM monthly allowance to other customers.

As a general threshold, the commenter assumes that a DOT special permit should only be required if waste load exceeds 49 CFR 173.436 thresholds. **(23, 24)**

Response: DOT has evaluated the 10x NORM factor in response to two requests relating to O&G-derived waste. Because an appropriate Ra-226 and Ra-228pCi/g value could take significant lab time and some cost, DOT concluded that the 10x NORM factor does not apply to TENORM-containing waste generated by O&G activity (See DOT interpretation letter(s), Reference No. 14-0159 and 13-0157). If radiation is detected in any load, issuing a DOT Special Permit enables the load to move promptly, instead of waiting 21 days for laboratory analysis that may confirm whether the thresholds of 49 CFR have been exceeded. Therefore, the Department is willing to issue a DOT Special Permit if TENORM is detected at a landfill but at unknown concentrations of Ra-226 and Ra-228. The TGD has been revised to clarify when a DOT Special Permit may be issued under these circumstances. Please also see DEP's response to Comment #13.

15. **Comment:** The commenter proposes revisions to the proposed definition of DOT Special Permit, as follows: Page 2 - DOT Special Permit: This special permit

authorizes the one-way transportation in commerce by highway or rail of shipments of scrap metal or solid waste which have been found, during or at the conclusion of transportation or during inspection of the shipment following its receipt, to contain radioactive material or contamination in excess of the applicable thresholds referenced in 49 CFR 173.436. The one-way transportation authorized by this special permit is exempted from the classification. **(23)**

Response: The proposed definition of DOT Special Permit remained in the TGD to maintain consistency with DOT's Pipeline and Hazardous Materials Safety Administration regulations. Additional information can be accessed at the following links:

- 49 CFR Parts 105-107 and Parts 171-180, under Docket HM-240 (70 FR 73156), which was published as a final rule on December 9, 2005. 05-23754.pdf (govinfo.gov)

- Hazardous Materials Special Permits List

    - https://www7.phmsa.dot.gov/approvals-and-permits/hazmat/special-permits-list

    - DOT-SP 10656 https://www.phmsa.dot.gov/hazmat/documents/offer/SP10656.pdf/offerserver/SP10656

    - DOT SP 11406 https://www.phmsa.dot.gov/hazmat/documents/offer/SP11406.pdf/offerserver/SP11406

16. **Comment:** The commenter notes that DEP has used the term DOT Special Permit as a replacement to DOT Exemption. Is this new? The accepting party of the waste must still seek DEP approval of a DOT Exemption Form if it must reject a load of TENORM waste. A DOT Special Permit sounds more involved. These facilities should not have to go through needless permit modifications to address this new policy, in whatever final form it takes. We suggest that rather than use this new term DOT Special Permit that it uses the already existing term "DOT Exemption" form in all of the places where this is mentioned. **(27, 29)**

Response: DEP acknowledges that its radiation protection regulations use the term "DOT Exemption." However, in 2005 DOT revised its terminology, replacing the term, "exemption," with "special permit." There is no additional regulatory burden associated with the change in DOT terminology. Therefore, the term, "DOT Special Permit," has remained in the TGD.

17. **Comment:** Because there are many different employers potentially involved with the drilling, operation and transportation of the potential TENORM, the Department should

use multi-employer safety program considerations such as used by OSHA. Multi-employer guidance from OSHA is available at: https://www.osha.gov/doc/accsh/accshwkgrpdoc/multiemployercitwkgrp.html. **(2)**

Response: The federal government has not directly regulated TENORM resulting from O&G activities, water treatment or other industries. The NRC and respective Agreement States, like Pennsylvania, have a regulatory system in place for radiation workers if the materials are licensed. However, TENORM resulting from O&G activity is not a licensed material. Since neither the NRC nor the Agreement States directly regulate NORM or TENORM, O&G workers are not automatically in this system. Nonetheless, if an O&G or other industrial operation does generate TENORM or has a source of ionizing radiation and they are not regulated by a federal or state agency for that source, the operation would be subject to OSHA's regulations in 29 CFR § 1910.1096. While this comment is somewhat outside the scope of the TGD, if an employer wanted to include its RP Action Plan into its overall occupational safety program, the Department would view this as a best management practice.

18. **Comment:** The TENORM Study Report states that scale inside pipes can range from 0.1 to 15,000 Bq/g. The concentration limit for DOT is 10 Bq/g, and the consignment limit is 10,000 Bq. It appears likely that many shipments of pipe will exceed classification as DOT radioactive material but unlike sludge, be unlikely to be detectable without sampling the material. The guidance is silent about scale. At a minimum, all pipes with scale should be capped to prevent scale from shaking out from inside the pipe to prevent spread of TENORM contamination. **(2)**

Response: The TGD does address the issue of TENORM scale discovered at well sites and metal recycling facilities by referencing the DOT requirements for shipping. Pipes or tubulars discovered to have TENORM-containing scale require evaluation for DOT shipping compliance, which includes packaging to prevent the release of radioactivity during transport. Low specific activity (LSA) RAM may also require wrapping pipes in plastic, shipping materials in an industrial box or use of exclusive vehicles with proper controls to prevent scale from leaking during transportation. Any O&G operation where the generation of pipe scale containing TENORM is anticipated should develop an RP Action Plan. Please see DEP's response to Comment #7 for additional information regarding the responsibilities of residual waste generators.

19. **Comment:** A commenter states that in 2015, the Pennsylvania DEP completed a comprehensive TENORM Study on O&G operations. The Department concluded repeatedly that there is little potential for radiological exposure to workers and the public during O&G operations. The study commented that filter cake from facilities treating wastes could pose a potential long-term disposal issue. Note that current solid waste management regulations related to waste characterization and disposal address potential disposal concerns of filter cake and other potential radiological wastes managed at area landfills through radiological monitoring and the disposal facilities monthly TENORM ton volume limits.

The Guidance Document lists a number of monitoring and reporting requirements for O&G well sites that are not supported by the 2015 TENORM Study and the Chapter 78a unconventional well site regulations. Furthermore, the 2015 TENORM report contained only two recommendations for natural gas well sites which do not correspond to the numerous proposed additions found throughout this Guidance Document:

a) To conduct research and investigation of vertical and horizontal drill cuttings for beneficial reuse, onsite disposal and future landfill disposal protocols. *The Department has accomplished the latter half of this recommendation by establishing the monthly landfill allocations which Pennsylvania DEP reviews yearly.*

b) Add sampling and analysis for Ra-226, Ra-228, and additional man-made radionuclides such as tracers used in the O&G industry to Pennsylvania spill response protocol for spills of flowback fluid, hydraulic fracturing fluid, or produced water. Field survey instrumentation should also be available for surveys of areas impacted by spills. *This Department has accomplished this recommendation prior to this proposed Guidance Document revision as sampling for TENORM radionuclides is currently required for the waste disposal of soils affected by spills as part of the department's waste profile approval process. Additionally, spill clean-up standards exist in Act 2 of the Environmental Cleanup Program and should not be modified through additions to a technical guidance document.* **(6, 15, 18, 22, 34)**

Response: Please see DEP's responses to Comments # 4, 5, 8, 9 and 10 for more information on the applicable regulatory requirements and radiation monitoring. DEP continues to follow-up on the recommendations made in the 2016 TENORM Study and will continue to utilize the readings from radiation monitoring combined with waste tonnage as the input for monthly source term allocations. DEP has begun an effort to evaluate radium in landfill leachate, as recommended by the 2016 TENORM Study. The Department has also recently coordinated its Emergency Response Program to perform radiation and radium monitoring when responding to spills.

20. **Comment:** The commenter suggests the guidance should clarify when materials other than waste need to be surveyed on receipt. **(2)**

Response: All waste received at a facility that is required to develop a RP Action Plan must utilize this guidance, including facilities that process or dispose of waste under a permit issued pursuant the SWMA, UIC wells and well sites where processing of waste takes place. In addition, facilities that accept scrap metal or otherwise choose to monitor incoming materials for radioactivity may also use this guidance document to develop a RP Action Plan.

Materials that are not "waste," as the term is defined in the SWMA, are not required to be surveyed for radioactivity. Given the physical difficulties in surveying or analyzing the wide variety and form of radioactive material that may be present, the TGD allows for the

applicant to propose methods of their choosing along with a justification. Material leaving the site may fall under various other state or federal regulations. The Department's approach to sources of radiation is to keep worker and public exposure ALARA.

21. **Comment:** The guidance refers to a 25 mrem limit from TENORM disposal, and all pathways combined. This should only apply to landfills and should be incorporated into the permitting for the landfill and not as a separate plan. The criteria for disposal at the landfill get communicated to entities disposing of the material, who then need to ensure that the load is appropriate for disposal. The commenter feels that this clutters the Action Plan Guidance with details that could be simply summarized as complying with the Waste Acceptance Criteria. **(2)**

Response: The RP Action Plan is incorporated by reference into the permit terms and conditions of all landfill permits, or other facilities processing or disposing of waste under a permit issued pursuant to the SWMA. The RP Action Plan is also incorporated by reference into the permit terms and conditions of all facilities processing waste prior to beneficial use or beneficially using waste under the authority granted by a general permit issued pursuant to the SWMA, where the development and implementation of a RP Action Plan is required by the permit. A facility that wishes to modify its RP Action Plan may only do so through a permit modification that is reviewed and acted on by DEP. The 25 mrem criteria is applicable to all landfills. The 25 mrem limit is a common clean-up and low-level radioactive waste disposal criteria and was employed in DEP's modeling on which it based Pennsylvania's disposal protocol for TENORM-containing waste.

Generators of residual waste that is suspected to contain TENORM also have an obligation to chemically and physically characterize waste prior to transporting it for processing or disposal. The generators' responsibility serves to inform the receiving facility of the nature of the waste being sent for processing or disposal and ensures that transportation occurs in a manner protective of human health and the environment. For additional information, please also see DEP's response to Comment #7.

22. **Comment:** The guidance recommends that the Action Plans describe potential exposure pathways including the radon pathway "turned on." This expression is understood that in a model, the pathway can be included in the dose calculation or not. The document should explain applicability of radon modeling inside a building vs. during outdoor operations. An alternative could be a screening value for total materials handled in a year where it is not possible to exceed significant radon dose; a source term for the facility operation per year can be used in a manner similar to a screening code such as EPA's COMPLY code.

AP-42 is a good computer code for many of the kinds of applications. Referring to computer codes commonly used by regulators for pathway analysis and dose modeling, e.g., the EPA's CAP88 (CAP88-PC is not a near field model applicable to onsite exposure. Suggest using AP-42 or other, simpler models as examples) or DOE/NRC's family of RESRAD codes require knowledge of local weather data as inputs. Many of

these sites do not have a met tower with annual wind speed and direction or temperature variations. Using CAP88 requires a level of sophistication that may be unnecessary given the proximity of the sites to affected populations and particularly useless for near field occupational exposures. **(2)**

Response: The Department's modeling uses essentially all the default values in the NRC's family of RESRAD codes, so the local weather data and other inputs mentioned by the commentator are not necessary. The radon pathway is required to be 'turned on' as a default parameter, because waste disposal facilities that are permitted pursuant to RCRA Subtitle D are not subject to long-term perpetual control, and it is assumed there may not be land use controls in place for the 16,000 year decay period of Ra-226. This ensures public protection for any disposed TENORM-containing waste. With the recent proposals for evaporators at landfills and well sites, the Department has removed the reference to the CAP88 air modeling code and now refer to EPA's air dispersion codes instead.

23. **Comment:** The RESRAD Model, with all due respect, sometimes the government needs to take a fresh look at its regulations and why they came into existence. For example, the RESRAD Model takes into the consideration that they want to make sure the proverbial farmer would be okay to build a house on top of an old landfill based upon the assumption that there are no more government controls, and NO ONE would know they are building on top of a landfill. Perhaps this Model should be reevaluated? Instead, government should focus on the probable instead of the improbable. I think Pennsylvania DEP is moving in the right direction with respect to some of their adjustments it has made over the past number of years in looking at the dose to humans; however, we need this and future regulations to be based on facts and science and not public fear. If public fear is a factor, then the state should look to educating the general public rather than trying to change regulations to calm unwarranted public fear. **(29)**

Response: The TGD references RESRAD as an example of commonly used codes for pathway analysis and dose modeling. The 'resident farmer' scenario in the RESRAD model is a well-established construct in the field of radiation protection, facility decommissioning, and radioactive waste disposal. The Department is open to considering other modeling approaches that have been as widely utilized as RESRAD and subjected to the same level of peer and public review. Please also see DEP's response to Comment #22.

24. **Comment:** In a couple areas of the document, the default values associated with the dose assessment modeling create limitations for the volumes of O&G waste a site might accept. The guidance document requires solid waste facilities to rely on dose assessment modeling (such as the RESRAD model) for compliance with the exposure limits for the general public. Risks are artificially elevated with the default values typically used by the RESRAD model when these dose assessments are run; consequently, it may be more appropriate to use actual site data, such as site radon measurements and more realistic values for "radon emanation" from waste for these modeling exercises. Over conservative assumptions and default factors will significantly lower the volume of

NORM/TENORM waste any given facility will be able to manage thereby needlessly limiting the disposal options available to companies. The guidance should specify that dose modeling should be based on reasonable potential exposure scenarios rather than worst case exposure scenarios and that site-specific dose modeling assumptions can be utilized. **(34)**

Response: Please see DEP's response to Comments #22 and #23 for more information on dose modeling. Pennsylvania's TENORM disposal protocol treats all facilities generically in terms of dose modeling and establishing source term allocations. Should a facility wish to approach TENORM disposal with a site-specific model, study of geohydrology and data set, the Department would be willing to evaluate the proposal and solicit public comment.

25. **Comment:** The commenter states it is nice that the table with nuclear medicine radionuclides is listed and could be referenced when characterizing wastes received at transfer stations and landfills. The information on quantities that can be released in a patient are not material to the Guidance. Similarly, while phosphorous-32 (P-32) might be in waste the only way someone would know is if there was a bag that was labeled which means inappropriate disposal not patient waste. **(2)**

Response: In accordance with 25 Pa. Code §§ 273.201 and 288.201 (relating to basic limitations for municipal and residual waste landfills, respectively) and 25 Pa. Code §§ 279.201 and 293.201 (relating to basic limitations for municipal and residual waste transfer stations, respectively), landfills and transfer stations are prohibited from processing or disposing of radioactive material controlled under a specific or general license or order authorized by any federal, state or other government agency, unless exempted by an applicable Pennsylvania or federal statute or regulation. Other materials, such as short-lived radioactive material from patients that have undergone a medical procedure, TENORM, or consumer products containing radioactive material, may not be processed or disposed at landfills and transfer stations unless approved in writing by the Department, and the processing or disposal does not endanger the environment, facility staff or public health and safety. Further, applications for these facilities are required to contain procedures for monitoring and inspecting incoming waste material to ensure waste satisfies the facility's permit and applicable regulations.

DEP acknowledges the commentator's remarks relating to P-32. The information referenced by the commentator was existing language that appeared in the previous version of the TGD and may be useful to those facilities managing waste in the commonwealth. Therefore, the information was retained in the TGD.

26. **Comment:** All unconventional O&G well pads should be required to develop RP Action Plans since the operators of these facilities produce and often store high volumes of wastewater with high levels of TENORM on site. **(5)**

Response: DEP's oil and gas regulations at 25 Pa. Code § 78a.58 only require well sites where waste is processed onsite to have a RP Action Plan. Waste processing

significantly increases the risk of concentrating radionuclides and creating TENORM in solids and sludges resulting from the processing activity. A RP Action Plan would alert an O&G well operator that is processing waste onsite that radioactivity in the waste may be detected by radiation monitoring equipment at the receiving facility and be limited in the amount of waste that can be disposed of at the facility.

In addition, all generators of residual waste, including well sites, are required by DEP's residual waste regulations to chemically and physically characterize the waste prior to transporting it for processing or disposal. While not all generators are required to develop an RP Action Plan, the generators' responsibility to characterize the waste it generates serves to inform the receiving facility of the nature of the waste being sent for processing or disposal and ensures the appropriate transportation of that waste to the receiving facility. Please also see DEP's response to Comment #7.

27. **Comment:** O&G field produced water in the northern Appalachian Basin has been found to contain radioactive elements such as radium at levels much higher than the drinking water standard (Rowan, et al. 2011). Careful monitoring and tracking of radiation are needed on these sites in order to protect workers as well as the nearby public who may be unknowingly exposed. All well pads should be required to have a radiation monitor on site for the duration of operation and until all radioactive materials, including flowback water and drill cuttings, have been removed from the site. **(3, 4, 5)**

Response: The US EPA's drinking water standard is not an appropriate regulatory limit for management of produced water, and the 2016 TENORM Study showed that the exposure to workers and drivers, and thereby nearby members of the public, is low. DEP's regulations at 25 Pa. Code § 78a.58 require the protections that the commentator suggests. The TGD intends to assist the regulated community in developing RP Action Plans for performing regular radiation surveys around well pad equipment, tanks, vehicles and operations. Please also see DEP's responses to Comments #9, #26 and #32.

28. **Comment:** As part of the RP Action Plan, all forms of transportation of wastewater and drill cuttings from O&G activities must be carefully monitored. The term transportation includes both trucks and pipelines. Waste pipelines are largely unregulated and are not monitored for TENORM levels. These pipelines cross forests, streams, farms, and backyards, and they may leak. All operators should be required to place radiation monitor alarms on pipelines. If not possible, they should be required to monitor wastewater pipelines for TENORM regularly (at least monthly) and notify the public of the presence of radioactive materials in the pipes running underneath their communities so that they can be properly informed.

The RP Action Plan must detail the capability of monitoring for radiation, and of shutting off pipeline waste delivery, *at the source* of the waste flow for a residual waste pipeline. It must also define DEP inspection and verification of these capabilities for adequacy of implementation of the protection. **(3, 4, 5, 7, 10, 11, 16, 30, 32, 35)**

Response: A RP Action Plan must contain methods by which a facility or well site will detect the presence of radioactivity, identify the type of radioactivity present, measure the radiation emitted, and determine the actions needed to protect workers, the public and the environment from any radiation contained in the waste it receives. The RP Action Plan also must include procedures for the monitoring of areas where waste is stored at the facility. Further, any generator of residual waste must know the chemical and physical characteristics of the waste prior to transportation, including the radiological characteristics of the waste transported within Pennsylvania or the jurisdiction of DOT (i.e., determining whether the waste must comply with DOT Class 7 Hazardous Material regulations). For instances where oil and gas waste are transported via pipeline, the generator of the waste must evaluate the expected concentrations of Ra-226 plus Ra-228 to determine the applicability of any federal regulations found in Title 49 of the CFR. Procedures for the acceptance or rejection of waste accepted via pipeline must be addressed in the RP Action Plan. Evaluation of the waste's radioactivity should occur, and a determination made as to the applicability of 49 CFR prior to introduction of the waste into the pipeline and prior to transmission of said waste to the receiving facility or well site.

For well sites, the pipeline may be used during well development or ongoing operation of the well, depending on the stage of operation. Under 25 Pa. Code § 78a.68(b), there are several requirements related to well development pipelines, including installation and operational controls; shut off valves, check valves or other methods of segmenting the pipeline; and procedures to empty and depressurize the pipelines.

If a well site is receiving waste by pipeline, the generator of the waste is required by DEP's residual waste regulations at 25 Pa. Code § 287.54, to chemically and physically characterize the waste and as part of such, the concentrations of Ra-226 and Ra-228 must be evaluated prior to transmission to determine if any federal regulations under 49 CFR apply. Also, the well site receiving the waste is required to develop and maintain a RP Action Plan that includes procedures to follow when accepting or rejecting waste received by pipeline. These procedures are reviewed and approved by DEP through the OG-71 approval process.

O&G liquid waste may also be transported from a well site by pipeline to a facility operating under a waste management permit, such as General Permit No. WMGR123 (WMGR123). The permitted facility is required to develop and maintain a RP Action Plan that is reviewed and approved by DEP. The only instances where WMGR123 permittees receive oil and gas liquid waste via pipelines are those in which the WMGR123 permittee and the generator of the oil and gas liquid waste are the same entity. As a result, the generator can determine whether the oil and gas liquid waste can be accepted by the WMGR123 facility before it is pumped from the well site, so rejection of oil and gas liquid waste conveyed to the WMGR123 facility via pipeline is unlikely to occur. Should a WMGR123 facility determine that oil and gas liquid waste delivered via pipeline exhibits radiological properties that are so high that the facility does not want to process it, the generator would be responsible for arranging for the oil and gas liquid waste to be returned to the point of generation, delivered to an alternative facility that is

permitted to accept it, or disposed of. The generator would need to contact DEP's Bureau of Radiation Protection to obtain a DOT Special Permit before a vehicle could leave the site. Returning rejected oil and gas liquid waste to the generator via pipeline is not feasible.

Under either scenario, the Department would require an evaluation of the waste's radioactivity to occur and a determination made as to the applicability of Title 49 prior to introducing the waste into the pipeline and transferring it to the O&G well site or permittee. However, if an O&G operator or waste management permittee receives liquid waste by pipeline that exhibits radiological properties that so are high the facility rejects it for processing, the generator would need to arrange for it to be returned to the point of generation or transported to an alternative facility authorized to accept or dispose of it. The generator would need to contact the Department's Bureau of Radiation Protection to obtain a DOT Special Permit before a vehicle could leave the site. Returning rejected O&G liquid waste to the generator via pipeline is not feasible. The TGD has been revised to include specific mention of pipelines as a means of transportation.

29. **Comment:** If radioactive waste is permitted to travel, the trucks carrying O&G wastes need to be labeled as radioactive and hazardous to warn pedestrian drivers. Currently, trucks transporting radioactive fracking wastewater only need to be labeled as "residual waste." As a result, the trucks are treated with less scrutiny and are often found parked in public areas or traveling down residential streets where shale gas development is active. The appropriate labels would warn drivers of the risks of the load they are carrying. **(3, 4, 5)**

Response: Liquid waste generated from oil and gas operations must contain 270,000 pCi/L total radium in order to be classified and shipped as a Class 7 'radioactive material,' in accordance with US DOT HAZMAT requirements. DEP's TENORM Study did not find any liquid O&G waste that would trigger the 270,000 pCi/L US DOT HAZMAT concentration limit and require it to be shipped as Class 7 'radioactive material.' Therefore, the majority of trucks transporting material wastes do not require labeling as radioactive or hazardous waste.

30. **Comment:** Draft 250-3100-001 contains so many references to trucks as the transportation mode delivering waste to a site covered by an RP Action Plan that we might even say trucking is "hard-wired" into Draft 250-3100-001 as an exclusive focus. However, waste may be materialized at a site via several means other than delivery by truck, such as: Delivery by Pipeline, On-site production by industrial process (e.g., unconventional O&G drilling), and Concentration in leachate from other sources of on-site waste.

All of these may raise severe complications which are not dealt with in Draft 250-3100-001. Consider the following example from DEP records. On 2/26/2018, DEP issued Permit Number WMGR123SW025 to Chevron Appalachia1 for a facility known as the Dogbone Centralized Water Facility (Site ID 822441). A requirement for receiving a WMGR123 permit is to submit a Form X with an accompanying RP Action

Plan. In its Project Narrative for this facility, Chevron states: "Water will be transmitted to and from the Dogbone Centralized water Facility using both water trucks and piping." However, there is no mention of pipeline delivery of "residual waste" (i.e., unconventional natural gas well pad flowback, produced water) in the RP Action Plan. Draft 250-3100-001 discusses the prospect of "*rejecting*" a waste load. How exactly is this to be accomplished when the waste is delivered via pipeline? Likewise, the Dogbone RP Action Plan states: "If gamma radiation is detected at or above 100 µR/hr above background and determined to be valid, Chevron will reject the load, and have it returned to its point of origin or alternative destination as directed by the operator responsible for the generation of the water or by Pennsylvania DEP." There is no consideration at all of what will happen if radiation of material inbound via pipeline exceeds the standard.

Draft 250-3100-001 contains a definition section, in which "facility" is defined at Page 3, which specifically includes "transportation and storage facilities." A pipeline is clearly a transportation facility, which implies a Residual Waste Pipeline delivering O&G wastewater to a waste processing facility MUST BE COVERED in an RP Action Plan. For Draft 250-3100-001 to be silent on the subject of wastewater delivery pipelines is simply unacceptable.

Waste pipelines are problematic on the output side as well as the input side. There are landfills that deliver leachate to sewage treatment plants via pipeline. Chestnut Valley Landfill, DEP (Site ID 240681) is a landfill in German Twp, Fayette County, which accepts O&G Waste material. The DEP Bureau of Air Quality Review Memo for its Title V Air Quality Permit states: "The leachate is stored in 1.9-million-gallon glass-lined steel tanks equipped with secondary containment prior to being pre-treated and pumped to the POTW in South Union Township." There are numerous complications here, none of which is mentioned in Draft 250-3100-001. Should the receiving Sewage Treatment Plant be required to file an RP Action Plan? Should a landfill pumping leachate to another facility be required to monitor that pipeline and shut it down when specified radiation levels are exceeded? (Of course, all of these arcane points beg the question of whether leachate pipelines from landfills receiving O&G Waste should simply be *prohibited*. There is in fact a court case on this exact issue. See Case Number 1046 of 2019 G.D., Fayette County Court of Common Pleas, for a case involving a leachate pipeline from the Tervita Rostraver Landfill to the Belle Vernon Sewage Treatment Plant; the company operating the landfill has been *enjoined* from pumping leachate to the sewage treatment plant.). **(30, 35)**

Response: Please see DEP's response to Comment #28.

31. **Comment:** The improper disposal of O&G wastes, both solid and liquid, continues to pose a threat to public drinking water sources. The practice of allowing publicly owned sewage treatment plants, also known as POTWs, to take drilling waste fluids was prohibited in 2012 after it was discovered that it was impacting the discharge from these plants into public waters. The increase in total dissolved solids and bromide in particular were causing problems for public drinking water authorities downstream. Carcinogenic trihalomethanes were being generated during the disinfection (i.e., chlorination) process.

The prohibition initially led to a decrease in bromide levels in the three rivers and many drinking water plants switched to chloramination, at public expense. This problem has now reemerged.

The Pennsylvania DEP currently allows sanitary landfills to take drilling wastes, both solid and liquid, up to 80% volume per day. The solids, such as drill cuttings are buried along with municipal waste and used as cover. The liquids, which may contain drilling fluids, flowback, and produced water, are "immobilized" (often just with wood chips) and buried along with the municipal waste. The solids, usually in rolloff containers, must past through a rad detector to ensure the load is less than 140 mrem. Tankers carrying liquids are typically scanned with a pan-type geiger counter held six inches from the truck. Both are insufficient and subject to underestimating the actual amount of radioactivity.

Given the high concentrations of TENORM present in O&G waste, the DEP should require that landfills accepting unconventional O&G waste regularly monitor leachate and groundwater for total radium-226 (Ra-226) plus radium-228 (Ra-228). The results need to be reported to any wastewater treatment facilities accepting this leachate. In addition, the landfills should implement an RP Action Plan to reduce radium as part of the pre-treatment requirements. Doing so would prevent situations like what occurred at the Belle Vernon Municipal Authority, which unknowingly accepted contaminated leachate from a landfill that accepts O&G wastes (Frazier 2019) and let it pass through its sanitary treatment facility. As a result, their wastewater system was compromised, causing them to discharge pollutants such as radium into the Monongahela River at levels higher than permitted by the drinking water standard. They had been receiving leachate from the Westmoreland County land fill, from 100,000 to 300,000 gallons a day. The leachate was so toxic it killed the microbial population that was supposed to treat the sewage. I was able to obtain samples of the leachate and the discharge from the POTW. The chemical (anions and cations) analysis of the leachate showed it was similar in composition to produced water, having high chloride and bromide levels, as well as radioactive radium (370 pCi/L). The discharge from the POTW also had similar constituents, including bromide and radium, although more dilute. This discharge exceeded the permitted amount of total dissolved solids by almost three times and was going directly into the Monongahela River. The Charleroi Municipal drinking water facility is about a mile downstream. They have been having issues with trihalomethanes since at least 2015 (as evidenced by the notification sent out August 31, 2015, PWS ID#5630039). Thanks to a court injunction, the POTW is no longer receiving leachate from the landfill and is now back in compliance for their discharge. I confirmed this when I revisited the plant at the end of May and took additional samples.

https://publicherald.org/pennsylvania-is-discharging-radioactive-fracking-waste-into-rivers-as-landfill-leachate-impacting-the-chesapeake-bay-ohio-river-watersheds/

https://stateimpact.npr.org/pennsylvania/2019/09/11/how-did-fracking-contaminants-end-up-in-the-monongahela-river-a-loophole-in-the-law-might-be-to-blame/

There are at least 15 sanitary landfills in Pennsylvania that are reported to be taking O&G wastes. This waste is hazardous and should be treated as such and disposed of appropriately (i.e., licensed hazardous waste facility). It is also clear that this practice is affecting the quality of the landfill leachate, rendering it more toxic and radioactive. Allowing this leachate to be disposed of at POTWs threatens the operation of these wastewater facilities and is facilitating the discharge of O&G wastes into the waters of Pennsylvania. Similar to the prohibition on direct discharge to POTWs, the practice of bringing radioactive solid and liquid drilling wastes to sanitary landfills must be prohibited.

Radioactive leachate must not be sent to treatment facilities not designed to handle such waste. One glaring deficiency in this Technical Guidance Document is the lack of guidance to landfill operators for reducing radium to the pre-treatment limits. To protect public health, landfills that accept O&G wastes need to routinely monitor their leachate for TENORM and report these results. **(3, 4, 5, 9, 31)**

Response: DEP acknowledges the commenters' remarks. The 2016 TENORM Study evaluated the concentration of radium in landfill leachate to evaluate the impact to treatment by a POTWs. While neither landfill leachate nor oil and gas liquid waste are subject to NRC regulation, DEP used the NRC's standards contained in 10 CFR Part 20, Appendix B for comparative purposes in the 2016 TENORM Study. The study found that any observed concentration of radium was below the NRC's limit for radium directed for treatment to a POTW of 600 pCi/L radium. Further, landfill leachate or waste generated by oil and gas activity does not typically meet the toxicity characteristics to be categorized as a hazardous waste, as the term is defined by EPA at 40 CFR 260, and incorporated by reference into DEP's hazardous waste regulations at 25 Pa. Code § 260a.1 (relating to definitions). Generally speaking, biological organisms utilized POTW for the removal of organic material contained in the wastewater are resistant to radioactive exposure. Further, natural radium found in groundwater has been documented to contribute to radium in POTWs; likewise, natural radium has been observed in most POTWs, as documented by EPA in studies posted in the ISCORS library accessible from the following url: http://www.iscors.org/library.htm

Following the recommendations provided in the 2016 TENORM study, DEP has initiated an evaluation of landfill leachate for Ra-226 and Ra-228 to determine the range of concentrations that may be observed in landfill leachate, compare any detected radium to the NRC's standards in 10 CFR Part 20, Appendix B, identify any correlation between an observed concentration of radium and waste acceptance practices at the facility, and ensure that landfill leachate does not contain concentrations of radioactivity that would present a harm to a wastewater treatment process. Due to naturally high concentration of radium in Pennsylvania's native soil and subsurface geology, the presence of natural radium in leachate is likely, regardless of whether a facility has accepted waste resulting from oil and gas activity or TENORM-containing waste. Please also see DEP's response to Comment #8.

32. **Comment:** There is no requirement for local government to be informed that a project will require an RP Action Plan (e.g., via the Act 14 notification process). The whole legislative purpose of Act 14 is to give local government a heads-up about permits that might conflict with local government provisions such as zoning requirements. But Act 14 notifications are silent on permit requirements for an RP Action Plan. This needs to be fixed! **(7, 10, 11, 12, 16, 30, 32, 35)**

Response: Section 3211(b)(2) of the Oil and Gas Act of 2012 requires that when an oil and gas well operator submits a well permit application to the Department, the operator must also, "forward by certified mail a copy of the plan to the surface landowner; the municipality in which the tract of land upon which the well to be drilled is located; each municipality within 3,000 feet of the proposed unconventional vertical well bore; the municipalities adjacent to the well; all surface landowners and water purveyors, whose water supplies are within 1,000 feet of the proposed well location or, in the case of an unconventional well, within 3,000 feet of the proposed unconventional vertical well bore; storage operators within 3,000 feet of the proposed unconventional vertical well bore; the owner and lessee of any coal seams; and each coal operator required to be identified on the well permit application." See 58 Pa.C.S. § 3211(b)(2). This is the mechanism to inform the local municipalities and other affected parties that a permit to drill an oil and gas well is being sought and activities associated with drilling the well may occur at the site once the well permit is issued.

Facilities operating under a permit issued pursuant to the SWMA that are required to develop and implement a RP Action Plan, including both facilities permitted to process or dispose waste and facilities operating under a general permit for the processing of waste prior to beneficial use or the beneficial use of waste, must provide a copy of the application for a permit to the host municipality and the appropriate county, county planning agency and county health department, if one exists, at the same time that the application is submitted to DEP for review. The copy of the application provided to local or county governments must include a copy of the RP Action Plan.

33. **Comment:** Why are local officials taken out of the process?

Response: Facilities operating under a permit issued pursuant to the SWMA that are required to develop and implement a RP Action Plan, including both facilities permitted to process or dispose waste and facilities operating under a general permit for the processing of waste prior to beneficial use or the beneficial use of waste, must provide a copy of the application for a permit to the host municipality and the appropriate county, county planning agency and county health department, if one exists, at the same time that the application is submitted to DEP for review. The copy of the application provided to local or county governments must include a copy of the RP Action Plan

34. **Comment:** RP Action Plans should also be on file with local municipalities that house facilities and available for public inspection, as are (and with) annual reports submitted to the Pennsylvania DEP. **(17)**

Response: To process oil and gas waste at a well site, an oil and gas operator must submit a Request for Approval of Alternate Waste Management Practices Form (Document No. 8000-PM-OOGM0071AU) to the Department in accordance with 25 Pa. Code § 78a.58(a), (d), and (g). In the Request for Approval of Alternate Waste Management Practices Form instructions for Residual Waste Treatment/Processing, a RP Action Plan must be developed and submitted along with the Request for Approval of Alternate Waste Management Practices Form using DEP's Green Port system. Records of these submissions and associated attachments are made available to the public on the Department's web site under Oil and Gas Reports/Interactive Submissions/Oil and Gas Electronic Submissions. Please also see DEP's response to Comment #32.

35. **Comment:** There is no requirement for remote monitoring of radiation alarms. What happens if a waste load arrive in the middle of the night and the radiation monitor has been turned off? **(7, 10, 11, 16, 30, 32, 35)**

Response: Facilities operating pursuant to a permit issued under the residual waste regulations are required to monitor incoming waste for radioactivity and must monitor all loads of incoming waste. These facilities are also subject to unannounced inspections by DEP, and operational hours must be identified in the permit application. Upon issuance of a permit, the approved hours of operation must be followed. Also, the facilities must prepare and provide to DEP annual reports on all detection of radioactivity alarms with related details. Further, the detectors are continuously monitoring radioactivity, including radioactivity attributed to natural background. Therefore, if a monitor was turned off, there would be no data. The absence of any data, including background data, would make the scenario described by the commentator obvious to identify and unlikely to occur.

36. **Comment:** The public must be provided access to RP Action Plan-related documents. All logging and reporting under an RP Action Plan must be done electronically and the public must be given access to these documents. **(3, 4, 7, 10, 11, 12, 16, 30, 32, 35)**

Response: While records are not required to be placed on a publicly accessible website, records can be requested at any time. Information requests related to a specific facility or well site should be directed to the DEP regional office having jurisdiction over the operation. Please also see DEP's response to Comment #34.

37. **Comment:** Well pad on-site waste processing is being authorized without permit numbers. In Fayette County, we have seen numerous authorization records from DEP's eFACTS system of type ALT RW where the permit number is blank. This should be prohibited. **(7, 10, 11, 16, 30, 32, 35)**

Response: Section 3273.1(a) of the 2012 Oil and Gas Act states:

The obligation to obtain a permit and post a bond under Articles III and V of the act of July 7, 1980 (P.L.380, No.97), known as the Solid Waste Management Act, and to provide public notice under section 1905-A(b)(1)(v) of the act of April 9, 1929 (P.L.177,

No.175), known as The Administrative Code of 1929, for any pit, impoundment, method or facility employed for the disposal, processing or storage of residual wastes generated by the drilling of an oil or gas well or from the production of wells which is located on the well site, shall be considered to have been satisfied if the owner or operator of the well meets the following conditions:

(1) the well is permitted under the requirements of section 3211 (relating to well permits) or registered under section 3213 (relating to well registration and identification);
(2) the owner or operator has satisfied the financial security requirements of section 3225 (relating to bonding) by obtaining a surety or collateral bond for the well and well site; and
(3) the owner or operator maintains compliance with this chapter and applicable regulations of the Environmental Quality Board.

While an oil and gas operator is afforded certain exemptions from obtaining a permit under the SWMA, by law, they must submit a Request for Approval of Alternate Waste Management Practices Form (Document No. 8000-PM-OOGM0071AU) to the Department in accordance with 25 Pa. Code § 78a.58(a), (e), and (g). In the Request for Approval of Alternate Waste Management Practices Form instructions for Residual Waste Treatment/Processing, a RP Action Plan must be developed and submitted along with the Request for Approval of Alternate Waste Management Practices Form via DEP Green Port. All oil and gas well permits associated with the proposed Alternate Waste Management Practices being submitted must be listed on the form. Records of these submissions and associated attachments are made available to the public on the Department's web site under Oil and Gas Reports/Interactive Submissions/Oil and Gas Electronic Submissions.

When a Request for Approval of Alternate Waste Management Practices is approved by the Department, an Authorization Number and a new Primary Facility representing the specific type of alternate waste management practice (RWPL – Residual Waste Processing Locations, TSS – Temporary Storage Structure or DP- Disposal Location) are created in eFACTS under the same eFACTS SITE ID NUMBER that the well permit(s) and ESCGP are issued under. Alternate Waste Management Practices coded as RWPL – Residual Waste Processing Locations, require submission of a RP Action Plan.

Please also see the response to Comment #33.

38. **Comment:** Attachment A presents a selection of eFACTS Authorization records in which the permit number is blank. A few are of type Temporary Storage, but most are of type Residual Waste Processing. Which of these applications should require an RP Action Plan under Draft 250-3100-001? The fact that the permit number is blank is severely problematic on a number of grounds. What permit number is a member of the public supposed to provide to DEP to do File Review on one of these applications? Under what kind of referencing should the public trace inspections for these applications? Indeed, how is DEP itself supposed to determine whether the application is supposed to

include an RP Action Plan? For which Authorization Types is an RP Action Plan mandatory? What are the instructions to industry for preparing well pad applications of type Residual Waste Processing regarding inclusion of an RP Action Plan in the application? Lack of clarity on such issues is exactly what a TGD is supposed to dispel, not create!

An obvious way to read 25 Pa. Code § 78a.58 would suggest that *every* application for a well pad of type Residual Waste Processing requires an RP Action Plan unless it meets the specific exemptions specified in 25 PA Code § 78a.58(b). Is this what DEP intends? If not, what is the rationale?

Lack of permit number here has some unfortunate interactions with other issues discussed above. The requirement for an Act 14 notification for well pad erosion and sediment control (E&S) applications is statutory. The site id for many of the applications shown in Attachment A below is the same site id as for the E&S permit. Is omission of the permit number being done to specifically evade the requirement for Act 14 notification in the case of a well pad Residual Waste Processing application? One certainly hopes not!! **(30, 35)**

Response: Section 3273.1(a) of the 2012 Oil and Gas Act states:

The obligation to obtain a permit and post a bond under Articles III and V of the act of July 7, 1980 (P.L.380, No.97), known as the Solid Waste Management Act, and to provide public notice under section 1905-A(b)(1)(v) of the act of April 9, 1929 (P.L.177, No.175), known as The Administrative Code of 1929, for any pit, impoundment, method or facility employed for the disposal, processing or storage of residual wastes generated by the drilling of an oil or gas well or from the production of wells which is located on the well site, shall be considered to have been satisfied if the owner or operator of the well meets the following conditions:

(1) the well is permitted under the requirements of section 3211 (relating to well permits) or registered under section 3213 (relating to well registration and identification);
(2) the owner or operator has satisfied the financial security requirements of section 3225 (relating to bonding) by obtaining a surety or collateral bond for the well and well site; and
(3) the owner or operator maintains compliance with this chapter and applicable regulations of the Environmental Quality Board.

While an oil and gas operator is afforded certain exemptions from obtaining a permit under the SWMA, by law, they must submit a Request for Approval of Alternate Waste Management Practices Form (Document No. 8000-PM-OOGM0071AU) to the Department in accordance with 25 Pa. Code § 78a.58(a), (e), and (g). In the Request for Approval of Alternate Waste Management Practices Form instructions for Residual Waste Treatment/Processing, a RP Action Plan must be developed and submitted along with the Request for Approval of Alternate Waste Management Practices Form via DEP

Green Port. All oil and gas well permits associated with the proposed Alternate Waste Management Practices being submitted must be listed on the form. Records of these submissions and associated attachments are made available to the public on the Department's web site under Oil and Gas Reports/Interactive Submissions/Oil and Gas Electronic Submissions.

When a Request for Approval of Alternate Waste Management Practices is approved by the Department, an Authorization Number and a new Primary Facility representing the specific type of alternate waste management practice (RWPL – Residual Waste Processing Locations, TSS – Temporary Storage Structure or DP- Disposal Location) are created in eFACTS under the same eFACTS SITE ID NUMBER that the well permit(s) and ESCGP are issued under. Alternate Waste Management Practices coded as RWPL – Residual Waste Processing Locations, require submission of a RP Action Plan.

Please also see the response to Comment #33.

39. **Comment:** Some counties have a few of the guidance items in regulations (e.g., Allegheny County with III F.3), and thus, they greatly improve those counties operating without them. However, when possible, they should be moved into actual regulations. **(17)**

Response: The requirement to develop and implement a RP Action Plan is provided by DEP's municipal and residual waste and unconventional well regulations. The TGD is applicable to all solid waste processing or disposal facilities and well sites in the Commonwealth that are required by regulation or the terms and conditions of a permit to develop and implement a RP Action Plan. Counties may also adopt their own regulations. The decision to adopt specific guidelines as local regulatory requirements is within the discretion of the county, provided that it is in compliance with the law and not preempted by federal or state law.

40. **Comment:** The TGD Omits guidance of plans for and monitoring of municipal water treatment facilities that take in leachate with O&G radioactive waste through pipes from landfill then mix into facility, then discharge residual into creeks. EX: USA South Hills Landfill #100592 to Piney Fork Sewage Treatment Plan I.D. 100000151587 (II. A list). **(17)**

Response: The monitoring of incoming wastewater at wastewater treatment facilities is beyond the scope of the TGD. The TGD is applicable to facilities or well sites that process or dispose of solid waste and are required by regulation or permit condition to develop an RP Action Plan in accordance with this guidance document. However, the Department evaluated landfill leachate, along with a number of POTWs and sewage treatment plants (STPs) as part of its 2016 TENORM Study and is currently conducting follow-up sampling and testing for radium in landfill leachate. Regardless of how the waste is transported (i.e., truck or pipeline), any radioactivity in leachate that is sent to a POTW or STP discovered accumulating in treatment facilities or the environment that exceeds applicable EPA, NRC and/or DEP guidelines will require additional

investigation and potentially clean-up. This clean-up could be required under a Consent Order & Agreement. Please also see DEP's response to Comments #8, #28, and #31.

41. **Comment:** Annual tests are needed to monitor for radioactive indicators (e.g., barium, dissolved solids and subsequent increases) of O&G waste, especially TENORM, since Radium 226/228 can be less than the 25mcr levels yet show increases in other indicators. These levels should then be reported annually to the Pennsylvania DEP with increases noted. **(17)**

Response: It is unclear what is meant by the phrase, "25mcr levels," in the comment. Well sites where processing of waste occurs are required by 25 Pa. Code § 78a.58 (relating to onsite processing) to develop and implement a RP Action Plan to monitor for radioactivity in wastes generated as a result of the processing activity. Section III.F of the TGD was revised to clarify that well sites required to develop and implement a RP Action Plan must follow any annual reporting requirements of the alternative waste management authorization issued for the processing activity.

Solid waste processing, disposal or beneficial use facilities that are required to develop and implement a RP Action Plan must evaluate the chemical and physical characteristics of incoming waste, in addition to monitoring for radioactivity. Solid waste processing, disposal or beneficial use facilities that are required to develop and implement a RP Action plan must also report annually to DEP information relating to the waste received. Section III.F was revised to clarify the reporting requirements for these facilities. Please also see DEP's response to Comment #48.

42. **Comment:** The Radiation Health Physicist in Pennsylvania DEP's regional office must review and monitor all reports of facilities and sites that accept TENORM with special scrutiny given to those facilities and sites permitted by Pennsylvania DEP. **(17)**

Response: A DEP Central Office Radiation Health Physicist (RHP) reviews all annual reports required by the TGD. DEP will implement the TGD through a joint effort by the regional staff in the waste and radiation protection programs to review and inspect all landfills and their RP Action Plans to ensure proper landfill staff training is occurring and Plan implementation is effective. Further, all Action Level Two alarms are promptly investigated by Regional RHPs.

43. **Comment:** I am concerned about the quality of our water. I have two children under the age of 10 and would like to see an improvement on the reporting of what is in our public drinking water. The proposal of a guideline for what should be done about the situation shows that there is a concern. That being said, how do I know that when I turn on my tap, I am not consuming unwanted particles? It appears that the radioactive nature of hydraulic fracturing may not be conducive to the quality of water the citizens of Westmoreland County take pride in. Both of our families have resided within the area for centuries and it feels like a public injustice to require the residents to pay for water that is not safe to drink. **(19)**

Response: All public water supplies in the state must meet the maximum contaminant level (MCL) set by EPA in 40 CFR 141, including the MCL established for radionuclides. If you have concerns about your public water supply, you can request the supplier's most recent test results or contact DEP for results related to routine testing of public water supplies. If you have a private drinking water supply, you may contact the DEP regional office having jurisdiction over the county in which you reside for a water test kit and a list of certified labs that can test for radionuclides. However, the regulation of our best management practices that should be implemented for drinking water sources is beyond the scope of the TGD.

44. **Comment:** The proposal to require long-term monitoring of leachate and groundwater for "large volumes" "and" "high concentration" wastes that are "routinely disposed of" in a landfill is vague and ambiguous. It does not define what are large volumes and high concentration TENORM wastes and provides neither the public nor the regulated community with due notice of what would trigger such a major modification to a landfill, requiring a change in post closure plans and other modifications. Is the statement intended to apply to drill cuttings? To sludges? To other waste streams?

Moreover, it is not clear why merely acceptance of large volumes of, for example, drill cuttings (RWC 810 waste), would trigger additional long monitoring requirements, when such material bears a lower level of radiation (radiation is everywhere) that rarely triggers the monitoring alarms (less than 1% of loads). As to alarm-triggering waste, the Department's existing policies, including the TENORM 2% policy (citation) and the subsequent waste allocation spreadsheets substantially limit TENORM acceptance to a fraction of actual waste volumes accepted. They also use very conservative assumptions that are protective of future-use scenarios. Therefore, long term monitoring of leachate for Ra-226 plus Ra-228 would not seem warranted. This is particularly true given Pennsylvania's very high levels of radium in native soils, and high background concentrations of radon gas.

There is significant precedence, both in the Commonwealth's other regulations and guidance and in the regulation of TENORM nationally for ensuring that background contributions of contaminants (radionuclides) are considered when setting standards and limits.

Pennsylvania landfills have maintained disposal of TENORM in average concentrations of the radon dose experienced by the average Pennsylvania with or without today's existing controls (basement fans).

Landfills should be allowed to demonstrate, through scientifically valid and accepted methods, that TENORM deposited in the landfill will not increase the risk to a future resident farmer beyond that which any other farmer throughout the Commonwealth is exposed from naturally occurring radiation.

In 2016, Waste Management provided documentation to the Department on these subjects which is Attachment A to this comment letter. We believe these sentences should be removed from the Proposed Guidance or substantially revised. First the Proposed Guidance has never been intended to address leachate or groundwater monitoring, and it is not authorized to do so by regulation. Issues regarding long-term monitoring of leachate and post-closure care are addressed by the solid waste management regulations, and include the radiation issues (for example, the final regulations identify the point of compliance for the radium drinking water standard at the perimeter of the landfill for final closure).

We believe the following statement in the Proposed Guidance does not meet the requirements in the Commonwealth Documents Law and the Regulatory Review Act, as it constitutes a binding norm: "DEP will only accept modeling that shows the radon pathway turned on." "DEP [will] ensure that the dose to a member of the public residing on the landfill in the future will not exceed 25 mrem/yr with all exposure pathways (including radon) considered. These statements should be removed from the Proposed Guidance. **(23, 24)**

Response: The language referred to by the commentators relating to a potential for long-term monitoring of leachate or groundwater reads as follows in Section II.B: If large volumes and high-concentration TENORM wastes are routinely disposed of in a Commonwealth landfill, DEP may require long-term monitoring of leachate and ground water for total radium-226 plus -228. This may require providing appropriate justification and/or pathway analysis for modeling potential radiation exposure to the public and facility.

DEP has granted approval to dispose of tons of TENORM-containing waste in Pennsylvania landfills based on theoretical modeling. Even though the modeling is conservative, DEP tracks the volume and associated radioactivity of TENORM-containing waste accepted at Pennsylvania landfills and uses that data to verify that the assumptions on which DEP's TENORM disposal protocol remain protective of human health and the environment, keeping all landfills below the 25mrem/year threshold. Additionally, DEP has recently initiated an evaluation of radium in landfill leachate, regardless of the amount of TENORM-containing waste received in recent years. Disposed waste may contain a myriad of substances that can cause changes in the waste mass of a landfill. For example, drill cuttings have the potential to contain pyrite, which is very acidic, which may change the way that elements such as radium and uranium leach or percolate through the waste mass. Further, the modeling of radium transport is theoretical and is more accurately confirmed by laboratory testing.

The language in the TGD simply indicates that based on DEP's ongoing evaluation of disposal practices, a need may arise to modify long-term monitoring requirements. Should ongoing groundwater or leachate monitoring, or changes to post-closure care standards be deemed necessary, DEP will ensure that any changes to regulatory requirements are managed through the established regulatory process and in compliance with all applicable laws and regulations.

The commentators also refer to language in the proposed TGD stating that DEP will only accept modeling showing the radon pathway turned on and recommends the removal of the referenced statements. Section II.C contains the following language: In all reviews of proposed RP Action Plans, DEP will perform evaluations to ensure solid waste processing or disposal and well site operations do not endanger the environment, facility staff, well site staff, or public health and safety. Therefore, proposed RP Action Plans should describe the potential radiation exposure pathways for workers and members of the general public and how these expected doses were modeled. For certain solid waste facilities or well site operations where processing or disposal of solid waste may release RAM to the environment, DEP recommends the use of computer codes commonly used by regulators for such pathway analysis and dose modeling, e.g., the EPA's various air dispersion codes or DOE/NRC's family of RESRAD codes. For disposal of TENORM-containing waste, DEP will only accept modeling that shows the radon pathway turned on. These codes and support documentation can be downloaded from various websites. However, valid manual calculations using dispersion equations and published dose conversion factors are equally acceptable to DEP. To validate TENORM landfill waste disposal "general public" dose calculations, and to monitor potential radium migration through waste, engineered barriers and soils, DEP may require long-term monitoring of leachate and ground water for total radium-226 plus -228, and possibly uranium / thorium and decay series.

The above language was included in the TGD to address additional radiation doses to the public or workers resulting from exposure to TENORM in waste, and to control the dose of radiation to the public or workers from the facilities. The Department has broad statutory and regulatory authority to control all sources of radiation exposure to the public, as provided by Act 147-1984 (as amended), including TENORM in solid waste disposed of in the Commonwealth. The TGD provides the ability for a facility to perform alternative or site-specific modeling. Please also see DEP's response to Comments #8, #11, and #23.

45. **Comment:** Water treatment and distribution systems and center need to install equipment required to test for radioactive materials in the drinking water immediately. **(26)**

Response: Monitoring of radioactive materials in drinking water is beyond the scope of the TGD. The TGD sets forth guidelines for facilities or well sites that are required by regulation or permit to develop and implement a RP Action Plan. Please also see DEP's response to Comment #41.

46. **Comment:** It is well known that Marcellus Shale waste is radioactive and is presently being received at our sanitary landfills, which in turn, is being sent to our wastewater facilities that cannot clean this radioactive waste along with other chemicals and solvents. This is a serious problem and we, as citizens, have a right to reject the contamination of our land and water due to drilling activity. There are too many loopholes in what I have read so far. This is very complex and the public who is being directly affected need more

time to address this draft. I am asking that you consult with Dr. Marvin Resnikoff, Ph.D, Senior Associate at Radioactive Waste Management Associates and is an international consultant on radioactive waste management issues. Please let him review your draft and make suggestions/recommendations. **(28)**

Response: The Department agrees that addressing radioactivity at solid waste processing disposal facilities is critical to ensuring public health and safety, and protecting and preserving natural resources, including land and water. The Department has Certified Health Physicists on staff and under contract as consultants. All members of the public and regulated community, including industry experts, have been afforded the opportunity to review and provide comments on the TGD. Please also see DEP's responses to Comments #1 and #31.

47. **Comment:** Economic consideration: It is my understanding that DEP must take into consideration small businesses when drafting regulations and/or technical guidance documents. In 2009, when one of my client's was applying for a general permit (now known as the WMGR123), as part of the general conditions of that permit they were required to follow the existing TGD on RP Action Plans. To create the document, the company had to hire a Radiation Health Physicist to prepare the plan. The cost of doing so was quite substantial for a small startup company. The changes to the TGD are very complicated especially with all the references to other state and Federal statutes thereby increasing the time and cost to prepare these plans.

Although these plans are to protect the health and safety of workers and the general public, I would suggest that the plans be able to be written for the level of radiation activity rather than a one-size fits all approach. If you are operating a nuclear power plant, the plan should be very detailed. If you have medical waste or smoke detectors that have some radiation, then your plans should reflect these lower levels. The same for the O&G industry as most of the solid waste that is generated is lower levels of radiation. Thus, the cost would be reflected in the type of plan needed. I would suggest that DEP provide examples of RP Action Plans for the different types of or levels of waste that contains TENORM. These draft plans should only need the operator of TENORM to fill in site-specific information. This would reduce costs to small businesses and keep the plans consistent. **(29)**

Response: The previous version of this guidance document, which became effective on January 4, 2002, applied to solid waste processing and disposal facilities operating under an individual permit issued by DEP's waste program, or facilities operating under a general permit for the processing prior to beneficial use or beneficial use of waste, which were determined to need a RP Action Plan for the authorized activity, including facilities operating under General Permit No. WMGR123, as referenced by the commentator. DEP's proposed changes to the guidance document included language aimed at incorporating well sites where waste processing activities occur onsite to align the document with the requirement in DEP's unconventional well regulations at 25 Pa. Code § 78a.58, for these well sites to develop a RP Action Plan. For those well sites that need to develop RP Action Plans, DEP included a checklist in Appendix E to assist in the

development of and provide an outline for a RP Action plan typical for a well site. Many aspects of a new RP Action Plan can be developed directly from this TGD. However, it is incumbent upon the solid waste facility or well site to understand their respective operations, the possible sources of radiation that could be encountered by the operation, and how to protect their workers, public and environment from harmful or unnecessary exposure to radioactivity.

DEP disagrees that the guidance document provides a "one-size-fits-all" approach, as asserted by the commentator. Rather, DEP recognizes that the guidance is applicable to a myriad of facilities, processing techniques and operations that may be required to monitor for radioactivity, and therefore, DEP has provided flexibility in the guidelines for development of a RP Action Plan and provided a 'template' for the permittee to fill-in.

48. **Comment:** Each end use of the material must be checked for radioactivity and not batch tested. **(31)**

Response: For solid waste processing or disposal facilities, each truckload of incoming waste is evaluated for radioactivity by fixed radiation monitors. Waste being transported to a facility processing oil and gas liquid waste for beneficial use in hydraulically fracturing an oil or gas well must also be evaluated prior to being transported to the facility. In a scenario where a well site where processing of waste occurs and waste is transported to the well site for processing, the waste from another well site would need to be evaluated for radioactivity prior to transportation in accordance with DOT's requirements. Please also see DEP's responses to Comments #28 and #29.

49. **Comment:** All persons handling or exposed to fracking radioactive waste must be notified. Radioactivity from drilling and fracking operations is primarily from drill cuttings but also potentially from produced water or other activities. You need to consider the radiation exposure at the source, during loading, during transport and at the locations of processing and/or disposal.

Dust, for example, which accumulates from drippings or blown from degrading solids will spread into the environment. On the roads, this dust will contaminate the surroundings. The whole spectrum of dust sizes needs to be considered as the impacts will be so dependent. Ingested and inhaled particles are particularly dangerous to human and animal species. High energy gamma radiation is damaging. In addition, alpha and beta particles usually carry high kinetic energy in addition to electrical charge and thus can damage human tissue. The recent evidence for excess cancer incidence in Southwest Pennsylvania must emphasize the need to take every precaution to protect the public health and welfare. (This information can be provided.) **(31, 33)**

Response: Persons handling or exposed to waste exhibiting radioactive characteristics above the thresholds identified by the NRC and OSHA are required to be notified in accordance with the applicable requirements. Generally speaking, worker radiation exposure in the O&G industry occurs at levels which fall below the federal jurisdiction of OSHA as a general workplace hazard. Pennsylvania, as an Agreement State, has

incorporated by reference a vast majority of NRC's regulations for worker protection involving higher sources of radioactivity. There are notification requirements for radiation workers; however, due to the documented low radiation exposure rates in the O&G industry, such employees are not considered, "radiation workers," as that term is defined by federal regulations. Therefore, most individuals working in the O&G industry do not require notification. Should an exposure scenario occur where a worker would exceed the public dose limit of 100 mrem/yr, the details of that occurrence should be reported to DEP and/or OSHA. See the relevant information from NRC, accessible at the following website: https://www.nrc.gov/about-nrc/radiation/health-effects/info.html

The TGD addresses exposure to radioactive materials, "during transport and at the locations of processing and/or disposal," with the inclusion of explicit action levels for the cab of transport vehicles to protect the driver, and monitoring requirements for facilities that process or dispose of waste. Additionally, monthly radiological surveys of processing areas and storage equipment are outlined in RP Action Plans for well sites that generate TENORM-containing waste. Please also see DEP's response to Comment 17.

In addition, DEP's 2016 TENORM Study concluded that workers handling, transporting or otherwise charged with the management of O&G waste were not being exposed to radiation above the thresholds allowed for members of the public. The study did not identify instances where workers were exceeding the dose limit of 100 mrem/yr, nor were any radiation exposure scenarios identified where members of the public would exceed appropriate limits and standards. However, DEP will continue to investigate public and occupational health hazards associated with the management of TENORM-containing waste and sources of natural and man-made radiation and modify established requirements and guidelines as needed to ensure the protection of public health, safety and the environment.

50. **Comment:** The half-life of many radioactive elements is quite long. The importance of both initial monitoring and long-term monitoring is essential. Accountability must be built into the RP Action Plan. Ownership of the wastes must be explicit throughout the handling chain. **(33)**

Response: The half-life or Ra-226 is 1,600 years, which is why DEP's radiation dose modeling for TENORM waste disposal extends for 1000 years. DEP will continue to assess if that time limit is adequate. Please also see DEP's responses to Comments #11 and #23.

DEP's residual waste regulations require recordkeeping for the life cycle of the waste. Generators of residual waste are required to maintain records that include the types and amounts of waste generated; the date on which the waste was generated; the date on which the waste was disposed of or processed onsite; the name, address and telephone number of a person or municipality that transported the waste; and the name, address and phone number of the processing or disposal facility or other destination to which the waste was transported, in accordance with 25 Pa. Code § 287.55 (relating to retained

recordkeeping). A generator of residual waste must retain these records for a minimum of 5 years and provide the records to DEP upon request.

Transporters of residual waste are required by the residual waste regulations at 25 Pa. Code § 299.219 to make and maintain an operational record for each day that residual waste is collected or transported, or both. The daily operational record must be kept in the cab of each transportation vehicle on the date of collection or transportation, and include the following:

(1) The types or classifications of residual waste transported.
(2) The weight or volume of the types of wastes transported.
(3) The name, mailing address, telephone number, county and state of each generator of transported waste.
(4) The name and location of a transfer facility that has received, or will receive, the waste.
(5) The name and location of the solid waste processing or disposal facility where the waste will be ultimately disposed or processed.
(6) A description of handling problems or emergency disposal activities.
(7) The name and address of the person or municipality collecting or transporting the waste.
(8) The license plate number of the trailer transporting the waste.

Transporter records must be made available to the Department upon request and be retained for at least 5years.

Facilities operating under a permit issued for the processing or disposal of waste are also required to maintain operational records, which include the type and weight or volume of the solid waste received; a description of waste handling problems or emergency disposal activities; a record of rejected waste loads, and the reason for rejecting the loads; the transporters of the waste; the name, mailing address, county and state of each generator of residual waste; and a record of each incident in which radioactive material is detected in waste loads.

Facilities operating under the authority of a beneficial use permit, such as General Permit No. WMGR123, that are required to develop and implement a RP Action Plan in accordance with the TGD are also required to maintain operational records in accordance with the terms and conditions of the permit.

Additionally, for well sites, DEP's unconventional well site regulations at 25 Pa. Code § 78a.121 establish the following waste reporting requirements for unconventional well operators: (a) Each operator of an unconventional well shall submit a monthly production and status report for each well on an individual basis within 45 calendar days of the close of each monthly reporting period. Production shall be reported for the preceding reporting period. When the production data is not available to the operator on a well basis, the operator shall report production on the most well-specific basis available. ***(b) The monthly production report must include information on the amount***

and type of waste produced and the method of waste disposal or reuse, including the specific facility or well site where the waste was managed. Waste information submitted to the Department in accordance with this subsection is deemed to satisfy the residual waste biennial reporting requirements of § 287.52 (relating to biennial report). (c) The production report shall be submitted electronically to the Department through its web site.

These reports provide details regarding the management of oil and gas wastes in Pennsylvania and can be accessed by the public at: https://www.depgreenport.state.pa.us/ReportExtracts/OG/OilGasWellWasteReport

DEP considers the existing regulatory requirements to apply appropriate and adequate management of the tracking and accountability of waste through its entire life cycle. Section III.F was revised to clarify recordkeeping procedures for facilities or well sites that are required to develop and implement a RP Action Plan.

51. **Comment:** Mathematical models for exposure, if used, will typically underestimate the most serious conditions. And, given that thresholds really don't exist for radiation exposure, it must be assumed that worst conditions apply. **(33)**

Response: DEP reviews, uses, and accepts all international and national recommendations and standards for radiation protection, including the 'linear non-threshold' (LNT) dose-effect construct. DEP uses a conservative approach to exposure and pathway modeling. If there is a specific exposure scenario of concern, DEP is open to reviewing it. Please also see DEP's responses to Comments #11 and #23.

52. **Comment:** Disposed solid wastes must be segregated from conventional solid wastes, and the radioactive cells must be limited in size, not only for practical management and monitoring but also to prevent water accumulation within or the spread of radioactivity by plants and animals. **(33)**

Response: NORM and TENORM are not defined as LLRW under federal regulations. Therefore NORM- or TENORM-containing waste is not segregated or disposed of as such. Thus, there are no radioactive waste disposal cells in Pennsylvania landfills.

53. **Comment:** So-called "residual waste" being excess aqueous waste from drilling and fracking operations carries some radioactivity, varying from load to load and site to site. In the interest of the public health, so as not to accumulate radioactive materials at specific locations, these "residual waste" loads should be accounted for and monitored. **(33)**

Response: The SWMA and DEP's residual waste regulations define "residual waste" to include waste from an industrial operation, including liquid waste. Therefore, O&G wastes must be regulated as residual waste, a classification that does not affect how the radiation public dose modeling is performed, or how it is tracked regarding the amount of NORM and TENORM going into a landfill in that all incoming waste is monitored for

radioactivity. Monitoring is not limited to waste resulting from O&G activity. The protocol for disposing of waste containing TENORM is designed such that radioactivity is not accumulated at specific locations in the waste mass or within specific cells at the landfill.

54. **Comment:** Provision needs to be made for accounting for tonnages and radiation levels associated with solid and liquid wastes transported across state lines. **(33)**

Response: Waste coming into the Commonwealth is tracked by the Pennsylvania facility that receives the waste; whereas waste transported to out-of-state facilities is tracked by the generator and transporter(s) of the waste. Some out-of-state licensed LLRW disposal sites in Utah and Texas have been accepting TENORM-containing waste resulting from O&G activity in Pennsylvania for the past five years. This data will be reported in DEP's annual LLRW Report for the 2020 calendar year.

55. **Comment:** In multiple places, the guidance references occupational exposures but does not specifically call out the OSHA regulations which govern those exposures. This contrasts with the guidance's treatment of DOT and NRC regulations. At times it can seem that DEP is suggesting general public exposure levels for those who are occupationally exposed, which conflicts with existing OSHA regulations. Additional clarity in this respect would be beneficial. **(34)**

Response: Federal DOT regulations always apply radioactive material shipped on public roads. OSHA's 'Ionizing Radiation' regulations apply if an Agreement State or NRC regulations are not explicitly required under a license or registration. Though O&G workers are potentially exposed to low levels of radiation from TENORM, said exposure does not exceed annual radiation levels allowed for members of the public. Therefore, workers in the O&G industry sector are not radiation workers compared to workers in a nuclear medicine clinic or nuclear power plant. To ensure workers are adequately protected, the Department applies the NRC's public annual dose limit for workers in the O&G industry sector. Should workers or members of the public exceed current NRC public dose limits, DEP would consider placing an operation into a licensed activity status for stricter controls. This is outlined in Section II.C of the TGD.

56. **Comment:** The guidance document recommends the use of standard radiochemistry methods to assess waste prior to transport. The guidance should also allow flexibility by stating "utilize standard radiochemistry methods or approved equivalent field methods to assay waste prior to transport." This will help with the development of satisfactory field methods to evaluate waste as DOT regulated or not. **(34)**

Response: The TGD does not prescribe the use of laboratory testing. Rather, it provides flexibility to utilize field measurements to characterize radioactivity prior to transportation. DEP accepts alternative testing methods provided the procedures are based on some standard method, NIST traceable calibration standards, and scientifically-accepted quality assurance and quality control procedures. The TGD contains the following language in Section III.B: "Standard gamma spectroscopy is the

recommended method to assay TENORM-containing waste (with potentially high levels of radium)."

In addition, Section 4 of Appendix D of the TGD, states the following: "Characterization equipment can be significantly more complex and expensive than detection equipment. Therefore, it is acceptable for solid waste, well sites and metal recycling facilities to merely have prompt access to characterization equipment (e.g., through a health physics consultant) rather than owning it. In this case, it must be explicitly stated in the RP Action Plan. Additionally, well sites and solid waste processing or disposal facilities may utilize commercial radio-chemistry laboratories or field characterization equipment with procedures and traceability to national radiological standards for characterizing solid and liquid waste for DOT shipping compliance."

57. **Comment:** The general purpose of the Draft TGD is to uniformly apply the same rules and guidance on how to prepare RP Action Plans in order to assist affected industries in ensuring the protection of worker health, the public and the environment regarding RAM.

Section 78a.58(d) of Pennsylvania DEP's regulations (relating to unconventional wells) require that "*An operator processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of oil or gas wells shall develop an action plan specifying procedures for monitoring for and responding to radioactive material produced by the treatment processes, as well as related procedures for training, notification, recordkeeping and reporting. The action plan shall be prepared in accordance with the Department's Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities, Commonwealth of Pennsylvania, Department of Environmental Protection, No. 250-3100-001, as amended and updated, or in a manner at least as protective of the environment, facility staff and public health and safety and which meets all statutory and regulatory requirements*."

The regulation specifically states that those who are performing the listed activities shall prepare a plan in accordance with the TGD. It does not state that the TGD must be written to single out the oil and natural gas industry. This draft TGD has singled out the O&G industry by making dozens of references to our industry and its operations. Prior to this revision, and in this revision, no other industry is singled out as O&G, which is evident in the "Policy," "Purpose" and "Applicability" sections on the first page. Although the TGD mentions certain areas of concern such as medical waste and smoke detectors, it does not single them out in the Policy, Purpose and Applicability sections. Therefore, PIOGA recommends both in these sections and throughout the TGD that the Department remove references which specifically single out our industry. The focus should be on the level of radioactivity, not the source of the waste.

<u>*Suggested change to TGD*</u>

POLICY: To protect the environment and the public health, safety, and welfare from the possible dangers of radioactive material that is delivered to landfills, waste processing or disposal facilities.

PURPOSE: This guidance document is intended to assist the regulated communities with the development of Radiation Protection Action Plans as required in the regulations.

APPLICABILITY: This guidance document applies to all owners and operators of solid waste processing and disposal facilities that are required by regulation to monitor for radiation from loads of waste, and to those facilities that choose to monitor even though not required. This guidance document also applies to all Department personnel and activities involved with waste facility permitting, operations and enforcement, radiation protection, grants, monitoring, administration, and emergency response. **(27, 29)**

Response: 25 Pa. Code Chapter 78a, which was codified in 2016, included the requirement for well sites where waste processing occurs to develop and implement a RP Action Plan in accordance with this TGD. Therefore, the revisions proposed by DEP intentionally considered the O&G industry as an industry sector that was newly addressed by the guidance.

The TGD is intended to assist the O&G industry in understanding the requirements that specifically relate to the industry. Therefore, specific mention of the O&G industry is necessary in the TGD, and the TGD retains language specific to the O&G industry as a way of expanding on how the TGD relates to well sites that are required by regulation to follow the TGD in development of a RP Action Plan.

58. **Comment:** *Authority* – Chapter 78a is only applicable to Natural Gas (not Oil) per the definition of Unconventional, so this should not reference O&G since the only relevant citation is 78a.58. Suggested Language: 25 Pa. Code Chapters 215-240; Unconventional Wells Regulations, 25 Pa. Code 78a.58 (relating to unconventional wells). **(6, 15, 18, 22, 34)**

Response: Section 78a.58(d) of the unconventional well regulations requires that, "[a]n operator processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of oil or gas wells shall develop an action plan…in accordance with the Department's *Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities*, Commonwealth of Pennsylvania, Department of Environmental Protection, No. 250-3100-001…or in a manner at least as protective of the environment, facility staff and public health and safety and which meets all statutory and regulatory requirements." The language in the TGD mimics existing regulatory language, and therefore, the change suggested by the commentators was not included in the TGD.

59. **Comment:** This document serves various industries and its primary focus is protecting public health, safety, and welfare from possible dangers of radioactive waste delivered to waste processing or disposal facilities regardless of the type of waste or specific industry that generated the waste, therefore O&G well development should not be specifically referenced. Note also that although 78a.58(d) does use the wording "oil and gas wells," as noted in the comment above, 78a is only applicable to unconventional natural gas

wells so the use of the term "oil" (even though used in 78a.58(d) inappropriately) is unnecessary in this guidance document as it would suggest applicability beyond the cited 78a.58 provision noted as Authority above. This same comment about "oil wells" not being subject to 78a should be considered throughout this document where statements are specifically intended to address 78a.58 vs. perhaps broader guidance being suggested for conventional wells, if intended, but which is not implied by the PA Bulletin notice which states that the "primary revisions amend the document to include guidance... in response to new provisions in 25 Pa. Code Chapter 78a (relating to unconventional wells)."

Suggested Language: To protect the environment and the public health, safety, and welfare from the possible dangers of radioactive material that is delivered to waste processing or disposal facilities. **(6, 15, 18, 22)**

Response: Please see DEP's response to Comment #55. The regulated community is required to comply with applicable laws and regulations, or the terms and conditions of a permit. However, DEP encourages a broader range of voluntary radiation protection measures as appropriate and outlined in the TGD as best management practices for protecting public health, safety and the environment.

60. **Comment:** The intent of the Guidance Document is primarily for waste processing and disposal facilities, not every unconventional gas well pad. The applicability section on the first page should be revised to better illustrate the purpose of the document as there is considerable confusion of terminology in the document and what facilities will be affected.

Suggested Language: This guidance document applies to all Department personnel and activities involved with waste facility permitting that are required by regulation to monitor for radiation from incoming loads of waste, or waste produced during waste treatment/processing, and those facilities that choose to monitor even though not required. This guidance document also applies to all owners and operators of solid waste processing and disposal and waste treatment facilities that are required by regulation to monitor loads of waste for radiation. **(6, 15, 18, 22)**

Response: The intent of the revised TGD is to incorporate applicable guidelines for well sites where waste processing activities occur, as required by DEP's unconventional well regulations, while maintaining the language applicable to solid waste facilities. Please also see DEP's response to Comment #55.

61. **Comment:** Oil and Gas Operations, Oil and Gas Facility, Oil and Gas Well Development Operations, O&G Processing are used throughout the document. As detailed in Chapter 78a.58, the Guidance Document only applies to processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of O&G wells, therefore a definition should be added to provide clarity to the Guidance Document.

Suggested Language: "Unconventional Well Site Processing" - processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of unconventional gas wells as described in Chapter 78a.58(d) or facilities with a Pennsylvania DEP Solid Waste Management Permit that requires an Action Plan as part of the facilities permit. **(6, 15, 18, 22, 34)**

Response: A definition of the term, "well site," which is consistent with the definition found in DEP's unconventional well regulations at 25 Pa. Code § 78a.1, has been added to the TGD, and the use of terminology has been made consistent throughout the TGD.

62. **Comment:** "Facility" - As detailed in Chapter 78a.58, the Guidance Document only applies to processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of O&G wells. It does not apply to "areas where solid or oil and gas waste management actually occurs."

Suggested Language: Land, structures, and other appurtenances or improvements where municipal, residual, or Unconventional Well Site Processing is permitted or takes place. The term includes land thereby used or affected during the lifetime of operations, including areas where waste management actually occurs, support facilities, offices, equipment sheds, air and water pollution control and treatment systems, access roads, associated onsite or contiguous collection, transportation and storage facilities, closure and post-closure care and maintenance activities, contiguous borrow areas, and other activities in which the natural land surface has been disturbed or used as a result or incidental to operation of the facility. **(6, 15, 18, 22, 27, 29)**

Response: The definition of "facility" has been revised to align municipal and residual waste regulations, 25 Pa. Code §§ 271.1 and 287.1. In DEP's proposed revisions to the guidance, the phrase, "or oil and gas" was inserted into the second sentence to emphasize that the proposed revisions to the guidance document aimed to address appropriate monitoring and management strategies applicable to the processing of oil and gas-derived wastes that take place on a well site, and therefore, are not operating under a solid waste processing or disposal permit issued pursuant to the SWMA. Please also see DEP's responses to Comments #4, #5, and #57.

63. **Comment:** ***Type of facility****:* DEP has expanded upon the definition of "facility" to specifically single out "oil and gas waste disposal or processing is permitted or takes place." Rather than cherry picking the types of facilities, DEP should use the predefined definition used in the Pennsylvania SWMA. It states- "Facility. All land, structures and other appurtenances or improvements where municipal or residual waste disposal or processing is permitted or takes place, or where hazardous waste is treated, stored or disposed." It is simple and to the point and furthermore does not call out or single out any one industry rather applies to any industry where hazardous waste is treated, stored or disposed.

a. The type of facility should also be taken into consideration when determining the type of RP Action Plan needed. For instance, a fixed facility whose process or

treatment regularly generates TENORM should be required to have a more comprehensive RP Action Plan. However, a facility that is temporary such as using filtering at a well site or for temporary storage tanks, should be able to be less complicated while still accomplishing the goal of protecting the health and safety of its workers. For example, a fixed facility where there are full-time workers it makes sense to require their exposure rate. However, for a temporary storage facility where workers may come and inspect the tanks once per day wearing dosimetry monitors is not necessary.

b. The reporting could also be tied to the type of facility as it is more important to report on large scale operations that generate high levels of RAM constantly than a facility that generates low-level material sporadically. Some of these low-level facilities generate material that has a lower radiation level than found in kitchen countertops made of granite. **(29)**

Response: The Department agrees with the commentator. The RP Action Plan should be developed taking into consideration the type of facility, operation, if there are temporary or fixed tanks and equipment, as well as the expected levels of radioactivity and radiation, potential for worker and public exposure, and environmental contamination. Please also see DEP's responses to Comments #4, #5, #57 and #58.

64. **Comment:** "LLRW" - Since this is a guidance document, it should specifically clarify where to find this Federal LLW classification, not leave it to readers unfamiliar with the Low-Level Radioactive Waste Policy Amendments Act of 1985 and subsequent Federal classifications to find that on their own. This is significant given the following item (3) that includes NORM unless excluded by (1) or (2)

What is the statutory or regulatory basis for including NORM in the definition of LLRW for purposes of this TGD? For example, unless excluded under (2) above (which is unclear) this would include all NORM at any concentration (e.g. rocks, soils, drill cuttings), and Appendix F (pg. 35, 1st paragraph), says that "LLRW must be disposed of in a licensed radioactive waste disposal facility" which should not be required for NORM. Other sections of this document also refer to TENORM being disposed at "permitted" facilities (such as landfills), not "licensed" facilities. **(6, 18, 34)**

Response: The definition of LLRW is consistent with the federal definition found in Title 10 of the Code of Federal Regulations. NORM or TENORM in solid waste is not LLRW, and the NRC does not consider TENORM to be LLRW or subject to its regulations. Facilities are permitted, licensed, registered, etc., by various entities for any number or combination of operations. Generally, in the context of the TGD, a license is a Radioactive Material license issued by the NRC or the Department, while a permit or other approval is issued by the Department to a waste processing or disposal facility or well site.

65. **Comment:** It is recommended the Department provide further clarification on the intent and make the definition more specific for ease of understanding to all regulated stakeholders. **(18)**

Response: The definition of LLRW is consistent with the federal definition found in Title 10 of the Code of Federal Regulations. NORM or TENORM in solid waste is not LLRW, and the NRC does not consider TENORM to be LLRW or subject to its regulations. Facilities are permitted, licensed, registered, etc., by various entities for any number or combination of operations. Generally, in the context of the TGD, a license is a Radioactive Material license issued by the NRC or the Department, while a permit or other approval is issued by the Department to a waste processing or disposal facility or well site.

66. **Comment:** "NARM" is not used anywhere in the document, so should be deleted here. But if retained, why is NORM included in the definition of NARM, rather than just limiting NARM to accelerator-produced radioactive material? Recommend that NARM, if retained, be defined as limited to accelerator-produced radioactive material. **(6, 18, 34)**

Response: Licensed NARM is prohibited from disposal in a landfill in accordance with DEP's municipal and residual waste regulations. Accelerator produced RAM was reclassified by NRC to be a category of 'byproduct material' under the federal Energy Policy Act of 2005. The Department believes it is important to keep this term to avoid confusion between NORM and NARM and has edited the TGD as such. The term, "NARM," is also used in Section III.A of the TGD which states, "Prior to the Federal Energy Policy Act of 2005 certain byproduct material produced by an accelerator, such as Cobalt 57, were exclusively regulated by the states and referred to as NARM."

67. **Comment:** "TENORM" - Though we recognize that including the "potential for human exposure" being increased is consistent with the existing Pennsylvania DEP regulatory definition in Chapter 287, we question why construction materials such as brick, granite, wall board, and related building rubble doesn't generally appear to be classified as TENORM in Pennsylvania (as are O&G drill cuttings), but rather still referred to as NORM (for example, in Section 2 of Appendix F, "Sources of Contamination). We recommend that the definition of TENORM in Pennsylvania should be limited to NORM with increased concentrations of radionuclides due to human activities, consistent with the CRCPD Suggested State Regulations, Part N definition.

Suggested Language: Technologically enhanced naturally occurring radioactive materials. It is naturally occurring radioactive material not specifically subject to regulation under the laws of the Commonwealth or Atomic Energy Act of 1954 (42 U.S.C.§§ 2011 et seq.), but whose radionuclide concentrations or potential for human exposure have been increased above levels encountered in the undisturbed natural environment by human activities. When disposed, TENORM-containing wastes are managed under the SWMA. **(6, 15, 18, 22, 27, 29, 34)**

Response: The definition of "TENORM" is identical to the definition contained in DEP's municipal and residual waste regulations. The definition is based on a 1999 National Academies of Science report on TENORM. The reference to some materials as, "NORM," in Appendix F refers to the parent radioactive elements present in the material. The same material may also meet the definition of TENORM.

It should be noted, the definition of NORM and TENORM varies between the states and internationally. Regardless, the Commonwealth's definition was crafted to protect the public, workers and environment from these natural sources of ionizing radiation.

68. **Comment:** II. Technical Guidance, A. Background - The only requirement in 78a for a radiation action plan is in 78a.58(d), so the Background should not suggest requirements beyond what is specified in 78a.58(d). **(34)**

Response: The citation referenced by the commentator was revised in the TGD.

69. **Comment:** II. Technical Guidance, A. Background (Paragraph 1) **-** As recognized in the following paragraph, when disposed, NORM & TENORM are regulated by DEP's BWM (regardless of concentration or dose), so it's incorrect to say, as drafted, that "NORM and TENORM are not regulated in Pennsylvania unless resulting radiation doses exceed the limits set forth in Title 25, Chapter 219". Based on Table 2 in 25 Pa. Code 217.137, it appears Ra-228 should be included here as well.

Suggested Language: Except for waste materials, NORM and TENORM are not regulated in Pennsylvania unless resulting radiation doses exceed the limits set forth in Title 25, Chapter 219 of the Pennsylvania Code. However, in the case of Ra-226 and Ra-228, DEP does regulate individual discrete sources above 0.1 μCi, as set forth in 25 Pa. Code Chapter 217. **(6, 18, 27, 29, 34)**

Response: The paragraph was revised to include language similar to that suggested by the commentators. The following statement was also included in the TGD, "When disposed, certain types of RAM, including NORM and TENORM, are regulated by DEP's BWM under authority granted by the SWMA."

70. **Comment:** II. Technical Guidance, A. Background, Paragraph 4 – "All generally licensed RAM is to be…" sounds like a requirement rather than guidance, if so, the appropriate regulatory/statutory citation(s) should be included here. **(34)**

Response: The licensing of 'general' or 'specific' licensed RAM is performed by NRC and Agreement States under federal and state regulations. NRC requires the regulations of all Agreement States to be compatible with NRC's requirements. The numerous citations related to RAM licensing in the NRC's regulations (e.g., in 10 CFR Parts 20, 30, 31, 32, 33, 33, 34, 35, 39, 40, 61 and 71) are not included in the final TGD, but are applicable in that DEP incorporates them by reference in DEP's RAM licensing requirements contained in Title 25 of the Pa. Code, Article V (relating to radiological health). DEP's regulations are cited in the final TGD. The discussion of 'specific' and

'general' licensed- and 'exempt' RAM is intended to emphasize the difference in disposal requirements for licensed versus exempt radioactive materials. Thus, unless it is exempt from disposal requirements, 'specific' or 'generally' licensed RAM may not be disposed of in a landfill. Links to these regulatory requirements are provided below:

- https://www.nrc.gov/reading-rm/doc-collections/cfr/index.html
- http://www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/025/articleIDV_toc.html&d=reduce

71. **Comment:** II. Technical Guidance, A. Background Paragraph 5 – Are there really any of these materials that do not contain natural radioactivity at some low level? For example, the first two sentences in Section 2 of Appendix F recognize that "just about everything contains some trace amount of radioactivity, listing soil, rocks, & water as examples, so that same message should be consistent here, rather than simply saying "some rocks", etc. Delete "some" to be consistent with Appendix F. Suggested Language: Rocks, bricks, gypsum wall board, slag from metal processing, waste from coal ash or coke processing, rock cuttings and sludges from O&G wastewater treatment, and similar residuals generally contain some natural radioactivity. **(6, 18, 34)**

Response: The word, "some," was removed from before the word, "rocks," from the TGD.

72. **Comment:** II. Technical Guidance A. Background- Paragraph 6 lists applicable regulations that are affected by this policy. Paragraph 7 again singles out the O&G industry. To be consistent, Paragraph 7 should be eliminated by including the citation reference as another bullet point in Paragraph 6. Suggested change: Relating to Unconventional wells (25 PA Code 78a.58(d). **(27, 29)**

Response: The TGD was revised to include a reference to 25 Pa. Code § 78a.58(d) in the body of paragraph 7. Please also see DEP's responses to Comments#4, #5, and #55.

73. **Comment:** II. Technical Guidance, A. Background **-** Revise to be consistent with language in Chapter 78a.58(d). Further, remove "The plan must be submitted to and approved by the Department." Submittal and approval of the plan is not a requirement in Chapter 78a. The plan is to be provided to the Department upon request. WMGR123 Permits (Pennsylvania DEP BWM) are the only facilities that would require submittal and approval of an action plan.

Suggested Language: In addition to the above-listed facilities, under 25 Pa. Code Chapter 78a. 58, an operator processing fluids or drill cuttings generated by the development, drilling, stimulation, alteration, operation or plugging of oil or gas wells shall develop an action plan specifying procedures for monitoring for and responding to radioactive material produced by the treatment processes, as well as related procedures for training, notification, recordkeeping and reporting. The action plan shall be prepared in accordance with this Guidance Document. The plan must be provided to the

Department upon request unless permit conditions require submittal and approval by the Department. **(6, 18, 27, 29, 34)**

Response: Section 78a.58(d) requires an oil and gas operator to develop a RP Action Plan for processing fluids or drill cuttings at a well site. Other subsections in 25 Pa. Code § 78a.58 state that an operator may request to process fluids and drill cuttings at the well site and that the request shall be submitted on forms provided by the Department. The Request for Approval of Alternate Waste Management Practices Form (Document No. 8000-PM-OOGM0071AU) is the form provided by the Department for this purpose and it instructs the operator to develop a RP Action Plan and submit it along with the form. The guidance was revised to reflect that a RP Action Plan must be submitted to and approved by the Department if required. Submission of the RP Action Plan is a requirement of the review process when an oil and gas operator requests processing of residual waste to be authorized at a well site under the alternate waste management practices provisions of 25 Pa. Code § 78a.58.

74. **Comment:** II. Technical Guidance, A. Background- "The facility should have access to equipment with the ability to characterize and identify isotopes." This implies that all facilities would be required to have or have immediate access to a very expensive piece of equipment that may not be necessary to properly characterize the waste. Waste material with known isotopes (Ra-226 and Ra-228) may be able to be characterized with gamma radiation detection devices or via third party laboratory analysis. Most facilities use and have access to gamma detectors which do not specifically identify isotopes, most folks would send sample to third party lab for analysis.

Suggested Language: Operators of affected facilities must comply with the applicable regulatory requirements, and in lieu of laboratory analysis to characterize the waste, the facility should have access to equipment with the ability to properly characterize the waste, and have an appropriate RP Action Plan that is developed in accordance with this policy and approved by DEP (except that DEP approval is not required for unconventional well operators operating under 25 Pa. Code 78a.58(d)) or in a manner at least as protective of the environment, facility, staff and public health and safety and meets all statutory and regulatory requirements. Or, remove language and simply state "facilities must accurately and properly characterize RAM" or state that equipment may be used at the site to identify isotopes in lieu of sending sample to third party lab for analysis. **(6, 18, 27, 29, 34)**

Response: The TGD is intended to be general for many types of facilities and operations. An operator may acquire such instruments to have readily available or have a consultant third party provide radioisotope identification on an as-needed basis. The language in the TGD was revised for clarity.

75. **Comment:** II. Technical Guidance A. Background- The TGD states that "For Pennsylvania facilities that are not required to monitor for RAM (e.g., metal recyclers) but choose to do so as a best management practice, this guidance document ***should*** also be followed. This guidance is intended to assist the solid waste and O&G regulated

communities with the development of RP Action Plans." PIOGA recommends that the word "should" above be changed to "may" because by using the term "should" creates a requirement for a facility to use this TGD when the facility is not required to monitor. **(27, 29)**

Response: "Should" is widely accepted as non-mandatory language that the Department uses consistently throughout its guidance documents and therefore was retained in the TGD.

76. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - "Designated area" concept does not take into account that facilities may disperse radiation in multiple locations with the intent of dilution and therefore, mask any concentrations. **(17)**

Response: The use of a designated area is specified in the municipal and residual waste regulations. The designated area functions as a vehicle holding area that allows vehicles that are segregated for further evaluation of radioactivity to be temporarily housed in a safe location until a radioactive source can be identified and managed. DEP disagrees that the designated area provides an opportunity to disperse radiation and reduce measurable amounts of radioactivity.

77. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - The language "However, DEP cautions O&G well development and wastewater treatment operators to fully evaluate the levels of RAM (e.g., radium-226) in fluids and sludges. Transport of these materials on public roads shall comply with the Federal DOT regulations in Title 49 of the Code of Federal Regulations as related to Class 7 HAZMAT "radioactive material." is not necessary.

Further, it is implying O&G operators do not properly characterize their waste. It is the responsibility of a generator to properly characterize their waste, if the Department suspects a generator is not properly characterizing their waste, they should pursue corrective actions with that specific generator. "However, DEP cautions O&G well development and wastewater treatment operators to fully evaluate the levels of RAM (e.g., radium-226) in fluids and sludges." **(6, 18, 27, 29, 34)**

Response: The language noted by the commentators serves as a reminder of other applicable regulations. DEP disagrees that the language is unnecessary or suggestive of improper practices. Rather, it is important for all entities managing TENORM waste to characterize amounts of radioactivity prior to transportation on a public road to protect the public from improper transport of contaminated liquids and solids in the event of a spill, and highlight that there may be expensive transportation costs for waste exceeding applicable thresholds for radioactivity. Therefore, the language was retained in the TGD.

78. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - What "low concentrations" and "small quantities" are being referred to here? **(34)**

Response: The language referenced by the commentator indicates that DEP has the ability to approve disposal of low volumes (e.g., < 10 ft^3) of Ra-226 contaminated waste, with a concentration of Ra-226 below EPA's clean-up standard of 5 pCi/g, without an in-depth dose modeling analysis.

79. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - What constitutes "large volumes" or "high concentration?" **(34)**

Response: The language referenced by the commentator indicates volumes above 10 ft^3 of Ra-226 contaminated waste and a concentration of Ra-226 above EPA's clean-up standard of 5 pCi/g. Please also see DEP's response to Comment #75.

80. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - On Page 9 of the Proposed Guidance, it suggests that on all occasions when radiation cannot be processed or disposed of onsite, a special permit is required. But in some cases, the site may be unable to accept waste for disposal based on its radiation characteristics, but the load would still be under the 49 CFR § 173.436 special permit thresholds. Therefore, a special permit would not be required. **(23, 24)**

Response: DEP would need to obtain additional detail regarding the scenario described by the commentator. Nonetheless, a load of solid waste or recycled metal that is not fully characterized for shipping in accordance with DOT regulations and has any amount of detectable radiation can be shipped to another location under a DOT Special Permit issued by the Department. If the shipper knew the radioactivity was below the limit in 49 CFR for shipping to a landfill or metal recycler but the material was rejected upon arrival for some other reason, an evaluation for a DOT Special Permit is also appropriate.

81. **Comment:** II. Technical Guidance, B. Radiation Protection Action Plans - Updating an RP Action Plan through a permit modification is not practical for GP (i.e., WMGR123 permits) that do not allow for minor and major modifications. Current regulations do not parse out, for GPs, the difference between something that might be considered a major modification vs. a minor modification like with individually permitted facilities, therefore a GP modification requires a substantial submittal document from the facility. An RP Action Plan would not necessarily be part of a "permit" for unconventional wells sites for the entire life of the well but would be a regulatory requirement to operate in accordance with the required plan. Suggested Language: RP Action Plans become part of the facility's permit or regulatory requirements and should be followed by the facility. For facilities required to have an RP Action Plan under the solid waste regulations, revisions to an approved RP Action Plan should also be approved by DEP through a permit modification, per the solid waste regulations. **(6, 18, 27, 29, 34)**

Response: RP Action Plans, in addition to all of a permittee's application documents that are required in accordance with the terms and conditions of a permit issued pursuant

to the SWMA, are incorporated by reference into the terms and conditions of the permit. Therefore, any revisions to the approved RP Action Plan must be submitted to DEP for review and approval, which can only be accomplished through the permit modification process set forth in DEP's regulations applicable to beneficial use.

For well sites that are required to develop and implement a RP Action Plan, the Request for Approval of Alternate Waste Management Practices Form (Document No. 8000-PM-OOGM0071AU) is the form provided by the Department for this purpose and it instructs the operator to develop a RP Action Plan and submit it along with the form. The guidance language was revised to reflect that a RP Action Plan must be submitted to and approved by the Department if required. Submission of the RP Action Plan is a requirement of the review process when an oil and gas operator requests processing of residual waste to be authorized at a well site under the alternate waste management practices provisions of 25 Pa. Code § 78a.58.

RP Action Plans required for processing residual waste on a well site become part of the operator's approved alternative waste management practice(s) and any revisions to approved alternative waste management practice(s) for processing residual waste on a well site may require revising the RP Action Plan. Any revisions made to the RP Action Plan for processing residual waste on well sites should be submitted to OOGM for review or approval. Language was included in the TGD for clarity.

82. **Comment:** II. Technical Guidance, C. Dose Limits for the Public and Workers - Remove "proposed." Suggested Language: The public and occupational annual dose limits that will be utilized by DEP in evaluating RP Action Plans are as follows: **(6, 18)**

Response: The word, "proposed," was replaced with the word, "submitted," in the TGD.

83. **Comment:** II. Technical Guidance, C. Dose Limits for the Public and Workers (Table) - Is there a Pennsylvania statutory or regulatory basis for requiring this to be 25 mrem for the general public dose limit from a facility? If so, that statutory or regulatory citation should be specified. If not, we recommend that this 25 mrem be changed to 100 mrem, consistent with the Federal standard for general public dose limit at 10 CFR 20.1301(a)(1), and 25 Pa. Code 219.51 which incorporates that 10 CFR 20 standard by reference. [The 25 mrem/yr appears as though it might be based on the 10 CFR 20.1402 limit for releasing sites for unrestricted use, but that isn't the correct scenario or standard for this limit that refers to the general public dose limit from an operating facility.] One commentator also had the same comment for III. B., last paragraph. **(6, 18, 27, 29, 34)**

Response: The 25 mrem/yr dose limit from a facility is the same as both the NRC's RAM license termination for 'unrestricted release' of a facility or site and the protection criteria for release of radioactivity LLRW disposal in 10 CFR 61.

84. **Comment:** II. Technical Guidance, C. Dose Limits for the Public and Workers (Final Paragraph) - Remove "proposed." This paragraph discusses modeling for potential

radiation exposure pathways for RP Action Plans. O&G waste processing should not have to model for exposure potential at each well pad. TENORM is not being disposed of on a well pad, it is being gathered, monitored and transported from the sites to appropriate disposal locations.

Remove "and O&G operations" from the first paragraph. The only reason this guidance would apply to our operations if when we obtain a permit to process residual waste as in the example of treating produced water at a centralized water facility which requires a WMGR-123 permit. It is misleading to lump the activities on a permitted well pad in with the requirements for solid waste treatment facilities. Suggested Language: In all reviews of RP Action Plans, DEP will perform evaluations to ensure solid waste processing or disposal operations do not endanger the environment, facility staff, or public health and safety. Therefore, RP Action Plans should describe the potential radiation exposure pathways for workers and members of the general public. **(6, 18, 27, 29, 34)**

Response: Modeling may be appropriate as part of a RP Action Plan in some circumstances. For example, exposure pathway analysis at a well site may be appropriate when liquid waste evaporators are used to process oil and gas wastewater because there are potential impacts offsite resulting from emissions from the processing unit. The language suggested by the commentators is vague and therefore, was not included in the TGD.

85. **Comment:** II. Technical Guidance, C. Dose Limits for the Public and Workers - The Proposed Guidance suggests that modeling is required even for landfills that rely only on the blanket authorization. See Page 10 ("In all reviews of proposed RP Action Plans, DEP will perform evaluations to ensure solid waste processing or disposal and O&G operations do not endanger the environment, facility staff, or public health and safety. Therefore, proposed RP Action Plans should describe the potential radiation exposure pathways for workers and members of the general public and how these expected doses were modeled. DEP will only accept modeling that shows the radon pathway "turned on."). This would represent a newly imposed requirement, and one that should require a regulatory amendment prior to promulgation. The Department's Proposed Guidance insists that the dose limit for a resident farmer be limited to 25 mrem/yr, with the radon pathway on. See pages 9-10, 13, 43-44. However, the Department also recognizes that the Applicable or ARAR for Radon is 4 pCi/L for a member of the general public. See also Appendix G ("For radon we limit the concentration in air to 4 and 30 pCi/L for residential and occupational exposure scenarios."). 4 pCi/L translates to a radiation dose of 800 mrem/year. Even a well-controlled home would receive a dose greater than 200 mrem/year (1 pCi/L) from naturally occurring radon gas.

The Department also refers to the 100 mrem standard applicable to the public. But see Proposed Guidance, Page 38 (average home radon dose 230 mrem). Thus, the Department expects a landfill to model the indoor air of a hypothetical farmer on top of an unregulated, "all control fails" scenario landfill where 1,000 years in the future, the

farmer may only be exposed to a radon dose (25 mrem), a dose that is 1132th of the permissible exposure to radon in a home (the 800 mrem limit or 4 pCi/L). This type of requirement is not reasonable, and it leads to absurd results.

If DEP desires to use a dose limit of 25 mrem/year for a future resident farmer, it must at least acknowledge that the 25 mrem/year dose should not include radon, or that the radon dose from the waste cannot be held to a standard stricter than occurs naturally throughout the Commonwealth. Said another way, municipal solid waste in landfills provides a radiation dose of essentially zero. By contrast, the surrounding soils have high radium content (these types of soils were excavated from the landfill, resulting in a lower overall dose of radium). Accordingly, mixing TENORM waste with municipal solid waste should be allowed to the extent that the dose from living on a landfill is at least equivalent to the dose from living outside the landfill. **(23, 24)**

The wording "DEP will only accept" gives the impression of a requirement incorporated into a guidance document that is not necessarily in the corresponding regulatory language (e.g. not in 78a.58), so the suggested edit changes this to a "should" statement more appropriate to guidance. **(34)**

Response: The 1,600-year half-life of Ra-226 presents a potential long-term public health risk. The final TGD includes an appropriate modeling construct for facilities that are not required to implement institutional land use controls, or requirements under state law for homes and businesses to test for and remediate radon. Please also see DEP's responses to Comments #11 and #42.

86. **Comment:** II. Technical Guidance, C. Dose Limits for the Public and Workers - Generally, we believe it needs to be better explained why TENORM was specifically added here. **(34)**

Response: There is a theoretical possibility that TENORM in high enough quantities can trigger a person to be designated as a "radiation worker." However, the Department believes that staff of a facility subject to this TGD should not automatically or routinely be designated as radiation workers. Rather, the potential levels of exposure be determined. The TENORM Study demonstrated that workers should not normally receive exposures above the 'public' dose limit of 100 mrem/yr. For clarity, a definition of "radiation worker" was included in the TGD. DEP maintains that the inclusion of TENORM is appropriate to further its mission of protecting human health, safety and the environment. Please also see DEP's responses to Comments #9, #10, and #47.

87. **Comment:** II. Technical Guidance, D. Detection of Radiation - tends to focus on initial entry and high dose levels of radiation by vehicle rather than long-term monitoring of environmental facility or site. **(17)**

Response: A primary purpose of the TGD is to measure and assess radioactivity in incoming waste at solid waste processing or disposal facilities. Therefore, it is appropriate to focus on initial entry and levels of radioactivity from vehicle waste loads.

88. **Comment:** II. Technical Guidance, D. Detection of Radiation - On Page 11 of the Proposed Guidance, it states that "when a prohibited or licensed RAM is detected or a waste load is to be rejected, a DOT Special Permit must be issued..." This should be edited to indicated "a DOT Special Permit may be required, and the determination should be made based on 49 CFR 173.436." **(23, 24)**

Response: The language in the TGD was revised and expanded. A DOT Special Permit is typically issued when little is known regarding the total activity or concentration of radioactive material in the load of waste or recycled metal.

89. **Comment:** II. Technical Guidance D. Detection of Radiation (last paragraph) states:

> *2. Action Level Two: Radiation dose rates of 20 µSv/hr (2 mrem/hr) or greater in the cab of the waste transport vehicle, 500 µSv/hr (50 mrem/hr) or greater from any other surface, or the detection of contamination on the outside of the vehicle requires immediate notification to DEP and isolation of the vehicle.*
>
> *An RP Action Plan should provide for immediate notification to DEP for conditions specified in the regulations (i.e., radiological conditions noted above in Action Level Two). When prohibited or licensed RAM is detected or when a waste load is to be rejected, a DOT Special Permit must be issued in order for the load to travel public roads to the destination.*

By requiring that when a waste load is rejected that it must be issued a DOT Special Permit to travel on the roads is not justified. A waste load could be "rejected" from a landfill because the landfill met or is getting close to the monthly TENORM allocation limits, even with prior coordination, or a load could be rejected at a waste processing facility because the material does not meet their acceptance criteria that doesn't have anything to do with the TENORM level. A load that does not trigger an action level may not need special DOT permitting to simply be taken to another disposal location.

Suggested change to TGD: When prohibited or licensed RAM is detected, and the waste load is rejected because its prohibited, a licensed RAM or because it exceeds Action Level Two, a DOT Special Permit must be issued in order for the load to travel public roads to the destination unless the waste load is transported as Class 7 Radioactive Waste. **(27, 29)**

Response: Any amount of detectable radiation in a load of solid waste or recycled metal that is not fully characterized for shipping in accordance with DOT regulations, should be shipped to another location under a DOT Special Permit issued by the Department. If the shipper knew the radioactivity was below the limit in 49 CFR for shipping to a landfill or metal recycler, but the material was rejected upon arrival for some other reason, an evaluation for a DOT Special Permit by is also appropriate. Please also see DEP's response to Comment #77.

90. **Comment:** II. Technical Guidance, D. Detection of Radiation, 2. Action Level 2 - Regarding notification to DEP and isolation of vehicle, this is not "required" by 78a.58(d), accordingly, the corresponding regulation should be cited, or this language should be revised. **(34)**

Response: Section 78a.58(d) of DEP's unconventional well regulations requires a RP Action Plan that is prepared in accordance with the TGD or in a manner at least as protective of the environment, facility staff, public health and safety and that meets all statutory and regulatory requirements. Therefore, the referenced language was retained in the final TGD.

91. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, RAM from TENORM-containing Wastes - This specifically references "unconventional" operations yet in the section referring to the TENORM Study (III.B) there is a mention of "conventional" operations. There is nothing in statute that specifically requires that this document be followed in "conventional" operations. **(27, 29)**

Response: The TGD may be utilized by the conventional operations as a best management practice to prevent unmonitored TENORM-containing waste that exceeds DOT shipping regulations from being transported on a public road or rejected from a disposal facility. The Department has concluded that UIC wells, as the term has been defined in the TGD, are required to have a RP Action Plan.

92. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, A. RAM from Patients Having Undergone a Nuclear Medicine Procedure - On Page 12 of the Proposed Guidance, it states: "The solid waste facility operator will always have the option to reject any waste load causing a radiation alarm; however, no vehicle containing RAM should leave the facility without written approval and an authorized DOT Special Permit issued by DEP (see above section relating to the detection of radiation)." However, there are cases where loads would be rejected but in compliance with the HMR, including DOT Special Permits would not be required because the radioactive element concentrations are under the § 173.436 special permit thresholds. Therefore, this language should be revised. See Supplemental Waste Tracking Form. **(23, 24)**

Response: In 2004, DOT confirmed in writing to DEP that households generating waste that is radiologically contaminated by medical patient are exempt from the HMR. If the waste does not require a DOT Special Permit, DEP can issue its own transportation 'Exemption Form.' Therefore, DEP recommends that the driver have some documentation upon arrival at another solid waste processing or disposal facility; alternately the waste load would have to be fully surveyed again. DEP's exemption form would satisfy the recommended documentation. The Supplemental Waste Tracking Form functions as a method by which DEP tracks the final disposition of waste rejected

by a facility, and therefore, it may not serve the same purpose for documentation as the exemption form.

93. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM from TENORM-Containing Wastes - RP Action Plans must be required of any facility or site with ANY level of radiation (not just "high level") since it is the cumulative, long-term effect, rather than annual. **(17)**

Response: Requiring a RP Action Plan for any facility or well site with "any level of radiation" is infeasible because radiation is natural and ubiquitous. DEP, through its regulations and the TGD, has developed a comprehensive approach for protecting the public, workers and environment that no other state has achieved. RP Actions Plans are required of all waste processing and disposal facilities and well sites where waste processing occurs. The RP Action Plans at these facilities would be designed to measure and assess radioactivity in all waste streams managed and is not limited to "high levels."

94. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM From TENORM-containing Wastes (Paragraph 1) - Same comment as at the definition of TENORM. Does this mean TENORM is not regulated under the 25 Pa. Code Chapters 217 to 220 regulations previously referenced in this document? If so, that should be made clearer such as by adding a parenthetical citing the BRP regulatory sections that are not applicable to TENORM; e.g., 25 Pa. Code Chapters 215 to 240, if that's what this means. **(6, 18, 27, 29, 34)**

Response: TENORM is not directly regulated for its radioactivity by the federal government or Pennsylvania; however, there are conditions and quantities of TENORM that may be subject to regulation in Pennsylvania when disposed of at a landfill. Please also see DEP's responses to Comments #64 and #66.

95. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM From TENORM-containing Wastes (b. of bullet list) - "Fracturing water" if that means the water to be used for fracturing, it should not be referred to broadly as a "waste" here. Update bulleted list (a-f) to be consistent with RWC 800 series language. Additionally, well pad liners do not have potential to contain TENORM, only TENORM-containing materials on the surface of the liner may contain TENORM, remove from. **(6, 18, 27, 29, 34)**

Response: The TGD was revised to modify the referenced bullet to align the language with the definition of produced water used by DEP's OOGM and BWM's residual waste codes for the reporting of wastewater disposed by oil and gas operations. Regarding well pad liners, DEP believes all waste materials leaving a well drilling and development operation have the potential for TENORM to be present. In most instances the liner must be cleaned in order to remove TENORM-containing sediments prior to reuse. A liner or portions of a liner that are not processed to remove TENORM and simply disposed of should be managed under a RP Action Plan and are subject to DEP's TENORM-disposal

protocol. Therefore, the bullet containing the term well pad liner was retained in the TGD.

96. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM From TENORM-containing Wastes - This paragraph is an unnecessary repetition of information already in the document elsewhere, please remove. If not removed, update language to be consistent with Guidance Document. Suggested Language: Facilities that process O&G liquid waste for reuse or disposal may generate higher volumes and activity levels of TENORM. For this reason, facilities that process O&G liquid waste should utilize standard gamma spectroscopy methods to assay waste prior to transport on public roads in accordance with the facility's RP Action Plan. **(6, 18, 27, 29)**

Response: The TGD was reviewed for repetition and revised to the greatest extent practical. Some language is repeated throughout the document and was retained in the TGD.

97. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM from TENORM-containing Wastes - The Proposed Guidance states on Page 13:

Landfills that accept TENORM-containing waste for disposal should provide justification in the proposed RP Action Plan demonstrating that it can adequately handle TENORM-containing waste, taking into consideration the facility's design and operational plan (e.g., considering the facility's engineered barriers, leachate collection and treatment, and environmental monitoring) and apply for approval to dispose of TENORM-containing waste at the facility through a permit modification. The monthly and annual volume of TENORM-containing waste that the facility is permitted to accept may be limited by DEP to ensure that the dose to a member of the public residing on the landfill in the future will not exceed 25 mrem/yr with all exposure pathways (including radon) considered.

In many instances, landfills that accept TENORM-containing waste and/or other waste streams from the O&G industry have applied for the right to do so via solid waste permit modifications, NPDES permit modifications, air permit modifications, and other modifications that may have also addressed the applicable radiation issues, albeit without always specifically revising the RP Action Plan. This is not surprising, since the RP Action Plan was never intended to address those issues, but rather, it was intended to address the receipt of the waste at the gates and response to radiation-containing loads. The regulations do not authorize the Department to require retroactive amendment of RP Action Plans to address issues such as leachate collection and treatment. Requiring the resubmission of RP Action Plans for issues already addressed in other permit modules would be expensive and burdensome, and it would not be in conformance with administrative law requirements applicable to binding norm requirements. See also discussion regarding radon pathway, infra. It would also impose unnecessary cost and burdens on landfills with respect to major permit modifications despite no change in operations. **(23, 24)**

Response: The Department is not requiring retroactive amendment of RP Action Plans through the revised TGD. Rather, the referenced language documents measures implemented to ensure that the disposal of TENORM-containing waste is contemplated in the context of a facility's approved design. Regulated facilities should routinely review their operational plans, including the RP Action Plan, to ensure that previously developed documents remain adequate and in compliance with regulations and guidelines. Any operational documents that may be identified as out of compliance should be modified.

98. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, B. RAM From TENORM-containing Wastes- Why are the types of waste generated from O&G operation mentioned multiple times in this section? They are listed, then again in the 4th paragraph they are repeated. Suggest removing the fourth paragraph (starts "Although there are multiple….") as everything mentioned is already included in the document. **(34)**

Response: The TGD was reviewed for repetition and revised to the greatest extent practical. Some language is repeated throughout the document and was retained in the TGD for emphasis.

99. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream B. RAM From TENORM- containing Wastes - The first sentence "Landfills that accept TENORM-containing waste for disposal should provide justification in the proposed RP Action Plan demonstrating that it can adequately handle TENORM-containing waste, taking into consideration the facility's design and operational plan (e.g., considering the facility's engineered barriers, leachate collection and treatment, and environmental monitoring) and apply for approval to dispose of TENORM-containing waste at the facility through a permit modification." is not practical or makes sense as how can a landfill be required to factor an unknown amount? Furthermore, DEP imposes a monthly allocation system for the acceptance of TENORM material which is updated as needed. Therefore, this first sentence should be deleted. **(27, 29)**

Response: The referenced language documents measures implemented to ensure that the disposal of TENORM-containing waste is contemplated in the context of a facility's approved design. The justification in the RP Action Plan could include the same type of information that is in the landfill's permit.

100. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, C. RAM From NORM-containing Wastes - Though we agree with this premise, the Pennsylvania definition of TENORM cited earlier, which includes any increased potential for human exposure, would suggest that any NORM-containing wastes being sent to a disposal facility (the mere handling and management of which would seemingly constitute "disturbance" from their natural environment and be increasing the potential for human exposure) would be defined as TENORM, so how can DEP be saying here that

there are no disposal restrictions, when O&G drill cuttings are being subjected to TENORM disposal restrictions. **(34)**

Response: The 2016 TENORM Study concluded that vertical drill cuttings have historically been indistinguishable from background. They typically are only moved and not processed. Therefore, no radiological considerations are created that would support handling restrictions. Additionally, the final TGD includes the TENORM definition as exactly stated in the municipal and residual waste regulations.

101. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, E. Rejecting Waste Loads Containing RAM from Any Source - A load could be "rejected" from a landfill simply because they have met or are getting close to the monthly TENORM allocation limits, even with prior coordination. A load could also be rejected at a waste processing facility because the material does not meet their acceptance criteria that doesn't have anything to do with the TENORM level. A load may not need a special DOT permit nor approval from the Department to simply be taken to another disposal location if characterization data identifies the waste below the DOT threshold (such as 270 pCi/g for Ra-226 and Ra-228).

A statutory or regulatory reference should be included here for clarity. If there are no such provisions, this would be an inappropriate "requirement" for inclusion in only a guidance document and should be either removed or rephrased as guidance to be included in the RP Action Plan. Suggested Language: A facility may accept waste containing RAM in accordance with this policy and the facility's approved RP Action Plan, or it can choose to reject any waste load containing DOT prohibited or licensed RAM. If rejected because its DOT prohibited or licensed RAM or it exceeds Action Level Two, then the vehicle or vessel containing RAM cannot leave the facility without written approval from the Radiation Health Physicist in DEP's Regional Office having jurisdiction over the facility and an authorized DOT Special Permit. If the driver of the vehicle does not comply with this requirement, the Radiation Health Physicist in DEP's Regional Office having jurisdiction over the facility and the Pennsylvania State Police should be immediately notified and provided the vehicle's license plate number. **(6, 18, 27, 29, 34)**

Response: RAM detected in a solid waste or metal recycling stream can be licensed, de-regulated or exempt from disposal restrictions, in accordance with numerous applicable laws and regulations. The Department does not wish to make the TGD or RP Action Plans overly complicated regarding DOT Special Permits. As specified in the TGD, the facility or well site should consider and train their staff to the 'DID' (detect, identify and determine) construct for evaluating measurable radioactivity. Licensed RAM is often recovered for proper LLRW disposal, household waste contaminated from medical procedures is processed or disposed of, and TENORM-containing waste is routinely disposed of at the facility. Please also see DEP's responses to Comments #77, #86, and #89.

102. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, E. Rejecting Waste Loads Containing RAM from Any Source - On Page 14 of

the Proposed Guidance, it states "If rejected, no vehicle containing RAM can leave the facility without written approval from the Radiation Health Physicist in DEP's Regional Office having jurisdiction over the facility and an authorized DOT Special Permit." This statement should be revised to refer to a DOT special permit "as applicable." **(23, 24)**

Response: If a DOT Special Permit is not applicable, an equivalent DEP 'Exemption' form may be issued. The TGD was revised to state, "If rejected, no vehicle containing RAM can leave the facility or well site without written approval from the Radiation Health Physicist in DEP's Regional Office having jurisdiction over the facility or well site, and if required, an authorized DOT Special Permit. Please also see DEP's response to Comment #89.

103. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, E. Rejecting Waste Loads Containing RAM from Any Source (Paragraph 1) - The first sentence should start with "A waste disposal facility ..." The O&G facilities are not disposal facilities because the residual waste (produced water) is beneficially reused to fracture a well and all other waste generated onsite is removed from the location. **(34)**

Response: The first sentence in the referenced section has been revised to read, "A facility or O&G well site…" for consistency with similar revisions made throughout the guidance document. Please also see DEP's response to Comment #4.

104. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream F. Records and Reports F.2 – Is this intended to mean "detected at any level?" It is recommended that this be revised to refer to detections above the Action Levels. **(34)**

Response: Any radioactivity detected above naturally occurring background for the site must be recorded in as much detail as possible and included in an annual report to the Department.

105. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream F. Records and Reports F.1 - Remove "O&G processor." This term is not defined and unnecessary. Suggested Language: Overview: Each person or municipality who operates a waste processing or disposal facility that receives waste from offsite and that has detected radioactive materials with radiation levels in excess of Action Level One to cause an alarm should maintain records of each incident, containing the information set forth in Section F.2. below in the facility's daily operational record. **(6, 18, 27, 29, 34)**

Response: The first sentence in the referenced section was revised to read, "Overview: Each person or municipality who operates a waste facility or well site…" for consistency with similar revisions made throughout the guidance document. Please also see DEP's response to Comment #4.

106. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream F. Records and Reports F.4- Chapter 78a.58(d) does not require an annual report for

radioactive materials as acknowledged by Appendix A of this Guidance Document (Appendix A does not list Chapter 78a as calling for an annual operation report). Additionally, any TENORM is ultimately disposed of at a landfill who is also tracking the amount of material; so annual reports by O&G operations would double count the same material that landfills are already reporting. Suggested Language: Annual Operation Report: Operators of municipal and residual waste processing or disposal facilities may be required to submit to DEP an annual operation report in accordance with 25 Pa. Code § 273.313 or 25 Pa. Code § 288.283 (relating to annual operation report). The Annual Operation Report should include a record of all detected RAM and summarize the information required in the daily operational records. A letter should be provided to DEP if no radioactive materials are found during the reporting year. **(6, 18, 27, 29)**

Response: The referenced language in Section III of the TGD applies only to operations that are permitted pursuant to the SWMA and require the development and implementation of a RP Action Plan, including municipal or residual waste landfills, transfer facilities, and other processing facilities. Said facilities can also include facilities operating under a general permit for the processing prior to beneficial use or beneficial use of waste that is required in accordance with the terms and conditions of that general permit generate an annual report. The referenced language does not apply to well sites where waste processing activities occur that is not operating under a permit issued pursuant to the SWMA, unless the well site where waste processing occurs is otherwise required to submit an annual report in accordance with the approval granted by DEP's OOGM or DEP's regulations applicable to oil and gas operations. The TGD was revised for clarification.

107. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream, F. Records and Reports, F.2. Daily Operational Records - The following statement appears "a brief narrative description of the occurrence" is needed for the operational record for each RAM detection. This is superfluous, and each of the related facts are already contained on the Form 30. **(23, 24)**

Response: The language of Section III.F.2 mimics the regulatory requirements for daily operational records. Regulatory citations are included in the revised TGD.

108. **Comment:** III. Identification and Disposition of RAM Found in a Waste Stream G. Monitoring Equipment – Add "at facilities where those types of containers or items may be required to be addressed in the facility's RP Action Plan" at the end of the last sentence for clarification. **(34)**

Response: The ability to recognize the symbols included in Section II.G of the TGD or visually identify items that should not be managed at the facility or well site is appropriate for any facility or well site where a RP Action Plan is required. Therefore, the TGD does not include the suggested language.

109. **Comment:** APPENDIX A. Radiation protection action plan (a) - (a) should be re-written since 78a.58(d) may not require monitoring for radioactive material entering an O&G operation but rather material generated at and leaving for disposal. Suggested Language: The action plan should specify the procedures for monitoring for and responding to radioactive material entering the facility (or in the case of unconventional well sites regulated under § 78a.58(d), for monitoring and responding to radioactive material produced by the treatment processes), as well as related procedures for training, notification, recordkeeping and reporting. **(6, 18, 27, 29, 34)**

Response: The language referenced by the commentators applies to solid waste disposal facilities and mirrors language found in DEP's municipal and residual waste regulations. For clarity, Appendix A was revised to include appropriate regulatory citations and section titles for the referenced paragraphs.

110. **Comment:** APPENDIX A. Radiation protection action plan (c) - What is meant by the statement, "(c) The action plan shall be incorporated into the landfill's approved waste analysis plan"? This reference does not appear to be related to O&G operations so it should be reworded. Suggested Language: A landfills action plan shall be incorporated into its approved waste analysis plan. **(6, 18, 27, 29, 34)**

Response: The language referenced by the commentators applies to solid waste disposal facilities and mirrors language found in DEP's municipal and residual waste regulations. For clarity, Appendix A was revised to include appropriate regulatory citations and section titles for the referenced paragraphs.

111. **Comment:** APPENDIX A. Radiation monitoring and response (g) - "(g) If radioactive material is detected, the vehicle containing the radioactive material may not leave the facility without written DEP approval and an authorized Federal DOT Special Permit." We do not believe this is appropriate for O&G operations. The purpose of this statement is if unknown RAM is detected in a conveyance. In the event known RAM is being shipped, you are not required to get Pennsylvania DEP approval and a DOT special permit. This would be a requirement if radiation levels were prohibited or it was licensed RAM. There should be some RAM concentration (e.g., pCi/g) or exposure rate (e.g., μR/hr) threshold for this to require the written approval noted here. Very small concentrations or quantities of RAM in waste (such as NORM levels) should not require this. Perhaps refer to RAM above the Action Levels. Suggested Language: If DOT prohibited or licensed RAM is detected, the vehicle containing the radioactive material may not leave the facility without written DEP approval and an authorized Federal DOT Special Permit. **(6, 18, 27, 29, 34)**

Response: Appendix A was revised for clarity and to include appropriate regulatory citations and section titles for the reference paragraphs. Subparagraph (g) of Appendix A mimics language in the municipal and residual waste regulations. Please also see DEP's response to Comment #89.

112. **Comment:** APPENDIX A, Radiation Monitoring and Response - 78a.58(d) should be included here since it does require certain monitoring and response, with appropriate edits to some of the language in this section.

(b) An operator shall monitor incoming waste *(or in the case of unconventional well sites regulated under § 78a.58(d), the radioactive material produced by the treatment processes)* in accordance with this guidance document or in a manner at least as protective of the environment, facility staff and public health and safety. **(34)**

Response: DEP included a reference to 25 Pa. Code § 78a.58(d) to the TGD.

113. **Comment:** APPENDIX A. Radiation Monitoring and Response (g) – Page 19 "If radioactive material is detected, the vehicle containing the radioactive material may not leave the facility without written DEP approval and an authorized Federal DOT Special Permit. "This statement should be clarified to indicate "as applicable." **(23, 24)**

Response: Please see DEP's response to Comment #99.

114. **Comment:** APPENDIX D, Guidelines for Radiological Monitoring and Characterization Equipment – The first paragraph of this section refers to "solid waste facilities" however, A. refers to "O&G operations." The applicability of the section needs to be clarified. **(34)**

Response: The paragraph was revised in the TGD to indicate that the monitoring equipment identified in Appendix D are likely to be found in any waste monitoring protocol.

115. **Comment:** APPENDIX D. 2. Facility Monitoring and APPENDIX D. 3. Monitoring Equipment (A.) - Remove "O&G operations" because fixed portal meters may be used and not all equipment is required or necessary at all types of O&G operations. Further, update last sentence to include incoming and outbound waste loads. O&G operations may not survey inbound waste loads.

Suggested Language in D.2: The waste load portal detectors are normally scintillation type detectors. In the scenario where time permits (e.g., waste loads are infrequent) or fixed portal monitors become inoperable, hand-held microR meters may be used to scan incoming or outbound waste loads.

Suggested Language in D.3.A: The monitoring equipment used at solid waste and at Unconventional Well Site Processing facilities should be calibrated no less frequently than annually, and (if utilized) its function should be tested daily using a check source for which the instrument's expected response has been previously determined. **(6, 18, 27, 29)**

Response: The final TGD focuses on inbound waste loads for solid waste processing or disposal facilities. DEP recognizes that many wells sites currently do not include acceptance of waste in their business model, but it is possible that waste is transported to the well site from other well sites for processing. The incoming waste may contain radioactivity. Therefore, the concept of incoming waste has been retained in the TGD. The TGD was revised to note that well sites typically use hand-held instruments to monitor waste.

116. **Comment:** APPENDIX D. 3. Monitoring Equipment (B.) - Paragraph I. below says, "to approximately 100 mrem/hr." Suggest being consistent between B. & I. **(6, 18, 27, 29, 34)**

Response: The language referenced by the commentator was revised for consistency.

117. **Comment:** APPENDIX D, 3. Monitoring Equipment – General Recommendations, B. page 24 "Portable instrumentation should have multiple probes for contamination and a range of gamma dose rate measurements...". Units typically have one probe which is sufficient. **(23, 24)**

Response: The intent of the referenced language is for facilities or well sites to have one probe for surveys and a separate probe for counting contamination swipes.

118. **Comment:** APPENDIX D, 3. Monitoring Equipment – General Recommendations, C. Some fixed monitoring equipment only displays count rate and does not have the capability to display dose rate even though it is properly calibrated to meet DEP requirements. **(23, 24)**

Response: The technology and equipment that satisfies Appendix D is readily available in the commercial marketplace. Therefore, the language pertaining to dose rate was retained in the TGD.

119. **Comment:** APPENDIX D, 3. Monitoring Equipment – General Recommendations, D. Scale multiplying factors and logarithmic scales are not present or needed on digital meters. **(23, 24)**

Response: DEP agrees with the commentators. However, the information is likely contained in the instrument's user manual, and therefore, should be included in staff training. The language has been retained in the TGD.

120. **Comment:** APPENDIX D, Guidelines for Radiological Monitoring and Characterization Equipment – Why is a third-party analysis from a laboratory not a viable option in place of characterization equipment? Add language that third-party lab analysis can be utilized in lieu of characterization equipment. Same comment in 4. **(6, 18, 27, 29, 34)**

Response: Laboratory analysis is an acceptable means of characterizing radioactivity. However, the use of a laboratory is likely to require more time to obtain information as

compared to the use of a consultant with accurate characterization equipment. While laboratory analysis may be an acceptable alternative for characterization, it is not an acceptable alternative for detection. This use of laboratory analysis is addressed in Appendix D.4.

121. **Comment:** APPENDIX D, 4. Characterization Equipment, C. "Supplies for taking samples for laboratory analysis...". Under the principles of as low as reasonably achievable (ALARA), scale-house workers and other landfill staff should generally not be involved in any sampling. **(23, 24)**

Response: At least one individual onsite must be properly trained in operating radiation detection and monitoring equipment and performing any needed radiological surveys. Further, this person must know the RP Action Plan and how to proceed if Action Level 1 or 2 radiation is detected.

122. **Comment:** APPENDIX E. Title - Use new term "Unconventional Well Site Processing" or "Facility." Suggested Language: APPENDIX E. GUIDELINES FOR RP ACTION PLANS FOR DETECTION AND HANDLING OF RADIOACTIVITY AT SOLID WASTE FACILITIES AND BY UNCONVENTIONAL WELL SITE PROCESSING. **(6, 18, 27, 29, 34)**

Response: The \ TGD was revised to use the term "well site" throughout. Please also see DEP's response to Comment #59.

123. **Comment:** APPENDIX E, 1. A. Qualifications of Persons Preparing the RP Action Plan - The guidance specifically recommends the use of a CHP in the development of a sites' RP Action Plan. Qualified CHP's are a very limited resource across the country. Many firms may use a CHP as a consultant, but other qualified RSO's, CIH's, or CSP's have the necessary skills and training to consult on the development of an RP Action Plan. Moreover, Pennsylvania DEP can reject any plan determined to be insufficient upon review. Accordingly, it is recommended that the last sentence under Appendix E, Section 1.A.(2) be deleted or modified to allow for greater flexibility in this regard. **(34)**

Response: The use of a CHP is a recommendation, not a requirement. DEP maintains that waste having a potential to contain radioactivity should be managed in consultation with a CHP. The language was retained in the
TGD.

124. **Comment:** APPENDIX E, 1. C. Persons Responsible for Implementation of the RP Action Plan - A minimum of one-day of training is generally more than should be required for many of the types of processing activities that occur at unconventional well sites; for example, if the only processing that is occurring involves drill cuttings at essentially NORM concentrations, a full day of radiation training should not be necessary. Suggested Language: Each facility should designate an individual responsible for implementation of the RP Action Plan. This individual should have adequate authority to implement the Plan. If the individual(s) implementing the RP

Action Plan is/are different from the individual(s) who prepared the RP Action Plan, the RP Action Plan should specify the minimum training in the fundamentals of radiation safety and detection to be required for the individual(s) responsible for implementing the RP Action Plan, at a level appropriate for the types of RAM being managed at the facility. **(6, 18, 27, 29)**

Response: The referenced language is a recommended duration for training staff on implementing the RP Action Plan. DEP disagrees that the language is overly burdensome. The referenced language applies to an individual responsible for the implementation of the RP Action Plan (if this individual(s) is different than the individual who prepared the RP Action Plan). Further, the one-day can be segmented into two or more partial days of training. The language was retained in the TGD.

125. **Comment**: The commenter believes the requirements for a "minimum one-day training session" in the fundamentals of radiation safety and detection may be both too prescriptive (to the extent it applies a single "all day" training event) and too narrow (to the extent we tend to have approved multi-partial-day training events with refreshers). Many of our landfills' approved Form X plans provide for initial training of three hours, intermediate level training at six hours, and retraining every two years for one hour. We believe the training can be accomplished in less than a day. We realize this is not a change proposed from the Current Guidance, but if revisions are occurring, we request greater flexibility. **(23, 24)**

Response: The referenced language is a recommended duration for training staff on implementing the RP Action Plan. DEP disagrees that the language is overly burdensome. The referenced language applies to an individual responsible for the implementation of the RP Action Plan (if this individual(s) is different than the individual who prepared the RP Action Plan). Further, the one-day can be segmented into two or more partial days of training. The language was retained in the TGD.

126. **Comment:** APPENDIX E, 1. D. Revision of the Plan - Updating an RP Action Plan through a permit modification is not practical for GPs (i.e., WMGR123 permits) that do not allow for minor and major modifications. Current regulations do not parse out, for GPs, the difference between something that might be considered a major modification vs. a minor modification like with individually permitted facilities, therefore, a GP modification requires a substantial submittal document from the facility. Suggested Language: If a facility's RP Action Plan requires submittal and approval by the Department, revisions to that RP Action Plan should be provided to the Department for approval, per the solid waste regulations. **(6, 18, 27, 29, 34)**

Response: The Department does not believe the proposed revisions to the referenced language significantly changes the language contained in the previously effective version of the TGD. Modifications to an approved RP Action Plan must be reviewed and approved by DEP, including situations where new equipment is purchased, or new staff is hired. Attaching a cover letter summarizing the changes is likely to expedite the review process. Also, including a version date and number will assist in tracking revisions.

For facilities operating under a permit issued pursuant to the SWMA, modifications to a RP Action Plan, including those listed in Appendix E.1.D. (Revision of the Plan), must be accomplished through a permit modification. Not all changes to an RP Action plan are considered major permit modifications and the determination as to whether a change is considered a major or minor permit modification may be dictated by specific circumstances. In instances where an update to an RP Action Plan is warranted or anticipated, the Department recommends discussing the proposed changes prior to a submittal which may result in elimination of certain permit application forms that are not necessary. Not all changes to the RP Action Plan would require a substantial application submittal from the facility.

Revisions to applicable regulations or policies are unlikely to occur on an annual basis. The TENORM Disposal Protocol (which includes the TENORM Allocation Spreadsheet that is completed by landfills and submitted to the Department monthly) is updated and distributed to permittees on an annual basis; however, updates to the spreadsheet and instructions do not also require an update to a facility's RP Action Plan.

127. **Comment**: APPENDIX E, 1. D. Revision of the plan states that the plan should be updated each time DEP regulations or policies are revised. This could require annual updates, but if major permit modifications are intended for each revision to an RP Action Plan, then this will lead to administrative burdens and issues for Pennsylvania DEP and the regulated community. There have been frequent updates to the TENORM spreadsheet. In that regard, the Guidance should reflect between changes to an RP Action Plan that require a major modification under the solid waste regulations, and changes that can be done by minor modification. Not all changes to an RP Action Plan should require a major modification. **(23, 24)**

Response: The Department does not believe the proposed revisions to the referenced language significantly changes the language contained in the previously effective version of the TGD. Modifications to an approved RP Action Plan must be reviewed and approved by DEP, including situations where new equipment is purchased, or new staff is hired. Attaching a cover letter summarizing the changes is likely to expedite the review process. Also, including a version date and number will assist in tracking revisions.

For facilities operating under a permit issued pursuant to the SWMA, modifications to a RP Action Plan, including those listed in Appendix E.1.D. (Revision of the Plan), must be accomplished through a permit modification. Not all changes to an RP Action plan are considered major permit modifications and the determination as to whether a change is considered a major or minor permit modification may be dictated by specific circumstances. In instances where an update to an RP Action Plan is warranted or anticipated, the Department recommends discussing the proposed changes prior to a submittal which may result in elimination of certain permit application forms that are not necessary. Not all changes to the RP Action Plan would require a substantial application submittal from the facility.

Revisions to applicable regulations or policies are unlikely to occur on an annual basis. The TENORM Disposal Protocol (which includes the TENORM Allocation Spreadsheet that is completed by landfills and submitted to the Department monthly) is updated and distributed to permittees on an annual basis; however, updates to the spreadsheet and instructions do not also require an update to a facility's RP Action Plan.

128. **Comment:** For facilities that are required to have their plans approved by DEP, is it the intention for the Department to review and approve an RP Action Plan in every instance when a site purchases a new meter or hires a new employee? RP Action Plans should be updated to reflect such changes but reviewing multiple versions of the same plan by DEP is unnecessary. Accordingly, in Appendix E, Section 1.D, revised plan approvals should be limited to item number "2) The RP Action Plan fails during an incident." and "6) The designated area for vehicles in which RAM has been detected changes." A failure incident indicates a potential weakness in the site program that may need to be addressed and a significant move of a "designated area" of more than several hundred yards could warrant additional review.

Updating an RP Action Plan through a permit modification is not a very practical way to update an RP Action Plan. What permit would need to be modified for an O&G facility? The RP Action Plan is not tied to any permit? Allow other means of updating a RP Action Plan such as simply a submittal of the plan for review and approval. **(34)**

Response: The Department does not believe the proposed revisions to the referenced language significantly changes the language contained in the previously effective version of the TGD. Modifications to an approved RP Action Plan must be reviewed and approved by DEP, including situations where new equipment is purchased, or new staff is hired. Attaching a cover letter summarizing the changes is likely to expedite the review process. Also, including a version date and number will assist in tracking revisions.

For facilities operating under a permit issued pursuant to the SWMA, modifications to a RP Action Plan, including those listed in Appendix E.1.D. (Revision of the Plan), must be accomplished through a permit modification. Not all changes to an RP Action plan are considered major permit modifications and the determination as to whether a change is considered a major or minor permit modification may be dictated by specific circumstances. In instances where an update to an RP Action Plan is warranted or anticipated, the Department recommends discussing the proposed changes prior to a submittal which may result in elimination of certain permit application forms that are not necessary. Not all changes to the RP Action Plan would require a substantial application submittal from the facility.

Revisions to applicable regulations or policies are unlikely to occur on an annual basis. The TENORM Disposal Protocol (which includes the TENORM Allocation Spreadsheet that is completed by landfills and submitted to the Department monthly) is updated and distributed to permittees on an annual basis; however, updates to the spreadsheet and instructions do not also require an update to a facility's RP Action Plan.

129. **Comment:** APPENDIX E, 2. A. General Instructions - If an element isn't applicable or appropriate, a written explanation to that effect should not be necessary. In fact, the next paragraph makes that point; that the most important thing is that the plan should be simple, etc., not contain unnecessary text explaining why non-applicable elements are not included. Delete the second half of the paragraph. Suggested Language: Certain RP Action Plan elements included in this guidance document may not be applicable or appropriate for a specific facility, operation or type of incident. In these cases, the person preparing the RP Action Plan should act accordingly. **(6, 18, 27, 29, 34)**

Response: DEP understands that not all aspects of the TGD are applicable to every well site or facility that is required to develop a RP Action Plan. The submitted plan should indicate which sections of the TGD not are applicable and why.

130. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response, O&G Vehicles - This section should be more consistent with language under Solid Waste Vehicles. Vehicles transporting fluids should not have detectable radiation above background. Further, for O&G activities the concern is solid waste leaving the facility not liquid waste entering the facility. Chapter 78a.58(d) only applies the RP Action Plan requirements to "radioactive material produced by the treatment processes," not all waste leaving the site. This Section is very confusing where it is describing guidance for detection, action levels and initial response for three different situations (solid waste vehicles, O&G vehicles, and O&G facilities fixed equipment and tanks). This section also has more stringent notification actions for Action Level One than anywhere else the Action Level One is described. It may be best to note that if a waste disposal facility has a policy to not accept any waste with a measured exposure rate of greater than 10 μR/hr above background these actions could take place. Suggested Language: If a vehicle containing liquid waste (e.g., water tanker trucks) is suspected of containing TENORM it should be surveyed according to the procedure listed above for solid waste vehicles. **(6, 18, 27, 29, 34)**

Response: Section 2.B in Appendix E of the TGD contains recommendations for vehicle screening when radioactivity is detected and expands upon the language regarding Action Level 1 provided elsewhere in the TGD. DEP understands that not all aspects of the TGD are applicable to every well site or facility that is required to develop a RP Action Plan. Please also see DEP's response to Comment #123.

131. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response, O&G Facilities Fixed Equipment and Tanks - This section is an overreach of the requirements for an O&G operator to "develop an action plan specifying the procedures for monitoring" for TENORM that is required by Chapter 78a.58(d). DEP would need to pursue the rulemaking process to prescribe monthly or even quarterly surveying. Further, O&G waste processing that occurs at a well site is temporary, tanks and pipelines associated with the processing activities are not "fixed." Suggest deleting this section. Suggest baseline monitoring and installation of signage to alert workers in the area of the presence of NORM/TENORM, Caution NORM signage.

Additionally, the requirement of monthly monitoring for a year then quarterly is too extensive. Additional monitoring should occur if: process changes, equipment being taken out of service. The guidance does not provide any expectations regarding what record keeping will consist of. These may be outlined in other regulatory guidance but why not summarize it here? The requirement overall seems problematic. What is the operator to record (e.g., an average value for the fixed pipe, the highest recorded value at a measuring spot)? Does it matter if the fixed equipment does develop measurements above Action Level One? Is the expectation that the operator would then have to clean the NORM-impacted fixed equipment? Doing so may not be justified to control risk. If the idea of NORM surveys is to keep track and look out for the potential build-up of NORM/TENORM, then an initial and post operation or a yearly survey to check for NORM/TENORM build up should be more than adequate. Obviously, if interior work on NORM-impacted equipment is planned, a survey prior would also be prudent. NORM deposits take time to build up, monthly surveys seem like excessive labor and recordkeeping for no substantive benefit.

Paragraph 5 of Section 2.B - Numerous studies and current data show that trucks transporting produced water do not pose a health risk to employees or the general public. Any other vehicles leaving the site with waste would be surveyed according to applicable waste regulations. This section does not make sense. It starts out saying "where detection is unlikely…" and then ends with mandating a frequency in which tanker trucks should be analyzed. Further, what is the purpose of screening water trucks entering the O&G facility…it should only be critical to screen solid wastes leaving a facility for disposal. If this is designed to target waters arriving for reuse, it should be more clearly stated. Otherwise, recommend deletion.

It does not have any validity to survey for gamma radiation on a monthly basis for new equipment when a radiation profile is developed over long periods of time from sediments accumulating at the bottom of a tank or scale forming on the walls of fixed piping. It would be more appropriate to have guideline language that recommends that fixed equipment surveys should occur prior to maintenance, cleaning or dismantling activities because this would be the time when any built-up radioactive material would exhibit a risk of being released to the environment. **(6, 18, 27, 29, 34)**

Response: If the operation or facility is subject to OSHA regulations, then proper radiation warning signs are required. It is suggested that a qualified health physicist evaluate the protocols in place for the facility or well site.

Monthly surveys of equipment are a standard health physics practice. The TGD provides additional flexibility to the regulated community by allowing the monthly frequency to be further reduced to a quarterly frequency. DEP believes it may be appropriate to reduce the frequency of the surveys, but not to eliminate the practice. Therefore, the language has been retained in the TGD.

DEP understands that not all aspects of the TGD are applicable to every well site or facility that is required to develop a RP Action Plan. The submitted plan should indicate which sections of the TGD not are applicable and why.

132. **Comment:** In II. D. Detection of Radiation, III. E. Rejecting Waste Loads Containing RAM from Any Source, and APPENDIX E. 2. B. and 2. D. - It seems as though there should be a minimum threshold below which this "contamination" would not require contacting the DEP. For example, if there was simply some minimal NORM contamination (at the low naturally occurring concentrations, such as could occur with a load of drill cuttings), that doesn't seem to justify DEP involvement. **(34)**

Response: There is no threshold because there are several factors that require consideration, such as homogeneity of the load, provenance, etc. There are some experienced operations that do not contact the Department. They have the resources to identify, document and dispose of waste described in the comment.

133. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response - "An example of a typical 'decision tree' for determining appropriate steps when radioactivity is detected is in Appendix I." - Suggest moving this reference statement above Solid Waste Vehicles as it relates to both Solid Waste Vehicles and O&G Vehicles and giving it a title "Decision Tree of Recommended Actions." **(6, 18, 27, 29, 34)**

Response: The recommended revision was incorporated into the TGD.

134. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response - "Solid Waste Vehicles" 2) says to mark the area with the highest radiation level with chalk. This is not needed for proper isotope identification and not in keeping with ALARA. **(23, 24)**

Response: Marking the area with the highest radiation level with chalk makes locating the area of interest easier to monitor movement within the vehicle at a later time, if necessary. The referenced language is a recommended procedure, and therefore, the use of mandatory language was not used.

135. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response - "Solid Waste Vehicles" 4) states that if a Level One RAM-containing load "is to be rejected, contact the appropriate DEP Area Health Physicist for approvals." This should be removed, since it infers that additional approval is needed beyond DOT-required shipping approvals discussed above. **(23, 24)**

Response: Any amount of detectable radiation in a load of solid waste or recycled metal that is not fully characterized for shipping in accordance with DOT regulations, should be shipped to another location under a DOT Special Permit issued by the Department. The referenced wording allows for flexibility in determining the appropriate approval. Please also see DEP's response to Comment #86.

136. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response - The guidance talks about doing response checks on a "relative basis?" How about saying prior to use. Also, indicate that if the instrument fails to properly respond after a survey is done, that the wastes or other materials should be re-checked? **(2)**

Response: The TGD was revised to state, "Detection, Action Levels, and Initial Response - Fixed and portable radiation monitoring systems should be calibrated at least annually to a traceable cesium-137 source. This radiation standard should be traceable to the U.S. National Institute of Standards and Technology. Radiation monitors should be response-checked on a routine daily basis when in use. Monitoring systems must be operated in a manner that addresses Action Levels One and Two, and procedures provide appropriate notifications for each as described in Section II.D. of this technical guidance document (relating to detection of radiation)."

137. **Comment:** APPENDIX E, 2. B. Detection, Action Levels, and Initial Response - How does the decision logic fit fixed equipment and tanks? Appears for waste acceptance and rejection. **(2)**

Response: The statement was relocated to appear just before the section heading, "Solid Waste Vehicles," in Section 2.B of Appendix E. Please also see DEP's response to Comment #127.

138. **Comment:** APPENDIX E, 2. D. Characterization – Page 30 "Action Level One procedures. Do not allow the vehicle or container to leave the facility without the permission of DEP and the driver being issued a DOT Special Permit signed by DEP's Area Health Physicist or their authorized representative." The special permit reference should be clarified to indicate as applicable per 49 CFR § 173.436. **(23, 24)**

Response: The Action Level One procedures in Appendix E.2.D have been edited in the TGD. However, reference to DOT's regulations in 49 CFR were not included, as it is understood that any radioactive material transported on public roads shall conform to DOT regulations. If a particular waste or scrap metal shipment exhibits an unknown source of radiation, DEP has the authority to issue a Special Permit to exempt certain aspects of these DOT regulations. The DOT Special Permit is described in Section II. B and in the definitions of the TGD. Any amount of detectable radiation in a load of solid waste or recycled metal that is not fully characterized for shipping in accordance with DOT regulations should be shipped to another location under a DOT Special Permit issued by the Department. Please also see DEP's response to Comment #86.

139. **Comment:** APPENDIX E, 2. D. Characterization - Action Level Two - 1) It is unclear as to the initiation of the actions listed. Should the actions take place if the dose limits are over 2 mrem/hr in the cab of the trucks and under 50 mrem/hr? **(34)**

Response: The actions should take place if the dose limits exceed 2 mrem/hr in the vehicle's cab, or 50 mrem/hr anywhere else on the vehicle, or if radioactive contamination is detected. Therefore, any one of the three scenarios would prompt Action Level Two, and DEP must be promptly contacted.

140. **Comment:** APPENDIX E, 2. F. Disposition and/or Storage – A DOT Special Permit should not be required if the waste is to remain at the facility. **(34)**

Response: DEP agrees with the commentator. A DOT Special Permit is only required if the material is transported on public roadways. The reference to DOT Special Permits was deleted from Section 2.F of Appendix E in the TGD.

141. **Comment:** APPENDIX E, 2. H. Other Items to be Included, 5. – This paragraph should be moved to the Training Section G above. **(34)**

Response: DEP believes subparagraph 5 in Section H is appropriately placed in the TGD.

142. **Comment:** APPENDIX E, 2. I. Long-term Monitoring and Termination of Operations – Why is this section only relevant to O&G related wastes? O&G wastes should not be targeted. Consider removing specific references to O&G wastes. Should this first sentence apply to any RAM-containing liquids containing elevated levels of radionuclides, not just O&G liquids? It is not clear what is meant by "elevated levels." Flow-back and produced water generally doesn't contain particularly "elevated" levels, but sludge resulting from treatment of those waters may. An RP Action Plan is not the appropriate place to discuss spill clean-up. This document should not reference spill clean-up criteria not included in the Pennsylvania regulations.

The need for, or usefulness of, the table in Appendix H in this document is unclear and will likely lead to confusion and/or uncertainty regarding its purpose in this document, if not further explained. For example, the first two lines in that table provide two different concentrations for total Radium as a Volumetric Cleanup Criteria (3 pCi/g and 5 pCi/g) based on different reference organizations, with no further explanations of which, if either, is relevant in Pennsylvania under various scenarios, nor for purposes of this document. This is the only place in this document where that Appendix is referenced, with no explanation as to specifically why it is being referenced or how the information is to be used, so we recommend that further explanation for including Appendix H be provided, or that it be deleted.

Suggested Language: At landfill sites and facilities that are handling and processing liquids containing elevated levels of radium, the Action Plan should include procedures for monitoring and mitigation of spills or leaks of wastewater. Similarly, liquid storage tanks once drained and taken out of service should be surveyed for radiological contamination. Survey records should be maintained for five years. Landfills that have accepted large volumes of TENORM waste should have long-term environmental

monitoring programs in place to monitor leachate and detection of radiological groundwater contamination. Appendix H provides a table of ARARs. **(6, 18, 27, 29, 34)**

Response: Appendix E was revised to add the statement to Section I, "At well sites and facilities that are generating, handling, processing, or disposing of O&G liquids (e.g., hydraulic fracturing flow-back wastewater or produced water) or solids containing elevated levels of TENORM, the RP Action Plan should include procedures for monitoring and mitigation of spills or leaks of wastewater. Similarly, O&G liquid storage tanks once drained and taken out of service should be surveyed for radiological contamination. All radiation monitoring and survey records must be maintained for five years. Landfills and UIC wells that have accepted large volumes of TENORM waste should include radium-226 and radium-228 in their long-term environmental monitoring programs to monitor leachate (for landfills) and detection of radiological groundwater contamination. Appendix H of this guidance provides a table of ARARs for environmental monitoring and cleanup of spills at well sites and other equipment and facilities.**"**

It is infeasible for DEP to provide exact guidance for every possible scenario related to the release, spill, or contamination incident involving radioactive materials at a solid waste, metal recycling, or well sites where waste processing occurs. There are references provided in Appendix H for these ARARs. If needed, the facility or operation should consult these reference documents for application of the ARAR.

143. **Comment:** APPENDIX E, 2. I. Long-term Monitoring and Termination of Operations – Page 33 of the Proposed Guidance, regarding Long-term Monitoring and Termination of Operations, states: Landfills that have accepted large volumes of TENORM waste should have long-term environmental monitoring programs in place to monitor leachate and detection of radiological groundwater contamination. Appendix H provides a table of ARARs.

We believe this sentence should be removed, for the reasons previously stated (e.g. vagueness). Moreover, the solid waste regulations already identify the applicable ARARs for the landfill. They are not necessarily the standards identified in Appendix H nor are the points of compliance and applicable timeframes referenced. These are not remedial sites and they were never intended to be cleaned up to a residential cleanup standard or to protect a resident farmer 1,000 years in the future from a radon dose (25 mrem) one fraction as stringent as a current well-controlled Pennsylvania home (200 mrem – 800 mrem) with a radon remediation system. The standards for post-closure care, including radium in drinking water, are identified in the applicable post closure care solid waste regulations, and other applicable regulatory programs (e.g., Landfill NSPS). **(23, 24)**

Response: Please see DEP's responses to Comments #42 and #136.

144. **Comment:** APPENDIX E, Radiation Protection Action (and Monitoring) Plan Checklist (Non-landfill Plan Elements) - Comments on Form X:

- This Form is not required by 78a.58(d), as implied by the first sentence on the form that says it "must be … completed" if it is intended to be used for 78a.58(d) operations.

- If intended for 78a.58(d) operations, the Form should be updated to include a reference to 78a.58 in the General References section and a check box in Section B for unconventional well site processing operations, per 78a.58(d).

- It's not clear why the Form includes a check box in Section B for O&G Wastewater Storage Impoundments since those are not required by 78a.58 to have an RP Action Plan (unless perhaps they're associated with onsite processing operations).

- Section C of the form says it's for waste "entering" the permitted facility, which isn't relevant to 78a.58(d) facilities since the RP Action Plans required for those facilities are for the radioactive material produced by the treatment processes.

- If this form is intended for 78a.58(d) facilities, then further detailed review of the form specific to those facilities and the regulatory language of 78a.58(d) should be performed separate from this guidance document review. **(6, 18, 27, 29, 34)**

Response: The reference to Form X was deleted from the RP Action Plan Checklist.

145. **Comment:** APPENDIX E, Radiation Protection Action (and Monitoring) Plan Checklist (Non-landfill Plan Elements) - This implies that if you send known TENORM with an approved profile to a landfill that gets rejected due to the facilities monthly TENORM allotment being completely utilized upon arrival of the waste load, the waste load would need a DOT Special Permit. This would not be necessary as you have characterization data and a DEP-approved profile that evidences the load is DOT compliant (less than 270 pCi/g). This known properly characterized load that is less than 270 pCi/g does not require a special permit and can be transported to another landfill or be return to the generating facility as Residual Waste. It is not possible to schedule loads into a landfill in advance to guarantee enough TENORM tons are available.

Example – Generator A contacts the landfill and schedules a load of known TENORM into the landfill on Wednesday evening. Generator A sends load first thing Thursday morning and upon arrival at the landfill, Generator A is informed that they no longer have available TENORM tons. The TENORM tons that were available were no longer available due to Generator B sending a load of TENORM to landfill that arrived 30-minutes prior and utilized the TENORM tons for that month. Therefore, this should be removed from the checklist. **(6, 18, 27, 29)**

Response: The language was modified to explain that DEP recommends coordination before sending waste to a landfill to provide the receiving landfill a chance to confirm they have the TENORM allotment available, reducing the likelihood of rejected waste.

146. **Comment:** APPENDIX F, 2. Sources of Contamination - Why is O&G the only example provided here? Other industrial examples should be included here as well to avoid misinterpretations that O&G is the only example worth highlighting. **(6, 18, 27, 29)**

Response: The TGD was revised to include additional examples of TENORM-containing waste in Section 2 of Appendix F.

147. **Comment:** APPENDIX F, 2. Sources of the Contamination – "NORM, such as radium, thorium, or uranium, is often found in bricks, wall board, or building rubble containing these construction materials. It should be noted that this NORM was present in the base material that was used to produce these construction materials." These examples should be considered TENORM under Pennsylvania's definition, since the base material has been moved and manipulated in ways that increase the potential for human exposure (similar to why Pennsylvania considers drill cuttings to be TENORM). **(34)**

Response: NORM refers to the parent radioactive elements present in the material. The same material may also meet the definition of TENORM. Please also see DEP's response to Comment #64.

148. **Comment:** APPENDIX G, 4. How Much Radioactivity versus Material is Present? – Should add picocurie to the paragraph of common fractions of the curie. **(34)**

Response: Picocurie was added to paragraph 4 in Appendix G.

149. **Comment:** APPENDIX G, 9. Is it Safe to be Around Sources of Radiation? - See previous comment above at the Table in Sec. II.C. questioning why this is 25 mrem/yr rather than 100 mrem/yr. **(6, 18, 27, 29, 34)**

Response: Please see DEP's response to Comment #80.

150. **Comment:** APPENDIX H deals with typical discharges in transport and storage to include spills, flaring of gas, and groundwater, but omits long-term residual radiation accrued in leachate or its compacted sludge. **(17)**

Response: The criteria for discharges to publicly owned treatment works or sewage treatment plants that may receive landfill leachate for treatment are stated and related to NRC's criteria in 10 CFR 20 Appendix B. EPA's clean-up criteria for possible spills or use of sludges is also noted. Please also see DEP's responses to Comments #8, #31, #38, and #42.

151. **Comment:** APPENDIX H, Typographic Errors – first row, Reference ANSI/HPS; third row, micro symbol appears as a box. **(2)**

Response: The typographic error was corrected in the TGD.

152. **Comment:** APPENDIX H - The "Potentially Apply:" column should be removed or revised to not be industry specific. None of the ARARs in this table are specific to the O&G industry. This column targets the O&G industry when recommendations/standards in the table apply to all industries. This Guidance Document supports all industries and therefore, it should not target O&G in this table.

Example:

Volumetric Liquids, e.g., Groundwater	5 pCi/L Total Radium (Ra-226 + Ra-228) in drinking water	US EPA Drinking Water Standards	Effluent Water from Well Pads

Effluent Water from Well Pads should never be compared to an EPA drinking water standard. Stormwater managed under the auspices of a well pads ESCGP permit is not required to meet a drinking water standard and produced water managed as a residual waste is not comparable to drinking water. What is "Effluent Water?"

O&G operations are required to follow cleanup standards found in Chapter 78a.66 and Act 2 of the Environmental Cleanup Program. To our knowledge Pennsylvania DEP has not promulgated the Federal standards within the table in Appendix H and it is unclear if they apply to any Pennsylvania regulatory programs. Cabot questions the Department's statutory authority for these numbers. We recommend either removing Appendix H or extensive revisions that would provide another title and reason for its inclusion. Suggested Language: Replace "Well Pads" with "facilities managing RAM." **(6, 15, 18, 22, 27, 29)**

Response: Appendix H is provided to the regulated community as a summary of references. Depending on the nature of the situation, a spill or release, the respective standard may be applied. Please also see DEP's responses to Comments #4 and #5.

153. **Comment:** APPENDIX H, Applicable or Relevant and Appropriate Requirements Used for Radium, Radon, and TENORM – The need for, or usefulness of, this table in this document is unclear and will likely lead to confusion and/or uncertainty as to what its purpose is in this document, if not further explained. For example, the first two lines provide two different concentrations for total Radium as a Volumetric Cleanup Criteria (3 pCi/g and 5 pCi/g) based on different reference organizations, with no further explanations of which, if either, is relevant in Pennsylvania under various scenarios, or for purposes of this document.

This Appendix is only referenced once in this document (in Section I of Appendix E) with no explanation there as to specifically why it is being referenced or how the

information is to be used, so we recommend that further explanation for including this Appendix be provided, or that it be deleted. This table should be removed as there are no Pennsylvania DEP regulations supporting the information within the table. Further the "Potentially Apply to:" column is targeting O&G, wouldn't these standards apply to all industries in the state? Lastly, the standards are also not correctly used in relation to the "Potentially Apply to:" column (i.e., Volumetric Liquids - EPA Drinking Water Standard - Effluent Water from Well Pads; what is effluent water from well pads and why would it ever be compared to a drinking water standard??).

It's highly unlikely that cuttings would ever approach this level, so we suggest deleting this reference here. "Volumetric Liquids, e.g., Groundwater and volumetric liquids, e.g. Discharges" all have "effluent water from well pads" as "Potentially apply to." The applicability of each of the three standards needs to be clarified. **(34)**

Response: Please see DEP's response to Comment #136.

154. **Comment:** APPENDIX I - This table does not account for properly characterized TENORM waste that is disposed of in another state. It also does not account for TENORM that triggers a Level 1 Alarm that is disposed of at a Pennsylvania landfill that does not require "blanket authorization." Under Level 1 Alarm – why process per blanket authorization? This is not the case for all waste from a water treatment facility that triggers a Level 1 Alarm and is either disposed in Pennsylvania landfill using TENORM tons or disposed out of state at low level disposal facility. **(6, 18, 27, 29, 34)**

Response: DEP agrees with the commentators. TENORM-containing waste disposed of at an out-of-state facility is beyond the scope of the TGD, which only applies to activities that take place in Pennsylvania. Appendix I was updated to remove the language relating to the blanket authorization.

155. **Comment:** APPENDIX I "Flowchart of Recommended Immediate Actions for a Solid Waste Facility Radiation Alarm." Neither this Section nor Appendix E. 2. B. "Solid Waste Vehicles" address a vehicle dose rate that is barely high enough to trigger the portal alarm yet too low for isotope identification with current state-of-the-art hand-held meters. We propose logging the load on the TENORM spreadsheet and listing the isotope as "not identified." A near background level load like this should not require additional DEP approval. **(23, 24)**

Response: The Department does not allow "not identified" by itself in the too-low scenario described. However, generator knowledge or clear isotopic gamma ray signature (peaks) are acceptable. The above noted scenario could be an orphaned, sealed source buried in a load of solid waste from a building demolition. In that case our expectation is the load would be rejected, transported back to the generator with a DOT Special Permit, or taken to the designated area onsite for the waste to be off-loaded and the source identified and retrieved.