

**NORTH DAKOTA DEPARTMENT OF HEALTH
DIVISION OF AIR QUALITY
DIVISION OF WASTE MANAGEMENT**

**Review and Response to Public Comments Received for the
Proposed Administrative Rules Related to TENORM Management and Disposal**

August 6, 2015

The North Dakota Department of Health (Department) is conducting a rulemaking proceeding to address proposed rules relating to Technologically Enhanced Naturally Occurring Radioactive Material (TENORM). TENORM is Naturally Occurring Radioactive Material (NORM) that has been concentrated to some degree by human activities through a number of different processes during oil exploration and production activities. This material is regulated by the Department through its Division of Air Quality and Division of Waste Management.

The Department regulates the management of radioactive materials under authority of North Dakota Century Code (NDCC) Chapter 23-20.1, Ionizing Radiation Development. The Division of Air Quality's Radiation Control Program implements the Department's administrative rules for the management of radioactive materials in NDAC Article 33-10, Radiological Health Rules. The proposed rules in NDAC Chapter 33-10-23 specifically address TENORM. The proposed rules generally deal with recordkeeping, reporting, licensing and closure standards for companies that generate, transport or manage TENORM.

The Department regulates the management of solid waste under the authority of NDCC Chapter 23-29, Solid Waste Management. The Division of Waste Management's Solid Waste Program implements the Department's rules for the management of solid waste in NDAC Article 33-20, Solid Waste Management and Land Protection. The proposed rules in NDAC Article 33-20 generally deal with landfill disposal requirements for TENORM.

The proposed rules were released to the public and published on the Department's web site on December 12, 2014, with a news release issued that day. Public comment hearings were scheduled and held in Williston, Bismarck, and Fargo on January 20, 21, and 22, 2015, respectively. The public comment period was scheduled to end on February 6, 2015, but was extended to March 2, 2015 due to public requests. Public notices of the draft rules, comment period and hearings were published in all official county newspapers in North Dakota and through the Department's public notice web page and public notice email subscription service in mid December 2014. During the public comment period, the Division received both verbal and written comments regarding the draft permit.

Many comments received were similar in nature and topic. The Department has grouped them into general categories to aid in the response. In some cases several similar comments have been summarized so that one response applies to all of them. In other cases excerpts have been quoted

and directly responded to. The transcript of the public comment hearings and copies of all written comments are included as appendices.

Please note that the Department is only responding to statements and comments that directly apply to the proposed draft rules. Lack of response to a comment does not indicate that the Department agrees that it is accurate. The public hearings were transcribed as accurately as possible, and comments are quoted as stated into the record, with no corrections for grammar or wording.

The public comments and the Department's review, analysis and responses are organized as follows:

- I. Scope of Proposed Rules
- II. Policy and Procedural Issues
- III. Technical Radiation Issues and Comments on Argonne National Laboratories Study
- IV. Air Quality – Radiation Control Program Rule Comments
- V. Waste Management – Solid Waste Program Rule Comments
- VI. Miscellaneous Issues
- VII. Summary and Conclusions

I. Scope of Proposed Rules

I.a. Comment

“And while there may be already rules for dealing with liquid waste that has radioactivity, if solid waste rules are going to be updated, we would like to see that liquid waste are included as well, particularly brine.” (**Williston page 7**)

I.a. Response

Under NDCC Chapter 23-29 Solid Waste includes “... solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.” Oilfield produced water, sometimes called brine, falls under the definition of Special Waste, which is a subcategory of Solid Waste, and is subject to regulation by both the North Dakota Industrial Commission and by the Division of Waste Management. A waste transporter permit is required for anyone that transports oilfield produced water. The only approved method for disposal of produced water is by injection into a Class II Underground Injection Control (UIC) well, regulated by the North Dakota Industrial Commission (NDIC), Oil and Gas Division.

Oilfield produced water may contain trace amounts of Naturally Occurring Radioactive Material (NORM), but it has not been technologically enhanced and thus is not proposed to be regulated as TENORM under the draft rules in NDAC Chapter 33-10-23 because it has not been concentrated by human activity. This is also the case for drill cuttings which have been dug out of the well bore, but have not been concentrated by human activity. So, while oilfield produced water and drill cuttings are Solid Waste and subject to laws for proper transporting, handling, and disposal, they will not be regulated as TENORM waste.

I.b. Comment

“Is there an existing MOU between the NDIC and NDDH - will there be a protocol to follow for responding to TENORM related incidents?” **(Williston page 13)**

I.b. Response

The Memorandum of Understanding (MOU) between the Department and the North Dakota Industrial Commission (NDIC), Oil and Gas Division relates specifically to responses to spills or releases, primarily of oil and produced water. The NDIC will respond and follow up with spills that are contained on the constructed oil well site. The Department will respond and follow up with spills that leave the well site. The MOU does not distinguish between spills that do or do not contain materials that would be regulated as TENORM, such as filter socks. The NDIC and Department have a good working relationship and if a spill occurred on a well site that contained regulated TENORM material the Department would be available to assist in any way needed and as provided for in existing or adopted state regulations.

I.c. Comments

There were a number of comments regarding the regulatory authority of the Department for the proposed TENORM-related rules, and which regulatory agencies will be implementing and enforcing the rules, such as:

“The NDDoH does not regulate those pits though, I was told by you, Scott Radig, at the meeting on 1/20/15. That is the Dept of Mineral Resources. Another problem!” **(B. Jorgenson)**

“...disposing drill cuttings on well sites ‘exposes this material to the accessible environment’, which is part of EPA’s definition of TENORM.” **(Earthworks)**

I.c. Response

The Department is the state agency delegated by state law to regulate radioactive materials, including TENORM. These proposed rules are being promulgated by the Department under authority in NDCC Chapter 23-20.1, Ionizing Radiation Development, and NDCC Chapter 23-29, Solid Waste Management. The NDIC has not been delegated the authority to regulate TENORM.

As previously discussed in Response I.a, drill cuttings are not being proposed to be regulated as TENORM because they have not had their naturally occurring radioactivity concentrated by any human activity. Drill cuttings are regulated by the NDIC if they are disposed of in a cuttings pit on a well site, which is exempt from permitting requirements of the Solid Waste Rules. If drill cuttings are transported off of the well site for disposal they are regulated under the Solid Waste Rules as Special Waste. The proposed rules for TENORM do not allow disposal of TENORM waste in cuttings pits. The only options are into a landfill approved by the Department or into a Class II Underground Injection Control Well approved by the NDIC Oil and Gas Division. The NDIC has primary authority for reclamation of well sites after well abandonment. All tanks and equipment that are removed from the well site must be checked for accumulation of TENORM materials prior to disposal. If the tanks or equipment do contain regulated TENORM material

they must be cleaned and the TENORM must be disposed at an approved facility. The accumulated TENORM will not be allowed to be disposed of on site.

No federal agencies have regulatory authority for NORM or TENORM, including the U.S. Nuclear Regulatory Commission (NRC) or the U.S. Environmental Protection Agency. All regulation of NORM and TENORM is left to the individual states. These federal agencies may discuss TENORM in various publications or on their web sites, but there are not federal definitions, standards, or management practices that are mandatory for states, individuals or companies. As such, the Department's proposed rules for management and disposal of TENORM are the only ones that will have legal authority in North Dakota.

I.d. Comments

There were a number of comments and questions related to why there were no hearings held on the Fort Berthold Reservation and applicability of the proposed rules on tribal lands and on the sovereignty of tribes for regulation of TENORM, including:

“I want a public hearing held by the North Dakota Department of Health at New Town, North Dakota within the Fort Berthold boundaries.....So potentially there could be some radioactive oil waste dump sites through the state of North Dakota within the Fort Berthold boundaries.”
(Bismarck page 17)

“And one thing I think that needs to be clarified in your communications with this rulemaking is whether these rules apply to tribal areas, or would that have to go through EPA.I really do think there needs to be some clarification as to who has jurisdiction if and when a facility is proposed on tribal land.” **(Fargo page 59)**

I.d. Response

EPA and NRC do not regulate TENORM anywhere, including tribal lands. TENORM regulation is a state and tribal issue.

The Department does not regulate or issue permits for landfills located within tribal lands, as its understanding is that this is within the authority of individual tribes. Thus, the proposed rules in NDAC 33-20 will not apply on tribal lands.

The Department acknowledges that, within the tribal boundaries, tribes have the authority to regulate the types of TENORM-related issues address in the proposed NDAC Chapter 33-10-23. The Department may have a limited role to regulate TENORM on reservations – for example, TENORM transporters on state highways – and will cooperate with any of the tribes to address these issues.

For a discussion of the location and number of public hearings, see Response II.f.

I.e. Comments

There were a number of comments related to regulation, siting and monitoring of pipelines:

“We are aware of so many underground pipelines that the state of North Dakota and the federal pipeline regulatory agency has no knowledge where they are buried. This is on federal land as well as state patent land. We’re aware a building is being constructed on these pipelines that do not show up in anyone’s record.” **(Bismarck page 24)**

“When pipes are laid through our land, the pipes hold the radiation in them. Over the years the pipelines will deteriorate and will no longer be useful. When you permit locations on our land, tanks and much other equipment are put on our land- the tanks and other equipment that holds radiation in them. Over the years, the tanks and other equipment will deteriorate and will no long be useful.” **(B. Jorgenson)**

I.e. Response

Pipelines are regulated by various state and federal agencies, including the U.S. Pipelines and Hazardous Materials Safety Administration (PHMSA), the North Dakota Public Service Commission (NDPSC) and the NDIC. The Department, however, does not have any regulatory authority over siting, construction, operation, or abandonment of pipelines and the proposed rules relating to TENORM will not change that the regulatory status. The pipeline regulating agencies have varied rules regarding abandonment, reclamation and removal of pipelines after their end of use. If any pipelines are removed and reclaimed that contain accumulated TENORM waste they will need to be managed and disposed in accordance with the Department’s proposed TENORM rules. In addition, many pipelines are routinely cleaned in a process called “pigging.” The residue from cleaning some pipelines may be regulated TENORM waste and must be managed and disposed in accordance with the proposed rules.

I.f. Comment

“OSHA, Occupational Safety & Health Administration, does not regulate how many hours employees work out there, as well as OSHA has only nine full-time compliance officers assigned to the Bismarck area office. Some estimates say it would take decades for OSHA to inspect every workplace in North Dakota. That doesn’t even cover the dumping sites. OSHA fines the oil companies with safety violations are also not substantial enough to be punitive.” **(Fargo page 54)**

I.f. Response

This is beyond the scope of the proposed rules and outside the Department’s authority.

II. Policy and Procedural Issues

II.a. Comments

There were a number of comments related to the Department’s Mission Statement and responsibility to protect citizens of the state, such as:

“The North Dakota Department of Health states on its website that its mission quote ‘Is committed to improving the status of the people and improving the quality of the environment.’ I seriously doubt how this agency can live up to this mission given its current proposal. How does allowing higher levels of radioactive waste improve the quality of the environment? I ask that

this issue be given more time and much, much more hard convincing data be gathered before moving forward.” (Fargo page 40)

“It seems counter to the mission of the Health Department to be campaigning to allow more hazardous waste to be dumped in western North Dakota.” (C. Ventsch)

“This proposal will do nothing to increase the health of the citizens of North Dakota. The purpose of the Health Department is to enhance the health and welfare of the citizens of North Dakota. It is not to enhance the profits of the oil industry which is about the only thing this proposal will do.” (Fargo page 39)

II.a. Response

The full Mission Statement of the Department is:

The mission of the North Dakota Department of Health is to protect and enhance the health and safety of all North Dakotans and the environment in which we live.

To accomplish our mission, the North Dakota Department of Health is committed to improving the health status of the people of North Dakota, improving access to and delivery of quality health care, preserving and improving the quality of the environment, promoting a state of emergency readiness and response, and achieving strategic outcomes within available resources.

Properly managing waste generated in the state in a manner that protects the health and safety of all North Dakotans and preserves the environment in which we live is a critical aspect of the duties of the Department. Through Legislative directive, the Department has been identified as the primary agency responsible to regulate solid waste, hazardous waste or radioactive waste. To do this the Department has relied upon the best available science related to radiation exposure health risk. The Argonne National Laboratory (ANL) study has shown that there will be no significant risk to the general population from landfill disposal of up to 50 pCi/g radium in special waste and industrial waste landfills. The study also concludes that the exposure to the maximum-exposed individuals – the landfill workers – will be less than 100 millirem/year. That is the limit set by the U.S. Nuclear Regulatory Agency (NRC), International Commission on Radiation Protection (ICRP), and the U.S. Occupational Safety and Health Administration (OSHA) as safe for additional long term exposure to the general public.

Any type of waste has the potential to impact human health and the environment if not managed and disposed properly. Landfills of all types are a necessity, even if recycling is emphasized. Having safe landfills available for proper waste disposal protects public health and safety in a number of ways. Landfills isolate the waste from future contact with human and environmental receptors. Having local disposal as an option also reduces the temptation to illegally dump waste rather than take the time and expense to transport waste to facilities in other states, such as Colorado, Utah, or Idaho. It will also reduce the number of truck miles traveled which will reduce the potential for highway accidents.

The Department has the responsibility to regulate waste that is generated from all sources equitably, whether it is municipal waste, agricultural waste, infectious medical waste, industrial waste from a wide diversity of sources, special waste from the power, mining, and oil industry, or TENORM waste from the oil industry. It should be noted that oilfield special waste landfills and industrial waste landfills are not allowed to accept hazardous waste. It has been the policy of the State and the Department to manage waste generated here to the extent practical, as long as it can be done in a manner that protects human health and the environment. The ANL study, through very conservative calculations, has shown that TENORM waste can be disposed in a protective manner within oilfield special waste and large volume industrial waste landfills in North Dakota.

II.b. Comment

“So I don’t understand why that would give anyone the right to make such a hasty, big decision. As I said I agree with the concept of precautionary principals, I’m wondering if there is in fact any scientific evidence that radioactivity in high concentrations is not detrimental to human health or to the environment.” **(Fargo page 48)**

II.b. Response

As previously discussed in Response I.c., the Department is the state agency delegated by state law to regulate radioactive materials, including TENORM, and regulate proper management of all waste materials. The Department is basing the decision to increase the allowable concentration of TENORM disposed of in approved landfills on the ANL study, which has shown that TENORM waste can be disposed in a protective manner within oilfield special waste and large volume industrial waste landfills in North Dakota.

The second part of this comment about high concentrations of radioactivity, while at face value may be true, is not applicable to the discussion of the proposed landfill limits for TENORM. The proposed limit of 50 pCi/g radium is not a high concentration of radioactive material. It is actually low on the scale of radioactive materials that are used safely in our society. For example, radioactive materials used in medical research are often in the range of millicuries, which is a billion times more concentrated than picocuries. Natural materials like granite can be 30 or more pCi/g and naturally-derived phosphate fertilizers can be greater than 100 pCi/g of total activity.

II.c. Comments

There were many questions and comments on who initiated the idea of changing the TENORM limits and how the process got started such as:

“Lastly, let me just say there would be some confusion I guess, over how these hearings got started and why we’re even talking about making these changes.” **(Williston page 6)**

“From your own words today, you told me that the industry came to you and asked for this. I know that no North Dakota citizen came to you asking for an increase in radioactivity to poison themselves....” **(Bismarck page 24)**

“The proposal to allow disposal in N.D. is being pushed by the oil industry and it appears to not be supported by the majority of N.D. residents. In an article on bismarcktribune.com from Feb. 13, 2013 titled "Radioactive Waste May be Buried" it states, "The North Dakota Petroleum Council may propose new state rules for burying radioactive waste generated in the oil patch. The council will meet Thursday with the State Health Department to evaluate a change in rules so radioactive waste that builds up on disposal well filters and other oil field equipment can be buried in specially-permitted landfills instead of hauled out of state." It appears this is being advocated by the oil industry (including the N.D. Petroleum Council) to reduce costs.” (L. Kimball)

II.c. Response

The Department started the discussion of implementing new rules specifically for TENORM waste management in 2009. The Department met with several industry stakeholders and the Department of Mineral Resources at that time and the general consensus was that TENORM was not a significant issue requiring specialized rules. In 2011 and 2012, the Department started getting reports of filter socks and synthetic frac proppant that had elevated levels of radiation, with a number of news stories voicing public concerns. In 2012, a number of industry stakeholders met with the Department and suggested that the regulatory limit and disposal limit of 5 pCi/g be increased to the levels similar in several other oil producing states. The Department asked the industry members to provide the scientific basis for the increased limit, but they were unable to provide specific documentation from these other states. Without scientific justification to document that the proposed increase would be protective of human health and the environment, the Department declined to move forward with the request. Meanwhile, the limit of 5 pCi/g was in effect with all TENORM waste above that level required to be disposed at approved facilities out of state. During that time there were increasing instances of illegal dumping, which were for the most part very difficult to investigate and track. In 2013, the Department made the decision that the state could not wait any longer for industry to provide scientific data regarding management and disposal of TENORM waste in North Dakota, so it was decided to initiate our own scientific study. After input from public stakeholders, the Department decided to work with a completely independent third party that had no ties to the oil industry in North Dakota. ANL was specifically selected because of their expertise in the field of radiation exposure. The cost of out-of-state disposal for oil companies was not a factor in the Department’s decision to move forward with the study and proposal of new TENORM management and disposal rules. The primary reason was that the Department needed science-based rules with which to address the problems with TENORM management that were occurring, including the full spectrum of registration, tracking and disposal options.

II.d. Comments

There were multiple comments about the Department having 120 days to review the ANL report but the public only had a short time for review and that the Department told ANL what to have in the report, including:

“The health department had 120 days to review the Argonne Study before it was released to the public, yet we have had a month to go through that same material.” (Williston page 7)

“The State has not allowed sufficient time for citizens of ND to read the Argonne Laboratories report and to have input into the proposal. The Dept. had a copy of the report for 120 days, now we are allowed only 45 days for public participation, and we do not know what was redacted from the Argonne study. ... Release the original Argonne Study!” **(Bismarck page 18)**

Thanks to open record laws, correspondence between Argonne and NDDoH is available, which discusses wording of the results-what to include or omit. The results were not released to the public until DoH approved them.” **(S. Ventsch)**

II.d. Response

The Department surmises that the 120 days in which the Department is said to have had the ANL study prior to public release refers to when we received the first preliminary draft. The first draft was sent to the Department on July 9, 2014. That draft included discussion of the study methodology and model input data, but did not include any results of the risk assessment or the study conclusions. In reviewing the preliminary first draft the Department found that a number of the assumptions and model inputs that ANL was using were not representative of landfill operations in North Dakota. The Department asked ANL to change these aspects of the study to be consistent with actual landfill operations. The Department also had comments and suggestions on how to make the report more understandable and complete, including a request to include Thorium activity in calculating the maximum landfill limit. Including activity from Thorium is a more conservative assumption, rather than evaluating exposure based only on Radium-226 and Radium-228, which is what other states have done. ANL sent the next draft of the report, with preliminary model results and conclusions to the Department in mid September 2014. The Department worked with ANL on editing the draft report for clarity and completeness until early November 2014. ANL sent the draft final report to the Department on November 12, 2014, however, ANL still had to undergo their own internal editorial review of the document before it could be cleared for public release. The Department was notified on November 24, 2014 that the report had been cleared for public release. The Department then worked on a number of public information documents and the proposed draft rules, which were all published with the final ANL TENORM study report on the Department web site on December 12, 2014. The Department issued a news release on that day informing the public of the final ANL TENORM study report and the proposed draft TENORM rules.

The Department did work with ANL on editing the final report, but the Department did not request or dictate what the results of the risk assessment should be or change the meaning and intent of ANL’s conclusions and recommendations. All drafts have been made available to the public.

II.e. Comments

There were multiple comments about lack of sufficient public notice (areas notified and time given), including:

“We have not had adequate notification of this.” **(Bismarck page 19)**

“I’m unprepared because of the short notice and I guess others have said this hasn’t had a notification for the public as it should have.” **(Bismarck page 20)**

“I found out about this meeting tonight on Facebook, which really surprises me because I read the paper every day.” **(Bismarck page 25)**

II.e. Response

The Department submitted public notice of the proposed TENORM rule changes and the three public information and comment hearings to the North Dakota Newspaper Association for publication in all official county newspapers in North Dakota on December 12, 2014. The notices were published by the individual newspapers on their next available publication date. This was in compliance with NDCC Chapter 28-32, regarding mandatory procedures for rulemaking by state agencies. In addition, news releases were issued by the Department on December 17, 2014 and January 7, 2015 informing the public of the information meeting and hearing dates. The public notices and news releases included the web page address for the Department information page for the ANL TENORM study and proposed TENORM rules. Emails containing the public notices were sent out to everyone on the Department’s public notice email list-serve. Numerous newspaper articles, TV and radio news stories were issued regarding the proposed TENORM rule changes and public meetings. The Department also extended the public comment period to allow more time for public review and comment.

II.f. Comments

Many comments were received saying that more hearings should be held in other locations in the oil producing areas and asking why a hearing was held in Fargo, including the following examples:

“I want more public comment hearings held, especially in western North Dakota. I want a public hearing held by the North Dakota Department of Health at New Town, North Dakota within the Fort Berthold boundaries.” **(Bismarck page 17)**

“Three meetings were held, one in Williston, Bismarck, and the final meeting was held in Fargo... what happened to the opinions of the people in Mandan, Dickinson, Watford City, New Town, Jamestown, Valley City, and Grand Forks? These are only a FEW of the communities which would provide valuable insight to these issues.” **(Dakota Resource Council)**

“Why were Public meetings only held in Williston, Bismarck & “FARGO”???? Will Fargo allow a special waste landfill in their backyard to bury radioactive waste?” **(G. Weisenberger)**

“No. 5: Why is one of the public meetings concerning this being held in Fargo? What does Fargo have to do with this? Why not Noonan or Crosby? My guess is of course the people of Fargo will endorse this because of the positive spin placed on the entire scenario.” **(M. Baker)**

II.f. Response

NDCC Chapter 28-32 requires state agencies to hold one public hearing on proposed new or amended administrative rules during the public comment period. Most state agencies hold that hearing in Bismarck. The Department decided to hold three public hearings and information meetings throughout the state. The rules will apply statewide, not just in oilfield areas, which is

why Fargo was included. It is important to note that significant interest was noted at the Fargo meeting.

II.g. Comments

Many comments were received requesting a longer public comment period or extension of the public comment period, such as:

“... they’re giving the people of the state of North Dakota a very short period of time to discuss something of such deep concern, with billions of years of impact on people. ... give these people more than 45 days ...” **(Bismarck page 22)**

“I’m asking for an extension of public comment period, I would like more meetings in towns throughout our state.” **(Fargo page 46)**

II.g. Response

The Department acknowledged these comments and requests and extended the public comment period from February 6, 2015 to March 2, 2015. A public notice of the public comment period extension was submitted to the North Dakota Newspaper Association on January 26, 2015 and a news release about the public comment period extension was issued by the Department on January 27, 2015. The public notice of the extension was also sent out via the Department’s public notice email list-server and was posted on the Department’s website.

II.h. Comments

There were comments received on the format which the Department used to conduct the information meetings:

“Tonight, by providing the people in this building for questioning is a reflection that is quite troubling when you are the North Dakota Department of Health. The public here asks that all benefit from the questions of other North Dakota citizens and yet you deny that. Why would you do that? If we can all benefit from each others’ knowledge why would you do that?” **(Bismarck page 24)**

“There was valuable conversation missed when Scott Radig, Waste Management NDDoH, asked us all to come to the back of the room and to ask questions at the booths set up there. It was a mumbo-jumbo cloud of noise.” **(B. Jorgenson)**

II.h. Response

NDCC Chapter 28-32 requires one public hearing to be held during the public comment period, but does not require any information meetings. There is not a prescribed format for an information meeting if an agency desires to hold one. The information meetings followed the format the Department has used in the past and found to work best, giving many people an opportunity to ask in-depth questions.

II.i. Comments

There were multiple comments about the perceived lack of enforcement in the oilfield by state agencies and insufficient penalties when enforcement did occur, such as:

“North Dakota as the regulatory agency, has demonstrated repeatedly since 2006 or 2007, when the oil and gas development started, that it’s been unable to regulate the industry. It’s been unable to enforce penalties. It compromises the penalty process.” **(Bismarck page 17)**

“The Department has shown an inability to regulate, often dramatically reducing fines on the false hope that companies will not continue to violate North Dakota laws and rules designed to protect the health and safety of the people who live and work in the state. Rather than making sure state rules and laws are followed, the Department has given permits to waste companies riddled with violations to actually increase the level of waste handled. ... In addition, there SHOULD be NO negotiating fines given to oil companies when our regulations are violated” **(Dakota Resource Council)**

II.i. Response

Many of the comments were directed at the state in general and seemed to group enforcement by multiple agencies with the Department. The different agencies do not necessarily follow the same or single enforcement laws, policies and procedures. This response is only for enforcement by the Department and comments related to other state agencies’ enforcement policies are beyond the scope of this rulemaking. Currently, the administrative penalties prescribed in NDCC Chapter 23-20.1, Ionizing Radiation Development are up to \$10,000 per day per violation, and in NDCC Chapter 23-29, Solid Waste Management are up to \$1,000 per day per violation. Both of these laws were modified in the 2015 North Dakota legislative session to be up to \$12,500 per day per violation, and will take effect August 1, 2015. The key wording in these penalty sections is “up to”. The legislature did not intend that all violations of a law or rule, regardless of circumstances or severity, be punished with the maximum fine. State agencies are given discretion in how to handle individual enforcement actions.

In some cases it is impossible to find a responsible party. In cases where a responsibility party is known, the Department investigates the circumstances of the apparent violation, including factors such as: how and why a violation occurred, was there any actual impact to the environment or was it just a paperwork violation, what was the potential for affects to human health, is there a history of previous violations, cooperation by the responsible party in correcting the violation, and was the violation done accidentally, carelessly, or intentionally? A “maximum penalty” can only be determined by taking all of these factors, and possibly more, into consideration. After investigating the violation the Department makes the decision on whether to start a formal enforcement action, send a letter of apparent violation, or drop the case. If a formal enforcement action is started the responsible party is entitled to the full due process of law, including responding to the alleged violations and opportunity for a hearing before an administrative law judge. In many cases the Department and the responsible party will negotiate a settlement that is acceptable to expedite the case and eliminate the need for a hearing. This is common practice in administrative law enforcement as well as criminal law enforcement.

Having rules that require record keeping, manifesting, and reporting of all TENORM waste loads will greatly aid the Department in enforcing proper transport and disposal. The number and volume of illegally dumped or disposed filter socks or other TENORM waste materials has actually been quite low in relation to the total volume that is generated.

II.j. Comments

There were multiple comments about the Department not having sufficient staff and funding to address the workload in the oilfield and to enforce the proposed TENORM regulations, including:

“This tells me that the Health Department already has a full plate so why would we want to add any other thing to that. ... Basically what I am saying is with all that’s going on in the oil industry and other things, they are not able to take care of the responsibilities that they have so why would we want them to assume anymore.” **(Fargo page 49)**

“But I think again we need more time and we need more personnel because this is an important job that you’re doing; it’s the health of the state of North Dakota. And as I work with members in your department, it’s very important that they could get their work done but they were always short of time and the ability to cover the bases that they needed to cover.” **(Fargo page 52)**

II.j. Response

The Department believes strongly that proper management, tracking and disposal of TENORM is an important issue and did not want to wait any longer to implement rules regulating TENORM. Funding for the Department is allocated by the legislature each biennium. The Department cannot set up a system of independent funding separate from what is allocated by the legislature. All treatment, storage and disposal facilities are already required to be permitted by the Department. The proposed rules clarify specific requirements for these facilities and generators of TENORM waste. But, whether or not the proposed rules are enacted, the Department will be regulating these facilities and TENORM under existing laws and rules, so the amount of additional work will be relatively minor. There will be some additional review of permit modification applications if any landfill facilities decide to accept TENORM waste, and there will be some additional work on recordkeeping and inspections. In 2013, the legislature added one full time employee to the Solid Waste Program. The 2015 legislature added two full time employees to the Solid Waste Program and one to the Radiation Control Program. The Department is fully committed to implementing and enforcing the proposed TENORM rules to the maximum extent possible.

II.k. Comment

“Are you going to track it and once you track it, is it public knowledge and how do access it? Can we come to Fargo and look at the records? Do we have to go on line? Can we submit a FOIA, Freedom of Information Act, request? How are we the citizens, living and breathing and working with this every day are going to access this information?” **(Fargo page 56)**

II.k. Response

One of the provisions of the proposed TENORM rules is a requirement for tracking, manifesting, and reporting of TENORM waste that is generated or disposed in North Dakota. Those reports are public records and will be provided to anyone that requests them. The Department is making plans for recordkeeping procedures. Eventually those records may be available online if resources are available.

II.l. Comment

“I would also ask for a 2 year waiting period on any changes as the oil industry may go away...”
(B. Lee)

II.l. Response

Even if no additional wells were ever drilled, there are still over 12,000 wells in production. Those wells will continue to be the source of TENORM waste in the form of filter socks, scale and tank sludge until they are plugged and abandoned. The Department believes it would not be prudent to wait any longer to implement the proposed TENORM rules.

II.m. Comment

“No action is made to deal with previous years of mishandled and misplaced radioactive waste disposed of in improper facilities. Actions to remediate these problems must also be considered in the rulemakings.” **(Dakota Resource Council)**

II.m. Response

If any TENORM or other radioactive waste is discovered in an improper location the Department will work with the responsible party, or through the emergency cleanup funds available to the Department, to have the location cleaned up to standards for unrestricted site use.

II.n. Comment

“2. What is the purpose of the public meetings? Was it to gauge the public opposition, to garner media attention, or to show the public that you are involved in the process? My understanding is that the health dept. proposes and enacts the rules with no oversight. You are the judge, jury, and executioner!” **(L. & D. Weisz)**

II.n. Response

The purpose of a public hearing on proposed administrative rules is to receive comments, information, or data on the justification for the rules or implementation of the rules. The public or regulated community stakeholders may have information that was not available to, or was overlooked by an agency when drafting the proposed rules. The proposing agency is required to consider all comments to determine whether the comment is cause for modifying or rejecting the proposed rule. Administrative rules are not determined based on popularity or public opposition. The Department has primarily based the proposed TENORM rules on the results and recommendations of the ANL TENORM study and on recommended model regulations from the national Council of Radiation Control Program Directors.

III. Technical Radiation Issues and Comments on Argonne National Laboratories Study

III.a. Comments

There were a number of comments about the perceived lack of expertise and scientific data to change the TENORM limits, including:

“It is asking us to trust its expertise based upon what I understand is a single study and through a few hearings.” (Fargo page 40)

“I’m afraid the health department is largely acting very much in a reactive manner without a significant amount of consideration for the health impact of rural development on the people who live there. And that not only includes the physiological feature, but also the mental health issues that are as important as anything else. ... by establishing more thorough and more valid baseline health information on the people who are affected by all aspects of the oil industry development so that we can be just and fair in the way in which we then monitor the potential impacts on their health over time.” (Fargo page 46)

III.a. Response

Scientists at the U.S. Department of Energy’s Argonne National Laboratory have conducted risk assessment studies related to TENORM for over 20 years. In addition to specific TENORM studies, ANL scientists also developed the computational tools that are used in the conducting these types of risk assessments. The tools developed by ANL staff are used not only by the ANL staff, but also by scientists and engineers throughout the United States and abroad. For example, the RESRAD code developed by ANL, is an internationally recognized preeminent computational tool used, by, among others, the U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) for cleanup of radiologically contaminated sites and for disposal of radioactive wastes. Another risk assessment code used to estimate the doses to workers and the general public, TSD-DOSE, was also developed by ANL staff. In addition, ANL staff members have extensive experience with management and risk analysis for all kinds of radioactive materials, including low-level wastes, that would be relevant to the assessment of risks associated with the management and disposal of TENORM wastes. (see attached document titled “ARGONNE NATIONAL LABORATORY RELEVANT EXPERIENCE AND PUBLICATIONS RELATED TO TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL RISK ASSESSMENT.”)

The scientists on the team that conducted the study for the Department have experience in all facets involved in this issue, including radiation exposure modeling, health physics, geology and hydrogeology, and petroleum engineering. The project team leader and principal investigator is a member of the Steering Committee for International Atomic Energy Agency’s Network of Environmental Management and Remediation.

All of the methodologies and computational models used in the study have been peer reviewed and are in standard use by the radioactive materials industry. The study is an implementation of the peer reviewed research. The statistical health effects of radiation exposure have been well studied. Estimating and then measuring radiation exposure doses to workers who have the highest potential for exposure is a recognized method of determining overall risk. The Department does not believe that establishing baseline health information for people in areas of oil industry development or landfills that accept TENORM, so that their health can be monitored over time, would not be an effective way to gauge the effectiveness of a TENORM standard because it is not possible to specifically identify what factors would have caused any observed changes in health.

III.b. Comment

“16. The well site operations scenarios used in the ANL risk assessment discount the possibility of any well site operations worker ever inhaling radioactive material. Excluding the inhalation pathway is not appropriate. The exclusion of inhalation is based on the assumption that the maximally exposed individual always wears respiratory protection. The following information is taken from Table B1:

Exposure Scenario	Status of Inhalation Pathway
Well pad workers mixing hydraulic fracturing fluid	“The inhalation and ingestion pathways are excluded because of the use of personal protective equipment....”
Well pad workers produced water filtration	“The inhalation pathway is excluded because of the wet nature of the process.”
Equipment cleaners pipe cleaning	“The inhalation and ingestion pathways are excluded because of the use of PPE.”
Equipment cleaners storage tank cleaning	“The inhalation and ingestion pathways are excluded because of the use of PPE.”
Equipment cleaners gas	“The inhalation and ingestion pathways are excluded because

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processing	of the use of PPE.”
Disposal well worker filtration	“Exposure pathways and parameter values are the same as for well pad workers except for the exposure time.”
Sludge treatment plant workers exposed to sludge	“...No exposure from the inhalation and ingestion pathways.”

Inhalation should not have been excluded from these scenarios based on the assumption that an OSHA compliant workplace would require workers to wear respiratory protection. In some cases an employer's respiratory protection programs will be inadequate or workers will fail to use respirators as required. Also, OSHA regulations (20 CFR 1910.1096) require that external doses to workers be controlled at a level of 1,250 mrem/quarter (much higher than the 100 mrem/y value used in the ANL study) and OSHA regulations require that exposure to airborne radioactivity be limited to the average concentration in air listed in 10 CFR 20. Appendix B, Table 1. For radium-226 this airborne concentration limit is $3 \times 10^{*}10$ uCi/mL, which is much higher than is likely to occur during well site operations. Therefore an employer could be easily be compliant with OSHA ionizing radiation regulations without requiring that respiratory protection be used for radioactive material exposure. By eliminating inhalation pathway from consideration the ANL study provides no information about doses that could if respirators fail, or are simply not used for whatever reason. An RSO, under a graded approach to radiation safety, may choose to require respiratory protection only for prolonged activities in an area where there is airborne radioactivity and allow short term jobs to be done without respiratory protection. This is done in the nuclear industry when the overall hazard level of a job would increase by use of respiratory protection, perhaps due to impairment of vision or other factors.” (MH Chew)

III.b. Response

The ANL study does evaluate inhalation of radioactive materials by oilfield workers. Table 6.5 of the report presents the sensitivity analysis dose assessment results related to Personal Protective Equipment (PPE) use, for workers for which inhalation and ingestion pathways are considered to be viable pathways. As mentioned in the comment, well site activities are regulated by OSHA and are outside the authority of the Department to regulate.

III.c. Comment

“I have one more comment based on tonight’s presentation, I want to point out in my testimony, that the models that were presented tonight to assess the risk of radiation exposure to humans are based on simply on predictive statistical analyses upon some factors. My concern is cumulative risk, that these models do not include critical variables such as blood draws from subjects that would confirm the claims of possible exposure in the different scenarios of the models.” **(Fargo page 40)**

III.c. Response

Landfill disposal of TENORM waste isn’t happening yet, so there are no direct data to measure. The RESRAD codes used in this study have undergone extensive review, benchmarking, independent verification, and validation. The manuals and codes have been used widely by DOE and its contractors, the NRC, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, industrial firms, universities, and foreign government agencies and institutions. See the following detailed discussion on the verification and validation studies of these methodologies.

Information on Benchmarking, Verification, and Validation of RESRAD, RESRAD-BUILD, and RESRAD-OFFSITE Codes

The RESRAD family of codes have undergone extensive review, benchmarking, independent verification, and validation. The manuals and codes have been used widely by DOE and its contractors, the NRC, EPA, U.S. Army Corps of Engineers, industrial firms, universities, and foreign government agencies and institutions.

Before the RESRAD code was officially released in 1989, ANL verified the early versions of the code by both hand and spreadsheet calculations (Woods and Yu 1990). In 1994, Halliburton NUS Corporation of Gaithersburg, Maryland, performed an independent verification of RESRAD, Version 5.03 (Halliburton NUS Corporation 1994). In 1990 and 1993, RESRAD was compared with different codes including DECOM version 2.2, GENII, PRESTO-EPA-CPG, PATHRAE-EPA, and NUREG/CR-5512. In 1995, RESRAD was compared with MEPAS and MMSOILS (Cheng, et al. 1995; Laniek et al. 1997; Mills et al., 1997; Whelan et al. 1999a, b;). From 1993 to 1998, the RESRAD code participated in two IAEA’s multimedia code validation studies (Yu and Gnanapragasam 1995; IAEA 1996; Gnanapragasam and Yu 1997). In 1998, the NRC compared the RESRAD code with its decontamination and decommissioning (DandD) code (Haaker et al. 1999).

RESRAD-BUILD version 3.0 results were compared with spreadsheet calculations (Kamboj et al. 2001). Many models used in the code have been benchmarked against other codes. For

example, the external dose models have been benchmarked against the Monte Carlo N-particle (MCNP) transport code (Briesmeister 1993), and the radon model used in the code has been compared with the radon model used in the RESRAD code. In 1998, the NRC compared the RESRAD-BUILD code with its decontamination and decommissioning (DandD) code (Haaker et al. 1999). The independent verification of the RESRAD-BUILD models and parameters was also conducted (Tetra Tech NUS, Inc. 2003).

RESRAD-OFFSITE code is an extension of the RESRAD code and the two codes share the same database and many models. Benchmarking of the code against other peer codes has been performed over the past several years (Yu et al. 2006).

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III.d. Comments

There were several comments related to prolonged health exposure by individuals living near landfills that accept TENORM waste, such as:

“Additionally, folks who are going to be living in proximity to this landfill are not going to be receiving single isolated doses, unfortunately, oh like people taking medical tests and things like that. This is going to be prolonged toxicity exposure to radioactivity. And that is a very serious concern especially for female bodied persons, women who would like to have their reproductive systems working for them and for young children.” **(Bismarck page 18)**

“Who is going to pay for the increased health problems that this will cause to the people living within a 50-mile radius of these landfills?” **(C. Davis, 2nd e-mail)**

“As the Argonne National Laboratory powerpoint presentation points out, "When a person is exposed to radiation, the energy penetrates the body." Being exposed to radiation does not imply the conscious act of eating something - that is, I might not have a choice in the matter, especially if I live around a site where TENORM becomes concentrated, either from filter socks, or pipes, or in any other way. This will probably not affect the general public, but it will affect the farmers and ranchers and those North Dakotans who live in the Williston Basin area. The question is whether or not the state of North Dakota and its Health Department should be concerned with the average health of North Dakotans or with the health of all North Dakotans. I would strongly urge the latter. Will TENORM changes affect the average health? Probably not. Will it affect the

health of individuals? Probably. Should the state listen to those individuals? Not if the overarching purpose of the state is to maximize profits. However, as I hope any North Dakotan would agree, that is not the purpose of any state.” (S. Braun)

III.d. Response

Table 6.14 lists potential doses to the maximally exposed individual (MEI) of the general public for the disposal at the landfill during landfill operations. The maximum exposure of 0.25 mrem/yr would occur for individuals living adjacent to the landfill; this dose would, decrease with increasing distance away from the landfill. Since the potential dose to the MEI is not expected to exceed 0.25 mrem/yr, the risk to the general public would be minimal because this is far below the limit of 100 mrem/yr recommended by the U.S. Nuclear Regulatory Agency and the International Commission on Radiological Protection for long term public exposure.

We believe that the comments regarding increased doses of radioactivity and increased health problems to people living in areas surrounding a landfill may result from a misunderstanding of the units used in the report. In the section describing the risk to the population surrounding the landfill both individual doses for the MEI (expressed in mrem/yr) and cumulative population doses (expressed in person-mrem/yr) were presented. The cumulative population dose represents the sum of doses received by all individuals within the study area, in this case a 50-mile radius surrounding the landfill.

ANL used an average population density of 9.7 people per square mile from the 2010 US census date (Appendix B, Table B.4), to calculate the collective population dose. As stated above, the maximum individual public exposure would be adjacent to the landfill at 0.25 mrem/yr, decreasing with distance away from the landfill. Collectively, the whole population in that 50-mile radius could receive up to 830 person-mrem/yr, or, dividing by the population of 76,145, it would be a straight average of 0.011 mrem/yr per person.

III.e. Comment

“Another element of the higher radiation disposal limit that concerns me is the 10-foot soil shield covering the top of these industrial and special oilfield landfills. Shielding in itself is a relatively ineffective method of protecting people from the hazardous effects of radiation, but widely used due to its relatively low implementation expense. Granted the vast majority of citizens would not be direct contact with these landfills, it does not seem quite logical to allow even more toxic materials and then resolve to make up for that by covering it over with a larger pile of dirt in an area with such high soil erosion potential.” (C. Kraft)

III.e. Response

The ANL study shows that shielding, by adding a thicker final cover to the landfill, is effective in reducing potential radiation exposure. In this study five future-use scenarios were evaluated: (1) a residential-use scenario, in which a resident is assumed to construct a house on top of the landfill, use the surrounding area for growing crops, and obtain drinking and irrigation water from an on-site well; (2) an industrial-use scenario, in which the land encompassing the landfill is used for industrial purposes; (3) a recreational-use scenario, in which the landfill is turned into a recreational area; (4) an intruder scenario, in which a resident on the landfill site accidentally uncovers the buried wastes and disperses the material around his or her property;

and (5) an off-site groundwater-use scenario, in which an off-site resident obtains water from a well drilled downgradient of the landfill. No soil cover was assumed in modeling the intruder scenario (i.e., the intruder would come in direct contact with the TENORM waste, although in a diluted concentration due to mixing with cover material). For the residential use, industrial use, and recreational use scenarios, erosion of the cover over the time frame of modeling was considered (see Appendix B, Table B.6). Moreover, a sensitivity analysis was done on the cover thickness for different future use scenarios and the results of the analysis are presented in Table 6.11.

The commenter specifically points out the potential for soil erosion. Erosion and limiting radon migration are the two main reasons for having additional thickness above any TENORM waste in a landfill. State rules require erosion control measures on closed landfills and prohibit disruption of landfill cover, placement of homes or buildings on closed landfills, etc. Landfills are required to place a notice on the deed to the property to inform future generations that the site is a closed landfill and any disruption or use of the property without Departmental approval is a violation of state law and rules.

III.f. Comments

There were several comments related to the number of hours per year for an oilfield worker, such as:

“Moving on, a Grand Forks Herald article, Saturday January 10th, if you think you have enough to do this job?”, page 5, “North Dakota workplace deaths examined in TV report. An employee North Dakota oil worker tells one of the reporters he spent as many as 69 hours straight on the job site. You’re given statistics based on a 40-hour work week. He spent 69 straight hours on one job. That increases your exposure exponentially.” **(Fargo page 20)**

“3) The only other suggestion I would make, is that basing your estimates on a standard 2000 hours per year work exposure, may not be realistic in the oil field jobs that are going on out here. I realize that many workers will have 2 weeks on and 2 weeks off; but suspect their total hours per year still go over the typical 2080 for full time employment.” **(L. Best)**

III.f. Response

Workers will typically have more than one assignment and, therefore, are unlikely to do the same TENORM-related activity full-time. As a result, the 2,000 hr/year exposure is considered to be reasonably conservative. The scenarios modeled were intended to represent the highest expected exposure rates to workers, and therefore any additional non-TENORM-related activity that they engaged in would likely result in a lower exposure rate.

III.g. Comment

“5. It is likely that the Th-232 data are not useful and instead are an artifact of the gamma spec method. The average ratio of Th-232 to total radium is highly suspect and may not be useful at all. Here are the reasons:

- a. it is not clear that thorium-232 can be accurately assessed by gamma spectroscopy, the method which is most likely used to acquire these data. Actinium-228, the signature

- gamma ray of thorium-232, can be confidently assumed to be in equilibrium with thorium-232 only if the mixture has been undisturbed for almost 30 years.
- b. the detection limit for thorium-232 seems to be high and inconsistent.
 - c. 26 of the 81 results for thorium-232 are "less than" values, which means that in those cases the reported value could be the method detection limit instead of an accurate analysis result.

The questionable thorium-232 data have already been referred to by others. On February 13, 2105, the "Michigan TENORM Disposal Advisory Panel White Paper" was issued. The white paper included the following statement: "The presence of Thorium-232 in the North Dakota TENORM study suggests that it may be a contributor to some exposure pathways. Its potential health effects on worker health and safety may warrant further studies." This points out that the quality of data included in the ANL report is important." (MH Chew)

III.g. Response

The Department and the ANL study report acknowledge that no sample collection and analysis was directly performed and that the sample data are limited. This was not intended to be a comprehensive study of the full range and variation of TENORM in North Dakota. The Department accepted the data as submitted by industry because sample data is not a necessary requirement to complete a landfill risk assessment, which was the primary objective of the study.. The Department saw the data regarding Thorium, and rather than ignore what may be a fairly significant portion of total radioactivity exposed to workers, decided to use the Thorium data to calculate a conservative landfill limit. If the Thorium data were ignored then the landfill limit was calculated to be 66.6 pCi/g Ra-226 plus Ra-228 (see page 69 of the ANL report). The Department agrees that the presence of Thorium-232 in oilfield waste may warrant further studies. If future data shows that Thorium is not a significant radionuclide in oilfield waste then the landfill limit could safely be increased.

III.h. Comment

“18. A radon scenario should be considered in which workers perform well site operations indoors or inside a tent. One example might be saltwater transfer from a truck to holding tanks for disposal well injection. At some facilities pumps and transfer stations are located indoors. Evaluation of this scenario may require new winter-time radon measurements to be made.” (MH Chew)

III.h. Response

Produced water is not technologically enhanced by human activities and thus is not proposed to be regulated as TENORM and an injection well will not typically be required to obtain a radioactive materials license unless some other TENORM treatment, storage or decontamination activities are conducted at the site. As such this comment is largely beyond the scope of the proposed rules. However it is a question that could be evaluated either by direct measurements or by additional modeling. If this scenario did occur at a facility with a radioactive material license, the licensing process requires the applicant to provide facility drawings and policies and procedures regarding radiation protection. If there was a concern of radon buildup in the proposed facility, the Department would require the applicant to adequately address the radiation safety issues before issuing a license.

III.i. Comment

“19. Was the possibility of misuse of soil-like proppant and sludge being as fill material in building construction considered? In this scenario if misuse of TENORM were to occur, the maximally exposure individual might live for decades in a home in which there were elevated levels of radon from TENORM. A similar situation involving uranium mill tailings occurred in Grand Junction, and a multi-year, taxpayer funded remediation program was required to cure the problem.” **(MH Chew)**

III.i. Response

The purpose of NDAC Chapter 33-10-23 of the North Dakota Radiological Health Rules is to specifically regulate the activities of persons involved with TENORM to reduce the probability of the above scenario from occurring.

III.j. Comment

“First of all, using computer models I think is a huge flaw in how data was collected when it would have been very easy to use the dosimeters that even this man’s company has to get accurate levels of what worker exposures are. I’m not going to spend any more time on that.” **(Bismarck page 17)**

III.j. Response

The purpose of the study was to determine the TENORM concentrations workers and members of the public may be exposed to during various scenarios as not to exceed the established public dose limit of 100 mrem in a year.

The Department will require personnel dosimetry monitoring devices be provided to TENORM workers as a part of the radioactive material license conditions until historical data is obtained for the possible relief of this requirement.

III.k. Comments

A number of comments asserted that the ANL study was not valid and that the changing of the landfill limit to 50 pCi/g was not justified because the sample data was supplied by industry, not collected by the Department or an independent third party. Examples are:

“but this study is basically flawed. Last night when we talked to Argonne, in that period when you could talk to people, the one thing that I asked was “Where did you get the information, where did you get the samples?” The samples and the information that they talked about were given to them by oil industry. You don’t give a test to a kid who’s going to take that test a week later. This thing is simply compromised, and it’s flawed, and it should not be used.” **(Bismarck page 30)**

“4. According to the presentation made by ANL, the data in Table A.1 were not collected for the purposes of this study. Instead these data were used because they were available. Consequently there is no assurance that they are representative of the waste streams under consideration. The data in Table A.1 have no information regarding the sampling method, the analytical method, the method detection limits and the origin (who collected the sample, date, location, who analyzed, etc.). None of the data include an uncertainty (a \pm value) associated with the results and are

therefore only marginally useful in a scientific report. A fundamental concept regarding all scientific measurement data is "A measurement result is complete only when accompanied by a quantitative statement of its uncertainty" (NIST Technical Note 1297)." (MH Chew)

III.k. Response

The Department contracted with ANL to study two different aspects of TENORM waste in North Dakota. The primary goal of the study was to determine the maximum acceptable radioactivity level for disposal in our Special Waste and Industrial Waste landfills. However, with all the questions by the public regarding the safety of handling TENORM in the state, we added as a secondary goal, the evaluation of exposure to oilfield workers and the public in a number of different scenarios, because TENORM will still be generated, handled, and transported in the state even if landfill disposal is not allowed.

For the landfill risk evaluation, ANL evaluated multiple scenarios and calculated the upper concentration so that the dose to the maximally exposed person is no greater than 100 mrem/year. Sample data is not necessary to do these calculations. This is a back-calculation starting at the maximum allowable exposure and working backwards to find what concentration of radionuclides in the waste may result in that exposure. No sample data from existing TENORM waste streams was used for this evaluation, so the source of the samples or the quality of data on TENORM waste streams in North Dakota has no impact on the proposed limit in the rule changes.

The secondary goal of the study looked at exposures to oilfield workers and members of the public to TENORM and used limited existing information on TENORM waste streams. This part of the study was not used to calculate possible disposal limits for landfills and had no impact on the changes to rules regarding TENORM disposal. The available sample data was used to calculate a ballpark range of potential exposure. This was not intended to be a comprehensive study of the full range and variation of TENORM in North Dakota. The report acknowledges that sample data is limited and states that the scenarios are not representative of all possible exposures. We know that every real-life situation will be somewhat different. The available data showed that TENORM generated by oilfield activities in North Dakota are generally very low and not a health risk for residents and workers, with only a few possible exceptions for workers in pipe cleaning and gas processing operations if they do not wear proper protective equipment.

The evaluation of potential exposures to oilfield workers and the general public did not affect the content of the proposed rules because the Department only has the authority for radiation exposure protection at facilities licensed by the Department. Most of the scenarios evaluated would not be licensed activities. In addition, it was explained to the industry group that provided the information that the sample results would not be used to calculate the landfill limit, therefore the Department does not believe that the sample results provided by industry were skewed or selectively chosen in any manner.

III.l. Comment

"1. Contaminated soil was excluded from analysis because it was not deemed a significant source of waste. One example is Secure Energy's 13 mile landfill taking 2,519 tons of waste from a "salt water release" in a 15 day period. Instances like this are provided in most bi-monthly

reports. The Department's own online spill database shows 200 reported spills in January 2015. This further asserts the conclusion: contaminated soils are a significant waste stream." (**Dakota Resource Council**)

III.l. Response

There may be a significant volume of contaminated soil, such as from produced water spills, but it is not a significantly high concentration unless multiple spills have occurred in the same location. Produced water and soil may contain some NORM, but it has not been technologically enhanced and thus is not considered TENORM. NORM is not a regulated radioactive material. Soil that is contaminated by spills can be accepted by landfills according to their permits and waste acceptance plans.

The example cited of 2,519 tons of contaminated soil disposed of at the Secure Energy 13-Mile Landfill is a good example. This was from a produced water pipeline leak in Williams County, called "the Blacktail Creek spill." Contaminated soil was excavated and stockpiled to be hauled for disposal at an approved facility. The stockpiles were checked for radioactivity with a hand-held meter. A sample was collected from the pile with the highest reading, to be analyzed at an approved laboratory. The laboratory result showed a combined total Ra-226 plus Ra-228 concentration of 4.83 pCi/g, which is less than the regulatory exemption limit for TENORM of 5 pCi/g, and well within the radioactivity range of natural soil in western North Dakota.

The waste streams which some commentors believe will significantly increase the total radioactivity going into landfills are drill cuttings and produced water contaminated soil. Data available to the Department indicate that these waste streams are generally significantly lower in concentration than filter socks, tank bottom sludge and pipe scale; and are more in the range of natural soil.

III.m. Comment

"20. The sandbox exposure scenario involving children should be corrected. Section 3.2.1 subsection "Proppant Used at a Playground" states that "Children were exposed by direct external exposure, **inhalation**, and ingestion pathways". However the reported doses on page 53 do not include inhalation: "Children were exposure by direct external exposure and ingestion of pathway." Note that Table B.2 confirms this: "Ingestion and direct external exposure pathways are included." Of course children playing in a sandbox will inevitably inhale particulate material and this is likely to be the dominant exposure pathway for this scenario." (**MH Chew**)

III.m. Response

On page 18 of the ANL Final Report: "Proppant Used at a Playground. It was assumed that a truckload of proppant material was illegally dumped in an open field. Children used that area as their playground and spent 2 hours every day for 50 days (total exposure of 100 hours over the course of a year). Children were exposed by direct external exposure, inhalation, and ingestion pathways."

On page 53 of the ANL Final Report: "For the proppant exposure scenario, it was assumed that a truckload of proppant material was illegally dumped in an open field. It was further assumed that children used that area as their playground and spent 2 hours every day there for 50 days

(total exposure duration of 100 hours over the course of 1 year). Children were exposed by direct external exposure and ingestion pathways. Table 6.8 lists the time-dependent dose rates using the maximum and average proppant concentrations for the proppant exposure scenario. The doses to a child exposed to proppant at the playground range from 1.3 to 1.9 mrem/yr at different times (using maximum proppant concentrations) and from 1.2 to 1.7 mrem/yr (using average proppant concentrations). These doses are quite small compared with the 100-mrem per year dose limit to members of the general public (ICRP 1991).”

The difference between the two paragraphs in the ANL report appears to be an error that carried over from the draft report. Synthetic proppant material consists of very hard, durable manufactured beads, similar to ceramic. They are used in addition to, or as an alternative to natural silica sand because they are much harder than natural sand and do not crush or break as easily. Synthetic proppant generates very little dust because of its hardness and it is too large to be inhaled directly. Inhalation is not the primary route of potential exposure for this material; rather ingestion and direct exposure are the primary routes of potential exposure. It should also be noted that the accidental public exposure scenarios were not used to determine acceptable disposal limits for the proposed TENORM rule change.

III.n. Comment

“2. Public exposure, and worker exposure models were not representative of real life contact with radioactive waste. An example of a realistic exposure is the process of installing and using down hole drill stem as fencing. Further, Argonne chose to only use one sensitivity parameter at maximum value while leaving others at their mean. With no direct knowledge of what exposures are, this is inadequate modeling. More analysis must be conducted to establish what realistic exposures are. A survey informed by and distributed to oilfield residents and workers is one option to assist in collection of this data.” **(Dakota Resource Council)**

III.n. Response

ANL studied general population exposures due to landfill operations, accidental scenarios, and for future land users after post-closure. ANL also evaluated several worker scenarios. The accidental exposure scenarios and the non-landfill worker scenarios had no impact on determining changes to the TENORM disposal limit in North Dakota. Scenarios that were modeled to determine changes to the disposal standard used conservative parameters and resulted in very low additional exposures to the general population during active landfill operations and after the facility is closed. The ANL study evaluated likely scenarios of exposure, but the Department acknowledges that not every possible real life scenario could be evaluated in the report. The Department notes that all of these scenarios outside of the landfill can take place whether or not the proposed rules are promulgated, so they have limited relevance to the proposed rules and should not impact the decision to change the TENORM disposal limit.

The Department notes that drill pipe that has deposits of TENORM will either need to be properly cleaned before recycling or the entire pipe will need to be managed and tracked as TENORM waste and sale of such uncleaned pipe for fencing would be a violation of the proposed rules. The proposed rules will help prevent the sale of TENORM containing materials for fencing or other uses.

III.o. Comments

A number of comments were received about the ANL report evaluation and discussion of children playing with filter socks, such as:

“From what the Argonne Study, the presentation today, apparently it’s safe for children to play with used radioactive filter socks.” **(Bismarck page 17)**

“What’s even more insulting is we do a study talking about our children in North Dakota finding and playing with radioactive filter socks. If the state department of health thinks that is an acceptable scenario, then I would say basically that we shouldn’t have the state health department enforcing any federal regulations from the Nuclear Regulatory Agency or EPA, or anybody else for that matter.” **(Fargo page 45)**

III.o. Response

The Department is in no way recommending that children play with filter socks. However, that concern has been raised by the public, who generally believes that used filter socks are highly dangerous. Because of that concern the scenario was included in the risk assessment performed by ANL. ANL determined that the risk from contact with a typical filter sock for a period of 24 hours has a relatively low risk. Even at low risk the Department recommends no contact with filter socks unless proper precautions are taken.

The Department advocated a study of this scenario in response to a comment from the acting Director of the Three Affiliated Tribes’ Environmental Division. In an article published in the Bismarck Tribune on March 05, 2013, a reporter stated the following:

“The Three Affiliated Tribes’ environmental division is worried that children will play with the potentially radioactive filters used by the oil industry that are illegally dumped in fields, dumpsters and along the roads. ... Children are a particular concern because the filters look like small nets and could be mistaken for an item they could use for play or for fishing, he said.”

III.p. Comment

“Your job, in the state of North Dakota would be to focus on health – protection of people. I did not see that. I did see you talk about the workers, but there are people up here in North Dakota who will live here forever. A part of that radioactive material that you’re talking about has a very long life. It’s not going to disappear, it’s going to remain in the earth and it’s going to be emitting radiation and when you portray the intruder’s scenario that probably wouldn’t happen. How do you know? You’re not going to be around. But the radioactive waste will be around. People will live on it; people will dig into it. You’re setting up a scenario for North Dakota that is horrific.” **(Bismarck page 24)**

III.p. Response

The investigation by ANL included possible exposure scenarios involving landfills after they were closed. The “intruder scenario” assumes that a resident 100 years in the future accidentally uncovers the buried wastes and disperses the material around on his or her property. This was one of five future use scenarios that were investigated, and changes in landfill rules were designed to maintain a 100-mrem/yr public dose limit. The Department used science identified

in the ANL report as a basis to ensure the protection of the health and safety of North Dakota residents now and in the future.

III.q. Comment

“So stuff that is highly radioactive that comes in a container where the container’s not broken and it’s put intact into the landfill, that would represent very little danger to the workers and the public. But if that would come in a bunch of loose material that would be pushed around with a Caterpillar or something it would probably be the most dangerous material you’d have. So there’s nothing in the standards that they’re really talking about handling the different materials that we would be taking.” **(Bismarck page 21)**

III.q Response

The investigation by ANL into exposures to landfill workers assumed that the waste material delivered to the landfill was loose waste, not containerized. Loose fill disposal is the typical practice for special waste landfills in North Dakota. The Department used the ANL study to protect the health and safety of workers at North Dakota landfills by restricting high concentrations of radioactive waste, whether or not the waste is containerized.

III.r. Comment

“... raising the disposal limit provides only temporary relief to an increasing problem. If NDDOH finds it necessary to accommodate industry by raising the disposal limits for radioactive materials, I implore you to go the way of six other states and elevate to no more than 30 picocuries/gram. After repeated scientific studies have deemed it safe to go higher than that amount, adjustments can be made at that time. A wise, proactive method is to incrementally raise limits once more information is available, instead of arriving at a level that may be too high and more dangerous than initially anticipated.” **(C. Kraft)**

III.r. Response

The Department contacted other states to find out how they determined their disposal limit, but could not find much scientific evidence that supported those numbers. ANL previously conducted a study for the state of Michigan to determine whether or not their disposal limit of 50 pCi/g in municipal solid waste landfills was safe and they concluded that it was. However, the Department did not know how applicable that study would be to landfills here in North Dakota. The study that ANL conducted for the Department showed that a disposal limit of 50 pCi/g of Radium 226 + Radium 228 was acceptable with a limit of 25,000 tons per year and 2 meters (approximately 6 feet) of cover between the top of the TENORM waste and the top of the final cover system.

The Department does not take changing rules lightly and there is a lengthy process involved. Therefore, when the Department decides to propose new or modified rules, it is with the intent of only changing them when necessary. There have now been two studies conducted, the one in Michigan and the one for the Department, that showed a limit of 50 pCi/g limit is acceptable for disposal in municipal solid waste, oilfield special waste and large volume industrial landfills. The proposed rules are more restrictive in that they do not allow TENORM disposal in municipal landfills here in North Dakota.

III.s. Comment

“An approximate \$200,000.00, very narrowly focused, very limited number of submitted study samples, obtained by the use of questionable methodology (by those requesting the study), commissioned study by the ND DoH (Argonne National Laboratory TENORM study [the study]) is only a virtual scientific study until it has been professionally peer reviewed by at least 5 professional scientific peer groups. A large price tag does not equal quality, no matter whom the check has been made out to. Attempting to corrupt the process and implying that the creation of acceptable sound science has been achieved by only asking the general public citizens of North Dakota to review the ND DoH's TENORM, new and amended rule changes is an insult to the taxpaying citizens of North Dakota. The general citizens of North Dakota are not professional scientific peers.” (L. Walker)

III.s. Response

The document has gone through the standard internal lab peer review process in which experts not directly involved with the project provided thorough review of sections relevant to their expertise. Furthermore, the codes used in the analysis are benchmarked, validated, and verified (see discussion on Benchmarking, Verification and Validation at the end of Response III.c.). In addition, the general modeling approach had been previously peer reviewed (Smith et al. 2003). The Department decided that external peer review was not necessary because this study was primarily an implementation of previously published, peer reviewed risk assessment methodologies.

Reference

Smith, K.P., J.J. Arnish, G.P. Williams, D.L. Blunt, “An Assessment of the Disposal of Radioactive Petroleum Industry Waste in Nonhazardous Landfills Using Risk-Based Modeling,” Environmental Science & Technology, 37(10) 2060-2066, June 2003.

III.t. Comment

“When we’re talking about potential risks to public health, we know that the effects of radiation at a population level can take 20 to 50 years needed to study a large population based and to my knowledge that isn’t even being discussed at this point before the level is even talked about being raised.” (Bismarck page 26)

III.t. Response

The maximum dose could occur at a later time due to buildup of progeny, soil erosion, or leaching of contaminants to ground water. The time frame of study considered was 1,000/10,000 years for future use scenarios, and the maximum peak dose in this time frame was used in this analysis. The study was designed to calculate the maximum allowable radionuclide concentrations that could be present in landfilled wastes such that potential doses would not exceed the 100 mrem/yr dose limit recommended for members of the general public by the International Commission on Radiological Protection (ICRP).

The comment appears to be suggesting that large, population wide studies should be performed prior to the raising of the limit. This poses a chicken and egg problem in which you can’t study a population for their exposure until you actually allow the activity that would lead to the exposure that’s intended to be measured. The Department will require a monitoring program through

permit requirements for landfills that apply to accept TENORM waste. That monitoring program will be focused upon the landfill workers which have been shown through this study to be the maximally exposed individuals. If the maximally exposed workers are shown to be safe then it follows that the general public which is likely to receive very low doses (average dose of 0.011 mrem/yr within a 50 mile radius of the landfill), will also be safe.

III.u. Comment

“6. The radon emanation coefficient shown in Table B.6 is 4%, which is appropriate for pipe scale. A higher value, perhaps 20% or 30%, would be appropriate for sludge and soil-like materials. The default value recommended in RESRAD is 25% which is 6 times higher than the value assumed by ANL for the landfill model. By selecting a value of 4% the model acts as if all of the radon in the TENORM waste is tightly bound as it would be in the scale. But most of the waste will not be scale. This assumption of 4% could result in a substantial underestimate of radon dose from the landfill.....” (MH Chew)

III.u. Response

It is likely that TENORM wastes sent to the landfills for disposal will be comprised of a mix of materials (scales, sludges, filter cake); however, at this time, we don't have a good sense of the mix of TENORM wastes. We could find only one paper that provides some data on the radon emanation from sludge generated from the petroleum industry (Hassan 2013). In this study, the radon emanation coefficient in scale samples varied from 0.3 to 7.3% with an average values of 2.6% (less than the assumed 4% value) and in sludge samples it varied from 3.7% to 57% with an average values of 11%. The radon emanation rate from landfilled wastes could be more accurately estimated if more information were available regarding the mix of TERNORM waste and the emanation rates for each waste stream.

Radon-222 is a decay product of Ra-226; it is an exposure concern only for the future-use scenarios, not the landfill worker scenarios which are currently the limiting scenarios. If different assumptions are made about the radon emanation rates, this could result in higher doses to receptors in some future use scenarios. At this point, given the limited amount of data on radon emanation rates, the uncertainty about the mix of wastes that are likely to be disposed in a given landfill, and uncertainty about which radon emanation rates would be most applicable to certain waste streams (such as filter socks), there isn't a strong basis for modifying this value.

The uncertainty about radon was one of the reasons that the Department decided to require a greater cover thickness. Given that the future use scenarios are not the limiting scenarios, and the fact that increasing the cover thickness from 2m (used in the baseline scenarios) to 3m (~10 ft as defined in the current rule) was shown to increase the allowable Ra-226 concentration by approximately a factor of 3 (see table 6.11 of the final report), we are confident that the uncertainty in this parameter, even if the value used is a significant underestimate of the actual radon emanation rate, would not result in exposures to future users of closed landfills above 100 mrem/yr.

Reference

Hassan, N.M., 2013, *Radon Emanation Coefficients and its Exhalation Rate of Wasted Petroleum Samples Associated with Petroleum Industry in Egypt*, *J. Radioanalytical Nuclear Chemistry*, DOI 10.1007/s10967-013-2718-1.

III.v. Comment

“8. The TSD-DOSE code, which was developed at ANL is not a maintained computer code and ANL no longer distributes this program to members of the public. Therefore the public has no means of obtaining the program and checking the results of the TSD-DOSE calculations in the ANL report. Please advise how the public can gain access to this computer code....” (MH Chew)

III.v. Response

TSD-DOSE code requires an XP computing platform which most people have abandoned. ANL ran the code on a virtual XP computer that was created to support this study. Verification of TSD-DOSE code results was performed in a step-by-step fashion with spreadsheets generated by Microsoft Excel (Pfungston et al. 1998). For the worker analysis, external doses were compared with results from the MCNP transport code (Briesmeister 1993). For the off-site analysis, TSD-DOSE was benchmarked against CAP88-PC for eight commercial treatment, Storage, and disposal (TSD) facilities (Pfungston et al. 1998). If anyone wants more information on running the TSD-DOSE code themselves they can contact the Department and we can assist them.

References

Pfungston, M., et al., 1998, TSD-DOSE: A Radiological Dose Assessment Model for Treatment, Storage, and Disposal Facilities, ANL/EAD/LD-4 (Rev. 1), Argonne National Laboratory, Argonne, IL.

Briesmeister, J.F., (editor), 1993, MCNP – A General Monte Carlo N-Particle Transport Code, Version 4A, LA-12625, Los Alamos National Laboratory, Los Alamos, N.M.

III.w. Comment

“9. The *source density* input variable is different for many of the model inputs, with no clear basis for the difference. For example a value of 0.7 is used for one section of TSD-DOSE and a value of 1.4 is used at a different part of TSD-DOSE. A value of 1.6 is used in RESRAD-Build and value of 2.0 is used for the landfill future use scenarios.....” (MH Chew)

III.w. Response

In this study, the RESRAD-BUILD code was used to model well site operation scenarios, TSD-DOSE was used to model landfill operation scenarios, and RESRAD was used to model future land use scenarios. The density differences are due to the different material types encountered in different phases of the operation. For example, in the well site operation scenarios the sludge density is assumed to be 1.6 g/cm³ on the basis of Smith et al. 1996 (Appendix B, Table B.1). In the TSD-DOSE analyses of bulk waste disposal, the density for the preprocessed waste was assumed to be 0.7 g/cm³ and the density for the processed waste was assumed to be 1.4 g/cm³ on the basis of TSD-DOSE default values (Appendix B, Table B.4). For the containerized waste, it was assumed the waste is already processed, with a density of 1.4 g/cm³ (Appendix B, Table

B.3). In the RESRAD code to model future use scenarios, the density of waste layer is assumed to be 2.0 (Appendix B, Table B.6) on the basis of EPA study (EPA 1993).

Reference

EPA (U.S. Environmental Protection Agency), 1993, DRAFT Diffuse NORM Wastes—Waste Characterization and Preliminary Risk Assessment, RAE-9232/1-2, Vol. 1, prepared by S. Cohen and Associates, Inc., and Rogers & Associates Engineering Corp. for the Office of Radiation and Indoor Air, Washington, DC.

III.x. Comment

“21. Each of the RESRAD codes (RESRAD-BUILD, RESRAD, RESRAD-OFFSITE) enable a Monte Carlo probabilistic assessment of the dose to be performed. This is different from the sensitivity analysis which is done to identify which input parameters should be refined to improve the analysis. Probabilistic assessment is useful for defining the uncertainty associated with any calculated value. It does not appear that this was used and as a result there is no uncertainty characterization associated with the reported numerical values. An uncertainty analysis is a necessary part of any scientific evaluation. What is the rationale for not conducting the probabilistic analysis since this is part of the analytical tools built into the modeling programs?” (MH Chew)

III.x. Response

A probabilistic assessment was not included in the scope of work. It is a more time-intensive analysis (entailing at least 50% more time and effort) and requires more complete characterization data than are available. The study was conducted using very conservative assumptions to account for the uncertainty, such as assuming that all of the TENORM waste disposed in a landfill would be at the maximum allowed concentration and that landfill workers would spend all of their time working with TENORM waste.

III.y. Comment

“22. RESRAD-OFFSITE input data, including details of the "site-specific" data, are not included in the report. The detailed input files for this, and for all of the other code inputs, should be reported in sufficient detail so that the results of the calculation can be repeated and evaluated.” (MH Chew)

III.y. Response

The RESRAD-OFFSITE analysis was only used as a sensitivity analysis to confirm that the use of groundwater modeling that did not include the buildup of progeny did not result in higher allowable concentrations than would be estimated by the more conservative approach. A table of the input parameters can be provided to anyone who requests them from the Department.

III.z. Comment

“23. Table B.6 lists the plant/soil transfer factors for radium, lead and thorium and cites "A&A (1996)" as the source of the data. These factors are not listed in the A&A (1996) report.” (MH Chew)

III.z. Response

The values used were cited from previous studies (Smith et al. 1999) which referenced the Auxier and Associates 1996 report. We agree the plant transfer factors are not included in the Auxier and Associates report and we are unable to produce a published source.

Plant/soil transfer factors are used in estimating the food ingestion pathway doses for the future-use scenarios. There is a direct correlation of plant transfer factor with the K_d values (Yu et al.1993) given as:

32.2.2 Empirical Determination of the Distribution Coefficient

In addition to the experimental methods for determining the distribution coefficient (K_d), Baes et al. (1984) and Sheppard and Sheppard (1989) proposed an empirical approach to calculate K_d for radionuclide i from the soil-to-plant concentration ratio (B_{iv}), on the basis of the strong correlation between B_{iv} and K_d . Sheppard and Thibault (1990) proposed the following correlation equation:

$$\ln K_d = a + b(\ln B_{iv}) , \tag{32.12}$$

where a and b are constants. The value for the coefficient b is -0.5, on the basis of experimental data. The value of a depends on soil type: for sandy soil, $a = 2.11$; for loamy soil, $a = 3.36$; for clayey soil, $a = 3.78$; and for organic soil, $a = 4.62$. Equation 32.12 provides a method of estimating the distribution coefficient from the plant-soil concentration ratio, especially when experimental or literature data are not available. Table 32.1 lists the geometric mean values of K_d obtained from the literature or predicted by using concentration ratios (Sheppard and Thibault 1990).

Using the above correlation, we computed plant transfer factors for different soil types using K_d values published in Vandenhove et al. (2009). The following table presents the newly calculated plant transfer factors and the values used in the report.

Element	K_d values (cm ³ /g)	Soil-to-Plant Concentration Ratio (B_{iv})			
		Sandy Soil	Loamy Soil	Clayey Soil	Value Used in the Report
Radium	2500	1.089E-05	1.33E-04	3.07E-04	6.80E-05
Lead	2100	1.543E-05	1.88E-04	4.35E-04	3.30E-05
Thorium	1900	1.885E-05	2.30E-04	5.32E-04	1.70E-06

Effect of plant transfer factor on the allowable TENORM concentrations for different soil types
 For radium, the ratio of the transfer factor used in the report and the values for different soil types varies from 0.2 – 4.5; for lead, the ratio varies from 0.5 – 13; and for thorium, the ratio varies from 11 to 300. The plant transfer factor is smaller for sandy soils and higher for clayey soils. Table 6.9 of the report provides the summary results for dose to source ratio for all future-use scenarios. For Pb-210, Ra-228, and Th-232, the intruder scenario is the limiting scenario and, for Ra-226, the resident scenario is limiting. The dose for the industrial worker, recreational visitor, and off site resident scenarios are very small compared to the limiting scenario doses. The limiting scenarios (i.e., the intruder and resident scenarios) were reanalyzed

using the plant transfer factors estimated for different soil types. The following table compares the allowable TENORM concentrations derived for different soil types.

Element	Allowable Concentration in the TENORM (pCi/g)			
	Report (Table 6.10)	Sandy Soil	Loamy Soil	Clayey Soil
Pb-210	11,000	11,000	8,600	6,400
Ra-226	130	130	130	130
Ra-228	700	700	700	700
Th-232	410	410	410	400

Although the resulting allowable TENORM concentrations are lower for some soil types, in all cases they are still greater than the allowable TENORM concentration for landfill workers (see Table 6.17). The waste concentration limit of 50 pCi/g total radium was based on the landfill worker scenarios and, therefore, is not sensitive to the plant transfer factors calculated for different soil types.

References

Vandenhove, H., G. Gil-Garcia, A. Rigol, and M. Vidal, 2009, “New Best Estimates for Radionuclide Solid–Liquid Distribution Coefficients in Soils. Part 2. Naturally Occurring Radionuclides,” *Journal of Environmental Radioactivity* 100:697–703.

Yu, C., et al., 1993, *Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil*, ANL/EAIS-8, Argonne National Laboratory, Argonne, Ill., Apr.

III.aa. Comment

“24. Table 6.14 should have included the dose from the polonium-210, which will be present with lead-210 (Pb-210) and approaching equal activity in 2 to 3 years. Both of these radionuclides would be present in pipes and components containing natural gas. In fact because lead-210 is more volatile than polonium-210 there may be situations in which polonium-210 can be found by itself in equipment.” (MH Chew)

III.aa. Response

Polonium-210 concentration data in the field were not available. In the modeling, it was assumed that the short-lived progeny with half-lives less than 6 months are in secular equilibrium with the parent radionuclide (i.e., the radionuclide concentrations of the progeny are equal to the radionuclide concentration of the parent [see page 55 in the report]). It was assumed Po-210 (half-life <180 days) is in secular equilibrium with its parent Pb-210. Therefore, potential doses from Po-210 are included in the dose estimates for Pb-210, assuming equal concentrations of Pb-210 and Po-210.

III.bb. Comment

“25. We understand the most recent revision of TSD-DOSE occurring in 1998. This suggests that the ICRP dosimetry system included in TSD-DOSE is outdated and not consistent with the most

recent recommendations of the ICRP. The impact of this is likely to be negligible, but it should be discussed in the report.” (MH Chew)

III.bb. Response

The dose coefficients used in TSD-DOSE are based on ICRP 26/ICRP 30 methodology. The NRC is still using the same methodology and the same dose coefficients as in TSD-DOSE. The following table compares the dose coefficients for Ra-226+D, Ra-228+D, and Th-232 based on the old (ICRP 26/ICRP 30) and new (ICRP 60) methodologies. In this study, the dose coefficients based on ICRP 26/ICRP 30 methodology were used.

Radio-nuclide ^a	Dose Coefficients based on ICRP 26/ICRP 30 Methodology			Dose Coefficients based on ICRP 60 Methodology		
	External (mrem/yr per pCi/g)	Inhalation (mrem/pCi)	Ingestion (mrem/pCi)	External (mrem/yr per pCi/g)	Inhalation (mrem/pCi)	Ingestion (mrem/pCi)
Pb-210+D	6.05E-3	1.38E-2	5.37E-3	7.5E-3	1.66E-2	7E-3
Ra-226+D	11.2	8.6E-3	1.33E-3	9.36	3.515E-2	1.04E-3
Ra-228+D	5.98	5.08E-3	1.44E-3	5.66	5.42E-2	2.55E-3
Th-232	5.21E-4	1.64	2.73E-3	4.56E-4	0.407	8.51E-4

^a Includes the contribution of short-lived progeny of half-life less than 180 days.

In the RESRAD code, the radiation dose from radon and its progeny is calculated by using the accumulated exposure in terms of working level month (WLM). The numerical values recommended by the ICRP Publications are used as a basis in RESRAD for converting WLM to total effective dose equivalent in ICRP 26/ICRP 30 methodology. In the ICRP 60 methodology, the RESRAD code calculates total effective dose instead of the total effective dose equivalent; therefore, the radon pathway dose calculations are also changed. The table below lists the changes for Rn-222 and Rn-220.

Methodology	Rn-220 (mrem/WLM)		Rn-222 (mrem/WLM)	
	Indoor	Outdoor	Indoor	Outdoor
ICRP 26/ICRP 30	150	250	760	570
ICRP 60	188	188	388	388

As mentioned before, the dose coefficients based on the ICRP 26/ICRP 30 methodology were used in this study. For Pb-210, the ICRP 60 methodology-based dose coefficients are slightly higher and would result in a higher dose from Pb-210 contamination. The external coefficients based on the ICRP 60 methodology are lower for Ra-226, Ra-228, and Th-232, and would result in lower external pathway doses. For Th-232, inhalation and ingestion pathway dose coefficients are lower based on ICRP 60 methodology and would result in a lower total dose for Th-232 contamination. The inhalation pathway dose coefficients for Ra-226+D and Ra-228+D are higher in ICRP 60 methodology; however, the dose from Ra-226 and Ra-228+D is dominated by radon inhalation pathways and the lower ICRP 60-based mrem/WLM conversion coefficient would result in much lower total doses from Ra-226 and Ra-228 contamination. In summary, the expected dose would be much lower if the ICRP 60 methodology-based coefficients are used for Ra-226, Ra-228, and Th-232.

III.cc. Comment

“26. The radon pathway through the leachate collection system has not been considered. This is potentially an important source of effluent from the landfill. Radon can be actively transported by water as evidenced in this quote from the EPA website. *“Radon gas can also dissolve and accumulate in water from underground sources (called ground water), such as wells. When water that contains radon is used in the home for showering, washing dishes, and cooking, radon gas escapes from the water and goes into the air. It is similar to carbonated soda drinks where carbon dioxide is dissolved in the soda and is released when you open the bottle. Some radon also stays in the water.”* We understand that there is no pathway model of radon movement through a leachate collection system in the modeling programs used in this study. A good response to this issue would be to monitor radon concentration in the standpipes of leachate collections systems. It may also be possible to appropriately model atmospheric pressure-driven transport of radon using Nuclear Regulatory Commission-approved computer codes.” (MH Chew)

III.cc. Response

A leachate collection system (LCS) would be expected to control leachate (liquid) at the base of the waste and pump this liquid to the surface for treatment. Such a system would not actively move subsurface gases to the surface, and radon gas is much denser than air, so passive upward movement in LCS piping is not expected. In addition, the solubility of radon gas in water is low, so transport of dissolved-phase radon gas to surface facilities for leachate treatment would also not be expected. Based on the above discussion, it is expected a special waste landfill leachate collection system is not a significant radon migration pathway. The Department has received verbal confirmation of this from field tests being conducted at a landfill in Montana.

IV. Air Quality – Radiation Control Program Rule Comments

IV.a. Comments

There were a number of comments related to the lack of short turn-around (field) TENORM waste screening methods, such as:

“Execution of these standards hinges upon a threshold value of 50 pCi/g of two isotopes of radium: 226Ra and 228Ra (ND Administrative Code Chapter 33-20- 11-01.1). To my knowledge and that of other experts in this field, there is currently no field deployable technology that can achieve this measurement directly and in a timely manner.” (Williston page 4)

“...we certainly need to push for some sort of field measurement tool that would give operators the confidence that what they’re sending into the landfill meets the regulations; we would give the landfill operators that confidence and also with the confidence of industry and landfill operators in the state of North Dakota, the confidence the public is looking for.” (Bismarck page 6)

“The laboratory methods currently approved by the NDDH do not allow for an immediate or real time result of the level of radioactivity of a waste material. A field method and instrument must be approved that demonstrates an equivalency to the laboratory method.” **(Clean Harbors)**

“As one example of an alternate method, I submit to you that other states with TENORM specific waste disposal regulations have opted to include an alternate gamma exposure rate threshold (mR/hr) that is measureable in the field and allows for immediate segregation of wastes.” **(Williston page 4)**

“We could follow the model offered by several states, Texas is one of them. And that model offers a separate pathway where you can measure something called micro Roentgen per hour, or essentially millirems per hour. And that’s been with a survey meter. If we offer that alternate pathway, I’m confident that better decisions on segregation of waste will be made in the field which will not only allow compliance from the operators and service providers in the field, but also allow your office to do an easier job of assuring compliance.” **(Bismarck page 14)**

“The subject of screening for wastes that may contain levels of radioactivity subject to the regulation was raised by a couple of the speakers at the hearing. I would like to add to those discussions the suggestions that the Department consider adopting a maximum reading on a Geiger counter that would trigger the requirement to test.” **(IHD)**

“These regulations create a disposal limit of TENORM as determined in picocuries per gram (pCi/g). There is no rapid field measurement currently available for accurate determinations of pCi/g. The only reliable method is a 21 day laboratory analysis. This presents a significant compliance burden, not only for operators, but for disposal facilities receiving TENORM waste. In order for operators to segregate waste economically, and for disposal facilities to accept this waste with confidence, real-time radiation measurements must be achievable. The units of measurement for rapid field measurement are typically in microroentgens per hour (mR/hr). There is no accurate conversion between microR/hr and pCi/g, which is problematic since the proposed Chapter 33-20-11 only provides a disposal limit in pCi/g. Without a means for a rapid field measurement, disposal facilities will be reluctant to accept TENORM waste, and operators will have difficulty segregating TENORM waste for disposal within North Dakota. Due to these radiation measurement concerns affecting compliance under the proposed rule, operators will most likely continue to dispose of TENORM waste outside of North Dakota, *NDPC suggest a dual-path regulatory framework, to permit a disposal limit threshold in either pCi/g or microR/hr or approve field measurement technology that can accurately determine pCi/g in the field.*” **(ND Petroleum Council)**

“Section 33-20-11-01.1: Screening.

As the Department is aware no commonly available instantaneous screening method exists for accurate measurement in (pCi/g). This raises questions for precise measurement, timely accurate reporting, and day to day operational procedures. We suggest a method congruent with our aforementioned proposal related to the RSP. We believe this proposal would simplify the process by allowing an action limit coupled with a fixed radiation meter set at a specified distance. We believe this method would promote accurate reporting and efficient operations while maintaining the highest degree of safety for those involved.” **(R360)**

“Currently, TENORM waste exhibiting two times background levels require additional screening (laboratory analysis) to confirm if waste is acceptable. However, this is just a "rule of thumb" practiced within North Dakota. The NDDOH should specify accepted practice within the proposed rule.” (Tervita)

IV.a. Response

The Department’s Radiation Control Program has received scientific documentation of short turn-around TENORM screening methods from several vendors. As these methods are approved by the Department, they are posted on the Department’s website https://www.ndhealth.gov/AQ/RAD/Licensed_tenorm_testing.htm. All persons requesting approval for a field screening procedure are required to submit split samples to an independent laboratory that uses one of the approved 28 day ingrowth testing methods such as the EPA 901.1(m) or the HASL 300 and submit the results to the Department. The screening results will be compared to the laboratory results to determine they do not deviate by more than two standard deviations from the mean. Some screening testing methods can provide results in as short as one day or less.

Survey meters may be used as a screening method to determine whether or not the waste material is radioactive, however, they do not indicate what radioisotopes are present or the amount or concentration. There is no direct correlation between the survey meter reading and the laboratory analysis. The survey meter is measuring how much radiation is being given off and the laboratory analysis is indicating what radioisotopes (i.e. Ra-226 and Ra-228) are present and at what concentrations (i.e. pCi/g).

The Department will not specify an accepted practice regarding “two times background” level because that is a screening procedure, not an analytical method and has no place in the rules. Screening procedures are addressed in the waste acceptance plan as part of the permitting process and is site specific. The radiation monitoring requirements for TENORM waste entering a landfill will be addressed in the specific conditions of the TENORM licenses and landfill permits. Due to a number of variables such as lack of training, improper use of survey meters, lack of calibrations of survey meters, and improper survey techniques, the Department deems this practice to be unacceptable.

IV.b. Comments

There were a number of comments relating to the Department not having adequate knowledge of the amounts of TENORM waste generated in North Dakota, some examples are:

“Next thing that bothers me is we’re making all of these proposed changes; we don’t even have any idea how much radioactive waste we generate in North Dakota every day.If you don’t know how many tons of radioactive waste you’re generating every day, how can you regulate it? That would be the first thing that you would want to do.” (Williston page 6)

“Second thing I’d like to know is what happens to the radioactive waste?I would like to know where the radioactive waste from North Dakota has been going for the last five years.” (Williston page 6)

IV.b. Response

The Department has been monitoring the various amounts and concentrations of TEMORM waste materials and continues to improve the TENORM waste recording processes. Licensed TENORM waste transporters are required to submit quarterly TENORM transport reports using an established spreadsheet available on the Department's website. The proposed rule amendments will enhance the ability of the state to track TENORM waste from generation to final disposal. For the past several years the majority of TENORM waste has been going to licensed disposal facilities in Montana, Colorado and Idaho, with small volumes going to other states.

IV.c. Comments

There were a number of comments relating to there being “no safe dose of radiation” and concerns of higher risks of cancer due to increased exposure levels. Some examples are listed:

“.....I've talked to the people at the health department here about the levels and the unsafe levels of the radiation here and the members that I talked to at the health department; they're not too clear about this either. A lot of people are not sure of what's safe and not safe.” **(Bismarck page 5)**

“...no one knows, you guys don't know what a safe level is.” **(Bismarck page 6)**

“If the companies are allowed to dispose of higher levels of radioactive waste, that may not be visible on the surface. However, it may cause pollution to our ground and water systems that will be felt in the future and therefore cause health problems for the residents.” **(Linda Kimball)**

“My other concern is that when radium 226 decays and produces radon gas that cannot be smelled, tasted or seen, if you do plan on raising the limit, what devices have you in place to implement for the workers and public safety to test for the radon levels or do you plan on having every individual citizen having to provide their own?” **(Fargo page 14)**

“.....recommends that North Dakota regulation should re-evaluate the disposal concentration limits, with the new limits being based upon <1 mrem/year RESRAD and TSD-Dose modeling. The risk based models should examine both non-radworker landfill worker/disposal dose pathways and also dose pathways to affected members of the public consistent with NRC, Agreement State, and IAEA International protocols.” **(Energy Solutions)**

“1) The acceptable limit of 50 picocuries for industrial landfills, while less than the 51.6 estimated to be the maximum that would result in exposure levels below the 100 millirem limit for landfill workers....this limit seems uncomfortably close to the calculated limit. Like all recommendations, this is based on modeling and calculations that could be inherently flawed (our understanding is never perfect). Most acceptable exposure limits error on the side of caution, by setting limits perhaps 10 fold or more below exposures of documented risk. Perhaps this has already been calculated into the 100 millirem annual exposure that this seeks to avoid; but this should be considered.

2) A potential solution to the above concern would be dosimetry monitoring of landfill workers. This would provide an objective indication of the accuracy of the modeling; and could even be discontinued at some distant point in the future, if it was demonstrated that these workers were, in fact, not exposed to any significant degree.” (Lyle G. Best)

IV.c. Response

The public radiation dose limit of 100 mrem in a year was established by the International Commission on Radiological Protection (ICRP) based on significant scientific knowledge and data. The ICRP dose limits are intended to serve as a boundary condition that will prevent deterministic effects (non-stochastic) and limit the probability of stochastic effects (cancer causing). The NRC and the Department have been following the ICRP public dose limit for many years.

The Department will require personnel dosimetry monitoring devices be provided to TENORM workers as a part of the radioactive material license conditions until historical data is obtained for the possible relief of this requirement.

Radon gas accumulates in confined spaces and landfill workers are working outdoors and accumulation of radon gas is not a concern.

IV.d. Comment

“Considering the number of potential sites with TENORM contamination, the requirement to provide 30 day notice to the agency before vacating or relinquishing possession or control of premises that has been contaminated with TENORM may have a significant impact on agency resources. This impact may be further exacerbated without a well-defined administrative process that should include standardized forms for notice and dedicated agency staff. Furthermore, countless property transactions may be at risk if a licensee will not be able to sell or transfer real property intended for similar use until the agency reviews and approves the transaction. A more appropriate standard would be to require notice and approval of sites that are intended to be vacated. The requirements for property transfers could then follow the standards that are set forth within later sections of the TENORM Rules.” (Continental Resources)

IV.d. Response

This requirement is already in NDAC Section 33-10-03.1-01, which adopts by reference the Federal Standard in 10 CFR 30.36.

The Department has the following forms currently listed on its website:

- 1. SFN 58229 – Facility Close-Out Form/Property Release and/or License Termination Checklist.*
- 2. SFN 18941 – Certificate: Disposition of Radioactive Material.*

At present, the Department believes it has the necessary staff to address the 30 day notice requirement. It will continue to look for ways to improve the current process and review policy to ensure a reasonable response time from the Department.

IV.e. Comment

“In terms of how sampling of radioactive material will be conducted, it was my understanding from information last night, that it would be the generator of the radioactive waste that would be doing that sampling. How that would be conducted is not spelled out.” **(Bismarck page 33)**

IV.e. Response

Sampling is performed using an approved testing facility’s established sampling protocols. After the samples are acquired, they are sent to the testing facility for analysis. The Department maintains a list of approved TENORM testing facilities on its website.

Sampling protocols are part of the approved EPA 901.1(m) and HASL 300 procedures used by those laboratories conducting the analysis.

IV.f. Comments

Several comments were received about items that had not been addressed in the proposed TENORM rules.

“Chapter 33-10-23 does not specifically address decontamination or cleaning of bulk containers, such as roll off boxes and dump trailers that haul TENORM impacted waste. Rules and procedures must be developed that address the removal of all impacted materials and that an "all clean" scan is completed prior to the waste container or trailer being placed back in surface. Tires of dump trailers must be cleaned prior to exiting a disposal unit to prevent "tracking" of waste materials. Both of these issues could be addressed in a facilities individual operating permit.” **(Clean Harbors)**

“Proposed rules do not address tracking and disposal of high-level radioactive waste.”

“Procedures for measuring the intensity of radiation fail to adequately set standards of operation that would provide quality assurance, quality control.” **(Dakota Resource Council)**

“The proposed rule does not include evaluation of storage tank bottom sludge or byproducts from gas refining separation processes..... encourages the State to evaluate the TENORM levels of these sludge and byproducts at production facilities, as well as drilling facilities, and include methods for their disposal in the proposed rule.”

“Without full investigation of equilibrium status of the waste, it is unknown how the waste stream will change. ... To adequately investigate equilibrium status, radiation detection systems with specific characteristics are needed in all current, proposed and previously used TENORM disposal sites.” **(Earthworks)**

IV.f. Response

There is currently no high level radioactive material or waste material used or generated in North Dakota. A part of the specific licensing process requires the applicant to submit operating and emergency policies and procedures (i.e., decontamination, evaluation of waste streams, tracking, quality control) that are reviewed by the Department prior to issuing a license. The license contains conditions that require the licensee to follow all information submitted in the

application. Cleaning of waste transport equipment will need to be addressed by disposal facilities who propose to accept TENORM.

All TENORM waste will be regulated irrespective of how it was generated or the source and is not limited to one activity or a combination of activities.

IV.g. Comment

“...the requirement to provide 30 day notice to the agency before vacating or relinquishing possession or control of premises that has been contaminated with TENORM may have a significant impact on agency resources....a more appropriate standard would be to require notice and approval of sites that are intended to be vacated.” **(Continental Resources)**

IV.g. Response

The 30-day notice is not a new requirement. This requirement is currently listed in Section 33-10-04.2-07 of the North Dakota Radiological Health Rules.

IV.h. Comment

“NDDoH is using rules regulating radiation from medical devices and processes and attempting to apply them to oil and gas TENORM waste.” **(Continental Resources)**

IV.h. Response

The North Dakota Radiological Health Rules currently regulate both medical and industrial users of radioactive materials, including TENORM. NDAC Chapters 33-10-01, 33-10-03.1, 33-10-04.2, 33-10-10.1 and 33-10-13.1 apply to all radioactive material licensees. Currently, the majority of North Dakota radioactive material licenses are industrial.

Many comments were received on specific sections of proposed NDAC Chapter 33-10-23:

33-10-23-01 Purpose

IV.i. Comment

“The defined “Purpose” of the TENORM Rules in Section 33-10-23-01 requires clarification and be revised to remove the reference to “disposal” since this chapter does not regulate or license the disposal of TENORM.” **(Continental Resources)**

IV.i. Response

The purpose stated in this section applies to all sections within NDAC Chapter 33-10-23. Chapter 33-10-23 regulates TENORM material receipt, possession, use and transfer. Disposal is an integral part of the transport and handling of the TENORM waste and it is specifically, addressed in Section 33-10-23-08 which regulates the disposal and transport of TENORM.

33-10-23-02 Scope

IV.j. Comment

“The defined “Scope” of the TENORM Rules in Section 33-10-23-02 should be revised to remove the reference to “disposal.” **(Continental Resources)**

IV.j. Response
See Response IV.i.

33-10-23-03 Definitions

IV.k. Comment

“a. Radiation Safety Officer - In personal communications with the Department of Health, I've been told that the RSO for an applicant must be employed by the applicant. This condition is not explicitly stated in the regulations and I would encourage the acceptance of third-party RSO's for safety programming and licensing protocols.” **(Williston page 9)**

IV.k. Response

The Radiation Safety Officer is the individual, appointed by licensee management and identified on the license, who is responsible for implementing the radiation safety program. This individual is not required to be employed directly by the applicant. However, the Radiation Safety Officer should be knowledgeable about the program, ensure that activities at the licensed facility are performed in accordance with approved procedures and the regulations, and have sufficient authority to halt operations that pose a threat to health and safety.

IV.l. Comments

“b. Definition of "tank" - is this definition intended to include E&P tanks

c. Paragraph 5 of Chapter 33-10-23-12 refers to a "person duly authorized to act for and on the applicant's behalf;" it might be prudent to add "authorized agent" to the list of definitions.” **(Williston page 9)**

“Also of concern is the Department's use of the term "coal combustion byproducts" in the proposed NDAC Chapter 33-10-23. While we concur with the Department's apparent intent to exempt these materials, we suggest the term "coal combustion byproducts" be defined in the proposed rule. Alternatively, the Department may wish to use the term "coal combustion residuals", a term defined in EPA's new coal ash rule.” **(Basin Electric Power Cooperative)**

“Throughout the TENORM Rules there are several terms that are used to describe circumstances or actions required for compliance, yet the terms are either undefined or poorly defined. These terms are as follows:

1. Decommissioning: The term is undefined in the TENORM Rules. We recommend defining "decommissioning" as the "withdrawing (someone or something) from service."
2. Decontamination: The term is undefined in the TENORM Rules, and it may be difficult to differentiate between activities that are considered to be routine maintenance and not subject to decontamination standards. We recommend "decontamination" as "the process of removing or reducing residual radioactivity to an acceptable level for reuse or disposal."
3. Oil and Gas Equipment: The term is undefined in the TENORM Rules. We recommend defining "oil and gas equipment" as "equipment used for drilling, completions, and

production operations and disposal, including but not limited to pipes(tubulars), tanks, vessels, pumps, valves, flow lines, wellheads, and connectors such tees and elbows, provided that such equipment is or has been in contact with oil and gas waste or produced fluids or substances."

4. Oil and Gas Waste: The term is undefined in the TENORM Rules. We recommend defining "oil and gas waste" as "materials to be disposed or decontaminated which have been generated in connection with activities associated with the exploration, development, and production of oil or gas, or waste or wastewater injection, and materials to be disposed of or reclaimed which have been generated in connection with activities associated with the solution mining of brine. The term 'oil and gas wastes' includes, but is not limited to, saltwater, other mineralized water, sludge, spent drilling fluids, cuttings, waste oil, spent completion fluids, and other liquid, semiliquid, or solid waste material. The term 'oil and gas wastes' includes waste generated in connection with activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants, or repressurizing plants unless that waste is a hazardous waste as defined by the administrator of the United States Environmental Protection Agency pursuant to the federal Solid Waste Disposal Act, as amended (42 United States Code §6901 et seq.)."

5. NORM Contaminated Oil and Gas Equipment: The term is undefined in the TENORM Rules. We recommend defining "NORM contaminated oil and gas equipment" as "oil and gas equipment that, at any accessible point, exhibits a minimum radiation exposure level greater than 50 uR/hr including background radiation level."

6. Reclaiming: The definition is poorly defined in the TENORM Rules and should be removed.

7. Unrestricted Use: The term is undefined in the TENORM Rules. We recommend defining "unrestricted use" as "a use not subject to or subjected to any restrictions."” (**Continental Resources**)

“7. "Decontamination" means the process of removing or reducing residual radioactivity to an acceptable level for reuse or disposal.

No definition for "decontamination" is provided, which is common in state NORM/TENORM regulations. The differentiation between decontamination and routine maintenance is not discussed until 33-10-23-10 General Licenses. References to decontamination are listed in 33-10-23-07 Unrestricted Use and Conditional Release. Defining "decontamination" would be useful in the front of the document, which dictates the need for specific licensure in the beginning.”

“9. "NORM Contaminated Oil and Gas Equipment" means oil and gas equipment that, any accessible point, exhibits a minimum radiation exposure level greater than 50 uR/hr including background radiation.”

“10. "Oil and Gas Equipment" means any apparatus associated with the potential for or actual enhancement of NORM including but not limited to tanks, valves, flow lines, wellheads, connectors such as tees and elbows tubular goods, piping, vessels, wellheads, separators and

condensers provided such equipment is or has been in contact with oil and gas waste or produced fluids or substances.”

“11. "Oil and Gas Wastes" means materials to be disposed of or reclaimed which have been generated in connection with activities associated with the exploration, development, and production of oil or gas or geothermal resources, such as those activities associated with:

(A) the drilling of exploratory wells, oil wells, gas wells, or geothermal resource wells:

(B) the production of oil or gas or geothermal resources, including:

(i) activities associated with the drilling of injection water source wells that penetrate the base of usable quality water:

(ii) activities associated with the drilling of cathodic protection holes associated with the cathodic protection of wells and pipelines subject to the jurisdiction of the commission to regulate the production of oil or gas or geothermal resources:

(iii) activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants, or repressurizing plants:

(iv) activities associated with any underground natural gas storage facility.

(iv) activities associated with any underground hydrocarbon storage facility.

(v) activities associated with the storage, handling, reclamation, gathering, transportation, or distribution of oil or gas prior to the refining of such oil or prior to the use of such gas in any manufacturing process or as a residential or industrial fuel:

(C) the operation, abandonment, and proper plugging of wells subject to the jurisdiction of the commission to regulate the exploration, development, and production of oil or gas or geothermal resources: and

(D) the discharge, storage, handling, transportation, reclamation, or disposal of waste or any other substance or material associated with any activity listed in subparagraphs (A) - (C) of this paragraph, except for waste generated in connection with activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants, or repressurizing plants if that waste is a hazardous waste as defined by the administrator of the United States Environmental Protection Agency pursuant to the federal Solid Waste Disposal Act, as amended (42 United States Code §6901. et seq.).

(E) And materials to be disposed of or reclaimed which have been generated in connection with activities associated with the solution mining of brine.

(F) The term "oil and gas wastes" includes, but is not limited to. Saltwater, other mineralized water, sludge, spent drilling fluids, cuttings, waste oil, spent completion fluids, and other liquids, semiliquid, or solid waste material. The term "oil and gas wastes" includes waste generated in connection with activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants or repressurizing plants unless that waste is a hazardous waste as defined by the administrator to the United State Environmental Protection Agency pursuant to the federal Solid Waste Disposal Act, as amended (42 United States Code §6901 et seq.).”

“16. "Reclaiming" means returning property to u condition or state such that the property no longer presents a health or safety hazard or threat to the environment; the term "reclaiming" includes those activities necessary to decommission the licensed facility (i.e., to remove, as a facility, safely from service and reduce residual radioactivity to a level that permits release of the

property for unrestricted use and termination of the license). Adding definitions for decommissioning and decontamination are more consistent with the regulation.”

“22. "Unrestricted Use" means a use not subject to or subjected to any restrictions. No definition for "unrestricted use" is provided, which is also common in state NORM/TENORM regulations. Section 33-10-23-07 Unrestricted Use and conditional release addresses both designations, but unrestricted use is not defined and definition will lead to greater clarity.” (ND Petroleum Council)

“Some may contend that the tanks were not “designed” to contain TENORM as TENORM is an incidental byproduct of the clarifying/filtration (and stratified solids accumulation) process. You may want to refine so as to not open up a loophole.”

“Defining "decontamination" would be useful in the front of the document, which dictates the need for specific licensure in the beginning.”

“A definition for "unrestricted use" may be helpful. Examples of places where TENORM is typically found may be helpful in the definition, such as scale in pipe, tank bottoms, pigging equipment, filter socks, heater treaters and other oilfield equipment used in midstream and exploration and production oil and gas activities.” (Secure Energy Services)

IV.l. Response

The Department has adapted many of the definitions in NDAC Section 33-10-23-03 from the Conference of Radiation Control Program Directors’ (CRCPD) Part N “Regulation and Licensing of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM).” The CRCPD’s primary membership is made up of radiation professionals in State and local government that regulate the use of radiation sources. The CRCPD’s goal is to assure that radiation exposure to individuals is kept to the lowest practical level, while not restricting its beneficial uses. Part N has been used by several other states in the development of their TENORM regulations. The Department feels confident that the definitions set forth in this section are adequate to ensure the safety of workers, members of the public and the environment.

The Department maintains the definitions for “tank” and “reclaiming” are adequately defined in the proposed rules.

The Department has decided not to incorporate the additional definitions suggested above. The Department maintains these items are adequately addressed in the proposed rules.

33-10-23-04 Exemptions

IV.m. Comments

“Chapter 33-10-23-04 identifies exemptions to regulation and licensing of TENORM Item 7 reads "Persons who possess TENORM in the form of coal combustion byproducts from energy conversion facilities are exempt from this chapter." Is the word possess used interchangeably with

generate in item 7? Are special waste landfills that manage coal combustion ash exempt from the TENORM regulation?" **(Clean Harbors)**

"The TENORM Rules should be revised to incorporate additional exemptions for the following:

- A. "the possession, storage, use, transportation, and commercial distribution of natural gas and natural gas products and of crude oil and crude oil products containing NORM are exempt from the requirements of this chapter"; **(Continental Resources)**

IV.m. Response

The Department believes it is clear that the proposed rules apply to TENORM, not NORM, and therefore declines to make this change as proposed. Special waste landfills that manage coal combustion residuals from energy conversion facilities are exempt from this chapter.

IV.n. Comment

"B. "the possession of produced waters from crude oil and natural gas production is exempt for the requirement of this chapter if the produced waters are injected in a well approved by the agency having jurisdiction to regulate such reinjection or if the produced waters are discharged under the authority of the agency having jurisdiction to regulate such discharge"; **(Continental Resources)**

IV.n. Response

The Department currently considers these produced waters to be NORM since they do not meet the definition of TENORM as defined in NDAC Chapter 33-10-23

IV.o. Comment

"C. "tanks, vessels, containers, and materials located on oil and gas drilling, completions, and production facilities, and saltwater disposal wells under the authorization and jurisdiction of North Dakota Industrial Commission"; **(Continental Resources)**

IV.o. Response

If the above materials contain TENORM not under the jurisdiction of the NDIC and as defined in the proposed rules NDAC 33-10-23, they are considered subject to Departmental regulation.

IV.p. Comment

"D. "materials and equipment used in the recycling process contaminated with NORM scale or residue not otherwise exempt from the requirement of this chapter if the maximum radiation exposure level does not exceed 50 μ R/hr including background level, at any accessible point"; and" **(Continental Resources)**

IV.p. Response

As these materials are being concentrated as a result of human practices, they meet the definition of TENORM as defined in NDAC Chapter 33-10-23.

IV.q. Comment

“E. "pipe (tubulars) and other downhole and surface equipment used in oil and gas drilling, completions, and production operations contaminated with NORM scale or residue not otherwise exempted from the requirements of this chapter if the maximum radiation exposure level does not exceed 50-uR/hr including background level, at any accessible point.”
(Continental Resources)

IV.q. Response

See Response IV.p.

IV.r. Comment

“Part five- Regulation by the Comprehensive Environmental Response, Resource Conservation and Recovery, and Compensation and Liability Acts set minimum standards, which the state can strengthen. No exemptions from tracking.” **(Dakota Resource Council)**

IV.r. Response

This is a recommended exemption from the Conference of Radiation Control Program Directors (CRCPD) Part N which is the foundation for these proposed rules. This exemption acknowledges that TENORM wastes subject to CERLCA must comply with those requirements. This exemption does not lessen or change any CERLCA-imposed requirements.

IV.s. Comment

“Part six- The Department’s proposed ability to exempt persons based on the minimal language, “upon it’s own determination...” provides no standards for determining what an acceptable case may be.” **(Dakota Resource Council)**

IV.s. Response

See Response IV.r. If persons who use and possess TENORM can provide documentation that demonstrates that the reasonably maximally exposed individual will not receive a public dose with a total effective dose equivalent of more than 100 mrem in one year from all licensed or registered sources of radiation including TENORM, the Department may approve the exemption.

IV.t. Comment

“Part seven- Coal combustion byproducts are known to be radioactive and are a public health concern. Using these byproducts to bind oil and gas waste would increase the intensity of radiation.” **(Dakota Resource Council)**

IV.t. Response

Elevated radiation levels in coal combustion residuals is very rare in North Dakota. In reviewing coal combustion residuals (bottom ash, fly ash, and leachate materials) sampling results from power plants across North Dakota, there are very few samples that exceed the 5 pCi/g of Radium and those few samples that do are only slightly elevated above 5 pCi/g.

IV.u. Comment

“The section 33-10-23-04 Exemptions could be raised to 15 pCi/g without adverse effects to the environment; or to those around the waste or material. Under EPA's Radiation Guide for CERCLA clean-up, sub soils with up to 15 pCi/g are allowed to remain in place.” **(IHD)**

IV.u. Response

The 15 pCi/g limit is the acceptable release limit measured at 15 cm below the surface. The 5 pCi/g limit is a surface release limit.

IV.v. Comment

“Under the licensing regulations, there is regulatory support to raise the limit for the requirement of a license, from 5 Picocuries per gram to 15 pCi/g. The section 33-10-23-04 Exemptions could be raised to 15 pCi/g without adverse effects to the environment; or to those around the waste or material. Under EPA's Radiation Guide for CERCLA clean-up, sub soils with up to 15 pCi/g are allowed to remain in place. The assumption is that: being under 6 inches of topsoil, this radiation level does not present an issue. All waste at a landfill will be under much more soil than that. Many places across the country including North Dakota can have NORM levels at or above 15 pCi/g naturally. Many household products also fit into this higher level of radioactivity.” **(ND Petroleum Council)**

IV.v. Response

See Response IV.u.

IV.w. Comment

“Persons who possess TENORM in the form of coal combustion byproducts *residuals* from energy conversion facilities are exempt from this chapter.

In addition, Montana-Dakota recommends that the proposed rule include examples of coal combustion residuals, considering the edit proposed above in Section 33-10-23-04 (Exemptions), for the NDDH to provide more clarity and will avoid unintended increases in permitting and management of CCR. The following are recommended to be included as examples of coal combustion residuals:

"coal combustion byproducts residuals "include fly ash, bottom ash, boiler slag, and flue gas desulfurization materials, and beneficial uses of these materials.” **(Montana Dakota Utilities)**

IV.w. Response

The Department concurs with changing the exemption wording in NDAC Subsection 33-10-23-04(7) from “coal combustion products” to “coal combustion residuals (i.e. fly ash waste, bottom ash waste, slag waste and flue gas emission control waste).” This change will be made to the draft of NDAC Chapter 33-10-23.

33-10-23-05 Standards for Radiation Protection for Members of the Public

IV.x. Comment

“ Language here is ambiguous. No standards are set to address how exposure is monitored. Testing protocols and frequency for air, water and soil sampling should be established for surrounding communities.” **(Dakota Resource Council)**

IV.x. Response

The regulations for occupational radiation dose limits, the dose limits for members of the public, surveys and monitoring, control of exposure and radiological release criteria are set forth in NDAC Chapter 33-10-04.2 of the current North Dakota Radiological Health Rules.

33-10-23-06 Protection of Workers During Operations

IV.y. Comment

“a. It is unclear whether cited laws are applicable to oil and gas.
i. 33-10-04.2 applies to people working in medical industry, not oil and gas.
ii. 33-10-10.1 deals with NRC regulated material. The EPA not NRC regulates radiation from oil and gas waste. The sections of federal code chosen do not apply.” **(Dakota Resource Council)**

IV.y. Response

The North Dakota Radiological Health Rules currently regulate both medical and industrial users of radioactive materials, including TENORM. NDAC Chapters 33-10-01, 33-10-03.1, 33-10-04.2, 33-10-10.1 and 33-10-13.1 apply to all radioactive material licensees. Currently, the majority of North Dakota radioactive material licenses are industrial. The EPA and NRC do not regulate TENORM. When the Department adopted the federal rules, it expanded their application to include TENORM.

33-10-23-07 Unrestricted Use and Conditional Release

IV.z. Comment

“a. Will there be a standard form for submitting decommissioning intents
b. 10 CFR part 20, subpart E in paragraph 1(this is NRC code - and the decommissioning limit differs from values we've been discussing.... Less than 50 pCi/g).
c. Table 4.2-07.1 identified in Paragraph 2 cannot be found in this document?” **(Williston page 9-10)**

IV.z. Response

There is no form, however the licensee shall comply with the requirements of NDAC Section 33-10-03.1[10 CFR 30.36].

50 pCi/g is the proposed disposal limit for special waste landfills and does not apply to decommissioning activities.

Table 4.2-07.1 does not appear in NDAC Chapter 33-10-23. This table resides in NDAC Chapter 33-10-04.2 of the existing North Dakota Radiological Health Rules. The table reference in NDAC 33-10-23-07(2) will be changed from “table 4.2-07.1” to “table 4.2-07.1 of chapter 33-10-04.2”.

IV.aa. Comment

“d. Paragraph 4: Decontamination activities require a specific license under 33-10-23-11. *I'm interpreting this to mean that any spill response company -for example a company that is called to cleanup an SWD struck by lightning - will require a specific permit if TENORM is found to be present?” (Williston page 9-10)*

IV.aa. Response

Salt water disposed at a Class II Underground Injection Control well, commonly known as a Salter Water Disposal (SWD) well, is considered NORM and is not subject to TENORM regulations.

IV.bb. Comment

“e. Paragraph 6: Actions taken to confine TENORM onsite or to remediate sites shall be based on expected longevity-related controls for one thousand years or longer.

i. Can someone elaborate on this? **(Williston page 9-10)**

IV.bb. Response

This is taken from the ANL report Section 3.2.2. (Future-Use Scenarios) which refers to the evaluation of all pathways, the associated doses and risks being evaluated over a 1,000 year time horizon and consideration of the fate and transport of the radionuclides through the environment.

IV.cc. Comment

“a. Part one- Decontamination survey requirements are not explicit; this eliminates standardization and complicates reporting and monitoring abilities for the Department.

b. Part two- Requirements for the survey are not clear.” **(Dakota Resource Council)**

IV.cc. Response

Decontamination requirements are site specific. Survey results shall comply with the requirements of NDAC Section 33-10-03.1[10 CFR 30.36].

The decontamination survey results are reviewed by the Department prior to approval.

IV.dd. Comment

“c. Part five- Two years of inactivity is too long a period for a radioactive waste site to be left with no permanent remediation or decontamination efforts.” **(Dakota Resource Council)**

IV.dd. Response

The two year inactivity period is a current requirement in NDAC Section 33-10-03.1 [10 CFR 30.36]. Section 33-10-23-07 incorporates this current requirement as it specifically pertains to

TENORM. Essentially, this section re-emphasizes many of the requirements already in the existing rules.

IV.ee. Comment

“d. Part seven- Specific testing requirements to find the maximum exposure level of TENORM on equipment should be more specific.” **(Dakota Resource Council)**

IV.ee. Response

Any calibrated radiation survey instruments capable of measuring microroentgens per hour are acceptable. As noted above in Response IV.cc., survey results are reviewed by the Department prior to approval.

IV.ff. Comment

“This section lists notification requirements to the department of intent to vacate no less than thirty (30) days before vacating or relinquishing possession or control of premises that have been contaminated with TENORM as a result of the licensee's activities. Will the department generate a standard notification form?” **(ND Petroleum Council)**

IV.ff. Response

The Department has the following forms currently listed on its website used to address the 30 day requirement:

- 1. SFN 58229 – Facility Close-Out Form/Property Release and/or License Termination Checklist.*
- 2. SFN 18941 – Certificate: Disposition of Radioactive Material.*

IV.gg. Comment

“This section requires each licensee to have equipment and property decontaminated prior to vacating the premises. The department must verify and accept decontamination surveys after property and equipment has been decontaminated. Will there be a standard notification form? This process may be difficult until an appropriate number of decontamination companies have been licensed in North Dakota. Decontamination activities require a specific license, however no definition was provided by ND DH for "decontamination" has been provided.” **(ND Petroleum Council)**

IV.gg. Response

See Response IV.z. The Department currently maintains a list of licensed decontamination companies on its website.

See Response IV.l. regarding definitions.

IV.hh. Comment

“Suggest adding to this section: Licensed and approved 3rd party service providers may also be used for conducting requisite surveys and decontamination activities.” **(Secure Energy Services)**

IV.hh. Response

The current and proposed regulations do not restrict 3rd party service providers from performing these activities.

IV.ii. Comment

“1. Each licensee before vacating or transferring any premises shall permanently decontaminate the premises to meet the criteria for decommissioning in 10 CFR part 20, subpart E. The licensee shall make a survey ~~shall~~ after the decontamination and provide a copy to the department and any landlord, subsequent tenant or transferee. The premises may not be vacated, sold, or transferred until the department verifies and accepts the decontamination survey.

“Suggested wording change for sentence 2 above: The licensee shall have a radiological survey performed and documented by a qualified personnel (e.g. RSO) after the decontamination.....

As deemed appropriate and at its sole discretion, the department may also require the licensee to prepare and submit, prior to the start of any decontamination and decommissioning work, a Work Plan, Sampling and Analysis Plan, Data Quality Objectives, and a Quality Assurance Plan.” **(Secure Energy Services)**

IV.ii. Response

Current Department licensing and approval processes address this issue. In addition, decommission requirements are identified in NDAC Section 33-10-03.1[10 CFR 30.36]. The Department will remove the word “shall” after the word “survey” in NDAC Subsection 33-10-23-07(1), as shown in the comment.

IV.jj. Comment

“(Subsection 7) This rule will be an issue if a single piece of equipment is < 50 uR/hr, but multiple pieces on a truck are well above 50 uR/hr. For example, a single joint of TENORM impacted tubing may read less than 50 uR/hr, but a truckload going to recycling could easily read 20x this value. Rule needs clarification if this is for each piece of equipment or each shipment.” **(Secure Energy Services)**

IV.jj. Response

This is adequately addressed in NDAC Section 33-10-23-07(2) which states “...or any other property used in contact with, or close proximity...”

33-10-23-08 Disposal and Transfer of Waste for Disposal

IV.kk. Comments

“The requirement for providing notice of delinquent manifests within 45 days does not give enough consideration to transportation variability and logistics...the delinquent manifest notification requirement should be relaxed to 60 days.” **(Continental Resources)**

“A more appropriate requirement would be for the delinquent manifest written report to only be required when a final copy of the manifest is not obtained within 30 days of initiating investigation.” **(Continental Resources)**

“...quarterly summary reporting of TENORM should be specific to transfer for disposal.”
(Continental Resources)

“The requirement to label each container as “radioactive material” may be confusing and overly conservative....the proposed labeling requirement may create unnecessary confusion with existing federal rules (Part 49 of the Code of Federal Regulations, Chapter 172)....requiring that each container be labeled as “radioactive material” may create unnecessary concern if the container were to be viewed by a member of the general public or person unfamiliar with the nature of TENORM.” **(Continental Resources)**

IV.kk. Response

TENORM by definition is classified as radioactive material and must be labeled as such to permit individuals handling and using the containers, or working in the vicinity of the containers, to take the precautions to avoid or minimize exposures. The Department believes the 45 day reporting requirement is reasonable and protective of public health.

IV.ll. Comment

“...the requirement to include the address of the generator on each container label is onerous and a potentially duplicative requirement....A simpler and more effective approach would be to only require the individual or company name as the generator and contents of the container on the label.” **(Continental Resources)**

IV.ll. Response

This information is necessary to accurately track waste materials generated by companies with multiple locations.

IV.mm. Comment

“a. Part two- Containers should have specific design criteria that has been reviewed and tested for compatibility by independent agencies or by regulatory authorities in other states dealing with similar levels of radioactivity. DRC recommends independent or regulatory experts on disposal of radioactive waste are consulted to inform rules on transportation.

i. Part two, subpart H- Location of records be kept and available for public viewing are not written.” **(Dakota Resource Council)**

IV.mm. Response

The requirements for transport containers are already established by the U.S. Department of Transportation.

Records in the Department’s possession are subject to North Dakota’s open records law and can be accessed by contacting the Department.

IV.nn. Comment

“ii. There are no qualifications for lids on containers, or covering during transport.” **(Dakota Resource Council)**

IV.nn. Response

The Department will add the words “or while in transport” after the word “storage” in Subdivision 33-10-23-08(2)(c).

Waste haulers that want to transport TENORM waste must also have a permit from the Solid Waste Program. All waste hauler permits have conditions that state:

II.D.3.b. The owner operator of each vehicle or unit transporting solid or hazardous waste must ensure the vehicle or unit is enclosed, leakproof, durable, capable of compacting such wastes (if applicable), and the construction is such that it can be easily cleaned.

II.D.3.c. The owner or operator of each vehicle or unit transporting solid or hazardous wastes must operate the vehicle or unit in such a manner that the wastes will not fall, leak or spill while in transit and minimize windblown dust or airborne contaminants.

IV.oo. Comment

b. Part three- No frequency or reporting procedures for inspections based on type of TENORM being stored, tank construction material and the type of erosion and corrosion that may exist are set. (Dakota Resource Council)

IV.oo. Response

The Department will revise the last sentence in NDAC Subdivision 33-10-23-08(3)(a) to state “The frequency of these inspections shall be performed at intervals not to exceed 12 months. Records shall be maintained for a period of 5 years.”

IV.pp. Comment

c. Part four- Standard procedures for testing for radioactivity are not established. Procedures for testing radioactivity at site generated are not prescribed.” (Dakota Resource Council)

IV.pp. Response

Refer to Response IV.a.

IV.qq. Comment

“Proposed NDAC § 33-10-23-08(3) requires an inspection schedule and procedure for assessing the condition of each tank containing TENORM. The "frequency of these inspections must be determined based on the type of TENORM being stored..." What does NDDH mean by "type" of TENORM being stored? The type of TENORM material (e.g. scale) or the type of contaminated equipment (e.g. separator)? Does this section just pertain to tanks containing TENORM at transfer and disposal facilities, or does it pertain to any tank containing TENORM waste (e.g. produced water tanks at a central tank battery)? If it pertains to the latter, this would represent a significant cost increase to the oil and gas industry. Most produced water tanks at a majority of central tank batteries do not require integrity testing, beyond visual inspection. If a mechanical integrity test is being required, these vessels would be more heavily regulated than required by the federal Spill Prevention, Control and Countermeasure Rules. Operational costs at these facilities would be significantly increased due to this requirement.” (ND Petroleum Council)

IV.qq. Response

See Responses IV.n. and IV.oo.

The requirement for inspection applies to all TENORM as the Department has deleted the reference to “the type of TENORM being stored, the tank construction material and the type of erosion or corrosion that may exist.”

IV.rr. Comment

“Proposed § 33-10-23-08(7) requires general licensees to submit quarterly summary reports to NDDH, providing the "type and total quantity by weight in tons..." of each TENORM transferred for disposal. What does NDDH mean by "type" - the type of TENORM material or the type of contaminated equipment? And, is NDDH requiring the weight of TENORM material or the weight of TENORM-contaminated equipment? **(ND Petroleum Council)**

IV.rr. Response

The “type” refers to the physical form of the material being disposed. Examples are filter socks, scale, sludge, tank bottoms, pipe, proppant, filter cake, contaminated equipment, contaminated soils, liquid and mixed.

Weight of material refers to the total weight of all material being disposed.

The Department will add the words “or cubic yards” after the word “tons” and add the wording “Quarterly summary reports shall be maintained for a period of 3 years.” in NDAC Subsection 33-10-23-08(7).

IV.ss. Comment

NDPC is concerned about the requirement for ALL TRANSFERS to be reported to the department. Is transfer defined as "the physical relocation of TENORM within a business' operation or between general or specific licensees?" Moving equipment from one (1) location to another that is TENORM-contaminated will require notification to the department. This will be a significant administrative issue for industry. This could apply to all contaminated pipe, pumps, vessels, filters, scrap metal, wastes, soils, any time any contaminated equipment or material is moved? **(ND Petroleum Council)**

IV.ss. Response

This section only established requirements for materials and equipment being transferred for disposal as waste.

IV.tt. Comment

Commercial distribution and change in legal title to TENORM that does not involve physical movement of those materials should not warrant notification.” **(ND Petroleum Council)**

IV.tt. Response

See Response IV.ss.

IV.uu. Comment

“May be worth clarifying. Date stored could be a reference to when a specific licensee receives the material from the generator or it could be the date that the label was first put on the container and the first time material was placed in it. Or it could be the time when it became full and was ready for final transport and disposal.” **(Secure Energy Services)**

IV.uu. Response

The licensee is required to maintain a label on each container including documentation of all materials placed in the container from the time the container is placed into service until the material is transferred for disposal.

IV.vv. Comment

“Oil and gas operators like clarity. We would recommend annual, documented TENORM surveys to include visual inspections for tank integrity with records kept on file at each facility. It may also be prudent to dictate a 3- or 5-year requirement for emptying tank contents at which time a complete tank inspection could be performed. Who is qualified to do these inspections? Do operators have that expertise? A qualified third party inspector would add an additional layer of protection for the public and environment. A sample survey and inspection form could be provided as a resource to licensees.” **(Secure Energy Services)**

IV.vv. Response

See Response IV.oo.

The tank owner has the responsibility to assure that a properly trained and qualified individual performs the tank inspection as required. The decision to empty the tank for inspection falls to the tank owner as described in their standard operating procedures.

IV.wv. Comment

“Most sites do not have physical site addresses and rely on the latitude/longitude and site name for clearly establishing the location. The new rules should explicitly make allowances for the absence of a physical address. Many sites will not have a hard phone line to them and some clarity should be added as to the expected telephone number.” **(Secure Energy Services)**

IV.wv. Response

Latitude/longitude is acceptable as an address. A licensee contact phone number is required.

IV.xx. Comment

“See above: Establishing the weight in tons is not feasible in the field as there is no ready access to weigh scales. It is realistic to document the yardage of material and number of and type of containers.” **(Secure Energy Services)**

IV.xx. Response

The quarterly TENORM transport report allows the licensee to report either total weight or total cubic yards. The report form is available on the Department website. The Department will add the words “or cubic yards” after the word “tons” in NDAC Subdivision 33-10-23-08(4)(e).

IV.yy. Comment

“Many private (non-commercial) saltwater disposals are unmanned so obtaining a signature from the licensee every time is impractical. If a representative of the licensee is not available, the transporter could provide the name and contact information of the licensee’s representative who requested the transport and disposal of the TENORM impacted waste.” **(Secure Energy Services)**

IV.yy. Response

The Department must have signatures to accurately track these materials for proper handling from generation to disposal.

IV.zz. Comment

“At final disposal we are typically charged by yardage and not by tons. Tons can be approximated at final disposal but total yards by each licensee or generator is the information we can collect due to the limited availability of scales. **(Secure Energy Services)**

IV.zz. Response

See Response IV.xx.

IV.aaa. Comment

“Recommendation to simplify the entire process:

1. Obtain a list of all NDIC approved SWDs
2. Require each licensed SWD to initially report their designated, licensed TENORM transporter and disposal provider. If the licensed SWD ever changes their designated provider they could complete a simple form with the change in provider date to the department.
3. Rely on the few TENORM service providers to do all reporting on their customers and simply audit for any omissions. This would eliminate the need to audit submissions from 400+ SWD’s every quarter and instead.” **(Secure Energy Services)**

IV.aaa. Response

These wells are Class II Underground Injection Control (UIC) wells. These wells are granted a general license under the proposed TENORM rules. Class II UIC wells are required to notify the Department within 60 days of becoming subject to a general license per the proposed TENORM rules. Only those entities subject to a specific license are required to submit quarterly reports per the proposed TENORM rules.

IV.bbb. Comment

“It may be beneficial to designate the required duration for retention of records. Utilization of the NRC Form 540 (Low Level Radioactive Waste Manifest) is strongly encouraged to minimize the creation of additional, new forms that may conflict with other state requirements.” **(Secure Energy Services)**

IV.bbb. Response

The Department agrees and will add a requirement that records be maintained for a period of 5 years.

33-10-23-09 Prohibition - Purposeful Dilution

IV.ccc. Comments

“There is no set procedure for how the Department will allow dilution. Stipulations on the quantity of waste allowed to be diluted and the frequency at which an interested person may dilute loads is critical for proper management. Limits on the level or intensity of the radioactive load must also bear weight in determining if a load is permitted for dilution.” (**Dakota Resource Council**)

“NDPC believes this rule needs greater clarification and should include exceptions for actions that may unintentionally result in dilution as a part of normal operations, such as the addition of a bulking agent for transport stabilization and for final disposal.” (**ND Petroleum Council**)

“We believe this rule needs greater clarification and should include exceptions for actions that may unintentionally result in dilution as a part of normal operations, such as the addition of bulking agent for transport stabilization and for final disposal.” (**R360 Environmental Solutions**)

“We are in full agreement with the department’s position prohibiting dilution. How will this be monitored and enforced?

Suggest using a couple of simple examples that help operators/licensees better understand what dilution activities are expressly prohibited (vs. like-material downblending).” (**Secure Energy Services**)

IV.ccc. Response

TENORM waste shall not be diluted for the sole purpose of making the waste exempt from the disposal requirements without prior Department approval. The Department will evaluate potential risks to health and safety of workers, members of the public and the environment before any request for dilution will be approved.

33-10-23-10 General License

IV.ddd. Comments

“The 60-day notification requirement to obtain coverage under the general license is overly burdensome and inconsistent with other regulation.....a more appropriate standard would be to require individuals and entities to provide an annual notification with a list of facilities that are eligible for coverage...” (**Continental Resources**)

IV.ddd. Response

The Department will work with the NDIC to maintain a list of facilities subject to the 60 day requirement.

IV.eee. Comment

“a. Part one- Information similar to what is required to apply for a specific license should be included in the application process. (**Dakota Resource Council**)

IV.eee. Response

No application is required for a general license.

IV.fff. Comment

b. Part two- Proposed rules do not provide standards for which employees are informed of the radioactive nature of materials they are working with, or sets standards for personal protective equipment, monitoring devices, and training. As stated in the review of worker safety protocols, it is necessary to provide an outline for worker safety programs, education and continuing education. Also, including an emergency action plan and public education programs would help companies proactively address exposure concerns.” **(Dakota Resource Council)**

IV.fff. Response

These concerns are already addressed in Chapter 33-10-10.1 of the existing North Dakota Radiological Health Rules in addition to regulations administered by the Occupational Safety and Health Administration (OSHA).

IV.ggg. Comment

“Proposed § 33-10-23-10(2) prohibits general licensees from performing anything beyond "routine maintenance" on equipment, facilities, and land owned or controlled by the general licensee. NDDH does not clarify what type of equipment, facilities or land is included in the prohibition (suspected contamination or proven contamination?). NDDH goes on to define what is not routine maintenance ("[maintenance that provides a pathway for exposure different from that found in periodic maintenance operations and that increases the potential for additional exposure)", please provide specific examples. Decontamination of equipment can only be performed by persons specifically licensed by the NDDH . How does this apply to construction activities that currently clean/flush tanks and treaters on location will this be considered "routine maintenance?" If only licensed contractors can clean vessels and tanks, we will be required to develop a testing program to determine TENORM presence/absence prior to cleaning of equipment. Additionally, it is unclear what protocols we will need to follow for worker exposure. We suggest adding a definition for "routine maintenance" to clarify the State's intent to ensure that all operators are handling this in a consistent manner. We note that a reference to "routine maintenance" is also included in Section 33-10-23- 11.2.” **(ND Petroleum Council)**

IV.ggg. Response

Treaters are known to be TENORM contaminated vessels that require decontamination by specifically licensed contractors/workers. Any equipment that is to be decontaminated may be surveyed with the proper survey instrument to determine if that equipment is contaminated above background levels. Routine maintenance is that maintenance which results in the incidental removal of contamination. Periodic cleaning and flushing of tanks and treaters on location would be considered "routine maintenance”.

In the interest of maintaining worker health and safety, it is necessary for those persons performing routine maintenance to assure that exposures are As Low As Reasonably Achievable (ALARA). This would require those persons to perform an assessment of the levels of TENORM present before beginning work.

IV.hhh. Comment

“Does not transport of and disposal of TENORM require a specific license? A general license should not apply to these activities. Additional distinction and/or clarification between general and specific licenses is important.” **(Secure Energy Services)**

IV.hhh. Response

For clarification of transportation requirements of TENORM, the Department will include NDAC Subsection 33-10-23-11(5) “A specific license is required to transport TENORM upon public roadways.”

IV.iii. Comment

“Tanks and piping that are being maintained or replaced will routinely (not the exception) be TENORM-impacted. Maintenance, cleaning, and decontamination should only be performed by service providers with a specific license. Anyone else will not understand the relevant issues nor have the experienced personnel who can conduct surveys, pull samples and complete analysis, properly label impacted equipment/tanks, ensure proper containment, transport and disposal, and safeguard the site from contamination from improper management and/or ingress/egress.” **(Secure Energy Services)**

IV.iii. Response

See Response IV.o. A specific license is required to decontaminate equipment or land not exempted under the provisions in NDAC Section 33-10-23-04 per Subsection 33-10-23-11(2) of the proposed rules.

IV.jjj. Comment

“It should be clearly stipulated in the rules that those with a general license may not store TENORM-impacted material or debris for others including general licensees.” **(Secure Energy Services)**

IV.jjj. Response

NDAC Subsection 33-10-23-11(3) of the proposed rules states “A specific license is required to receive TENORM from other persons for storage.”

The Department will remove the words “treatment or disposal unless otherwise authorized in writing by the department” in NDAC Subsection 33-10-23-11(3).

IV.kkk. Comment

“While entities required to obtain a specific license are identified in 33-10-23-11, it is less clear who would need to, or be subject to the general license requirements of 33-10-23-10. Are people or entities handling or possessing TENORM materials in excess of 5pCi/g (or as I propose 15 pCi/g), subject to the licensing requirements? In other words, how does one know when they become subject to the general license? Are contractors responding to a spill subject to any licensing? It seems to me that every operator, used equipment dealer, oil company, recycler, etc. will need a license of one form or another.” **(IHD)**

IV.kkk. Response

NDAC Section 33-10-23-11 of the proposed rules has been changed to reflect the following for clarification:

- 3. A specific license is required to receive TENORM from other persons for storage.*
- 4. A specific license is required to possess or use TENORM for the purposes of processing, treatment or disposal.*
- 5. A specific license is required to transport TENORM upon public roadways.*

Persons who receive, possess, use, process, transfer, distribute, or dispose of concentrations of TENORM equal to or greater than 5.0 pCi/g excluding natural background are subject to general or specific licensing requirements.

33-10-23-11 Specific Licenses

IV.iii. Comment

a. Given the exemptions from 33-10-23-04, it is unclear if standards for specific licenses will apply to oil and gas waste handlers. **(Dakota Resource Council)**

IV.iii. Response

NDAC Section 33-10-23-11 of the proposed rules applies to all persons handling TENORM in concentrations equal to or greater than 5 pCi/g. This includes oil and gas waste handlers.

IV.mmm. Comment

b. Part three- Specifics on what would allow for an “otherwise authorization to store, treat or dispose of TENORM” is not detailed.” **(Dakota Resource Council)**

IV.mmm. Response

Each request for a specific licensing exemption will be reviewed by the Department. This review would include review of health and safety related procedures to ensure exposures to workers and members of the public are kept As Low As Reasonably Achievable (ALARA).

33-10-23-12 Application and Background Review for Specific Licenses

IV.nnn. Comments

“Chapter 33-10-23-12 - with regard to review and approval of general and specific licenses: will general and specific license applicants have an opportunity for a hearing? Will the final decision be made by a committee?” **(Williston page 10)**

IV.nnn. Response

General licenses are effective pursuant to rule, without the filing of an application, under NDCC Section 23-20.1-01(4). Specific licenses require an application under NDCC Section 23-20.1-01(10). NDCC Section 23-20.1-04.3 provides procedures, including the opportunity for a public hearing, for the licensing and regulation of the processing, generation, or disposal of source material, byproduct material, or other radioactive material occurring naturally or produced artificially. The Department determines whether a license will be issued.

IV.ooo. Comment

“A procedure for public input should be written into licensing procedures.” (**Dakota Resource Council**)

IV.ooo. Response

See Response IV.nnn.

IV.ppp. Comment

“Does the Department propose a formal process by which applications are reviewed, and does it propose a method of recourse should the need arise? Does the Department view its licensing as preeminent to current and future local statutes?” (**R360 Environmental Solutions**)

IV.ppp. Response

Specific license applications undergo Department review prior to issuing a license. This process consists of a review of all application materials submitted, including the applicant’s operating and emergency procedures to assure compliance with the North Dakota Radiological Health Rules to protect the health and safety of workers, members of the public and the environment. Applications for a specific license will be approved if the application meets the requirements in existing rule NDAC Section 33-10-03.1[10 CFR 30.33].

See Response IV.nnn.

33-10-23-13 Requirements for the Issuance of Specific Licenses

IV.qqq. Comment

“a. Part one- The “Will be” language forces the Department to issue a permit if conditions are met. Changing to “May be” allows for greater discretion in denying permits for public health and safety reasons.

b. Part two- The “Will be” language forces the NDDH to issue a permit if conditions are met. Changing to “May be” allows for greater discretion in denying permits for public health and safety reasons.” (**Dakota Resource Council**)

IV.qqq. Response

A specific license application will be approved if the application satisfies all of the requirements of the North Dakota Radiological Health Rules.

33-10-23-14 Safety Criteria for Consumer and Retail Products

No Comments

33-10-23-15 Table of Doses

No Comments

33-10-23-16 Issuance of Specific Licenses

No Comments

33-10-23-17 Conditions of Specific Licenses

IV.rrr. Comment

“a. Part one, subsection D- Licensee should be required to notify the Department before a transfer occurs. **(Dakota Resource Council)**

IV.rrr. Response

NDAC Subdivision 33-10-23-17(1)(b) of the proposed rules states that licensees shall not transfer control of a license to any person unless the Department, after securing full information, finds that the transfer is in accordance with the NDCC, and shall give its consent in writing. In other words, the control of licenses cannot be transferred to any person until the Department has received full information regarding the transfer and has provided written consent. This requirement also exists in NDAC Section 33-10-03.1-01, which adopts by reference 10 CFR 30.34, of the current North Dakota Radiological Health Rules.

IV.sss. Comment

“b. Part one, subsection E- Requiring full bond amount to be held in an account separate from other company money is necessary if and when a company files bankruptcy so remediation and decontamination does not become a burden of the tax payers. Ensure 33-10-23-25 is applicable and held in all cases.” **(Dakota Resource Council)**

IV.ttt. Response

Financial assurance regulations are set forth in NDAC Section 33-10-03.1 [10 CFR 30.35]. Any required bond is held by the State of North Dakota until the property is released by the Department for unrestricted access.

IV.uuu. Comment

“c. Part 1, subsection G- Two years of abandonment or use is too long for a facility with radioactive waste to go without commencing final decontamination and reclamation.” **(Dakota Resource Council)**

IV.uuu. Response

See Response IV.dd.

IV.vvv. Comment

“d. Part one, subsection H- Placement of temporary storage, quantity of waste to be stored, monitoring equipment and protocols, and duration of site to be deemed temporary are all standards the Department needs to establish. DRC is not in favor of temporary storage sites due to the radioactive nature of materials addressed. Ensuring public safety requires expedient disposal to a permanent facility.” **(Dakota Resource Council)**

IV.vvv. Response

Licensed activities performed at temporary jobsites are allowed until the project is completed. Temporary storage still has requirements to ensure that it is protective of human health and the environment.

IV.www. Comment

“e. Part two- Adequate control measures are not articulated and no requirements for parameters in intensity of radioactivity is required for transfer.” (Dakota Resource Council)

IV.www. Response

These control measures and requirements are addressed in NDAC Section 33-10-23-13 of the proposed rules.

33-10-23-18 Expiration and Termination of Specific Licenses

IV.xxx. Comment

“a. Part four- “To the extent practicable” gives leeway for licensees in deeming what is acceptable radiation left on a site. (Dakota Resource Council)

IV.xxx. Response

The Department will not release sites for unrestricted use until the licensee has met the requirements in NDAC Chapter 33-10-04.2 [10 CFR 20.1402]. A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem per year. Critical group means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

Under NDAC Subdivision 33-10-23-18(4)(b) of the proposed rules, the Department confirms decontamination survey findings prior to license termination.

IV.yyy. Comment

b. Part five- Quality assurance, quality control protocol and standards are not written out. No specific requirements for standardizing monitoring are written.” (Dakota Resource Council)

IV.yyy. Response

Quality assurance and quality control protocol and standards are addressed during review of the license application due to site specifics and the variable nature of what is being monitored.

Each specific license continues in effect, beyond the expiration date if necessary, with respect to possession of byproduct material until the Department notifies the licensee in writing that the license is terminated. During this time, the licensee shall—

- (1) Limit actions involving byproduct material to those related to decommissioning; and*
- (2) Continue to control entry to restricted areas until they are suitable for release in accordance with NRC requirements. These requirements are found in existing rule. (NDAC Subsection 33-10-03.1[10 CFR 30.36(c)].*

For monitoring requirements refer to NDAC Subsection 33-10-23-18(4) of the proposed rules.

33-10-23-19 Renewal of Specific Licenses

No Comments

33-10-23-20 Amendment of Specific Licenses at Request of Licensee

No Comments

33-10-23-21 Department Action on Applications to Renew and Amend Specific Licenses

No Comments

33-10-23-22 Modification and Revocation of Specific Licenses

No Comments

33-10-23-23 Record Keeping Requirements for Site Reclamation

IV.zzz. Comment

“a. All records should be publicly available.” **(Dakota Resource Council)**

IV.zzz. Response

Records in the Department’s possession are subject to North Dakota’s open records law and can be accessed by contacting the Department.

IV.aaaa. Comment

“b. Part one- No records on spills should be limited.” **(Dakota Resource Council)**

IV.aaaa. Response

Records of on-site spills are maintained by the licensee as a part of their decommissioning plan. If no residual contamination remains after clean-up activities have been performed, records are not required to be maintained.

33-10-23-24 Reciprocal Recognition of Specific Licenses

No Comments

33-10-23-25 Financial Assurance Arrangements

IV.bbbb. Comment

“As we've been assisting clients through regulatory processes, including zoning, for E&P facilities, some of whom may now be required to obtain a general or specific license, we've become aware that operators are at times having to provide multiple reclamation bonds across: a

reclamation bond for the NDIC (I've seen as high as \$500,000), a reclamation bond for zoning (I've seen as high as \$125,000), and now, a bond for TENORM licensing "to ensure the protection of the public health and safety and the environment in the event of abandonment."). This multitude of bonds seems redundant and excessive - we would like to see a single financial assurance requirement that satisfies all regulatory stakeholders." **(Williston page 10)**

IV.bbbb. Response

Bonding by the Department of Mineral Resources is limited to land reclamation. The financial assurance requirement in the North Dakota Radiological Health Rules addresses radiological decontamination and decommissioning of the facility prior to reclamation. Financial assurance requirements are identified in NDAC Chapter 33-10-03.1, which adopts by reference 10 CFR 30.35 and makes it applicable to TENORM.

IV.cccc. Comment

"a. Part two- No procedure is established to determine what a sufficient bond amount is. It is not prescribed as a specific duty of an officer of the Department." **(Dakota Resource Council)**

IV.cccc. Response

See Response IV.bbbb.

IV.dddd. Comment

"b. Part four- Standards for appropriate detectors, frequency of monitoring and calibration should be established in rulemakings." **(Dakota Resource Council)**

IV.dddd. Response

Frequency of monitoring, surveys, and instrument calibrations are part of the license application review process and are included in NDAC Chapter 33-10-04.2. [20 CFR Subpart F].

IV.eeee. Comment

"c. A procedure for non-compliance needs to be written in rulemaking." **(Dakota Resource Council)**

IV.eeee. Response

The current enforcement policy of the Department provides for enforcement actions that begin with a "Letter of Apparent Noncompliance" which requires the licensee to respond within 30 days explaining the reasons for the noncompliance and how it has or will be corrected. The Department may issue a "Notice of Violation" depending on the severity of the alleged violation. This also provides the licensee with the opportunity to explain reasons for the noncompliance. Finally, the Department can follow-up with formal enforcement action, which usually involves a financial penalty and/or other sanctions such as license termination. Also see Response II.i.

IV.ffff. Comment

"d. There is no procedure for licensees failing to comply with acceptable surface contamination levels." **(Dakota Resource Council)**

IV.ffff. Response
See Response IV.eeee.

IV.gggg. Comment

“Each licensee or applicant for specific licensure shall post with the department financial assurance within ninety (90) days of the effective date of the rule. This is rare to request for specific licensees that only work at temporary jobsites. This infers that decontamination companies will have the ability to decontaminate at their facilities, typically referred to as a fixed facility. Will a difference in licensing fee distinguish between temporary jobsite authority and a fixed facility?” **(ND Petroleum Council)**

IV.gggg. Response

The same licensing fee applies to both. Financial assurance requirements are determined from the amount of licensed material possessed by the licensee at any one time. Activities performed at temporary jobsites do not result in the licensee possessing licensed material. This material remains under the control of the client.

33-10-23-26 Acceptable Surface Contamination Levels for TENORM

IV.hhhh. Comment

“a. Part two- Standards for appropriate detectors, frequency of monitoring and calibration should be established in rulemakings. **(Dakota Resource Council)**”

IV.hhhh. Response

See Response IV.dddd.

IV.iiii. Comment

b. There is no set procedure for licensees failing to comply with acceptable surface contamination levels. Procedures for noncompliance need to be written in rulemaking. A scale of financial penalties and restrictions of operations and revocation of operating permits would provide greater incentive for companies to comply.” **(Dakota Resource Council)**

IV.iiii. Response

See Response II.i. and Response IV.eeee.

33-10-23-27 Specific Licenses – Radiation Protection Program Required

IV.jjjj. Comment

“Radiation Protection Program

Please provide further explanation of NDAC 33-10-23-27. There is some confusion as to whether these requirements pertain to specific licensees (NDAC 33-10-23-11) or general licensees (NDAC 33-10-23-10), or both. If the NDDH intends to apply this rule to general licensees, which most of the oil and gas, exploration and production industry would fall under, the requirement for a Radiation Safety Officer ("RSO") would present several challenges. Exploration and Production companies do not currently employ RSOs, and if a company does have a RSO on staff, they are most likely not located within North Dakota. There are also a

limited number of individuals who can be considered qualified RSOs located in North Dakota, let alone located within the United States. This presents a significant challenge to find this type of personnel. Costs to hire a RSO with appropriate qualifications and training are high.” (ND Petroleum Council)

IV.jjjj. Response

This section applies only to specific licensees as indicated in the title.

33-10-23-28 Radiation Safety Officer – Qualifications

IV.kkkk. Comments

“a. Does this paragraph only apply to specific licensees or all licensees?” (Williston page 11)

IV.kkkk. Response

The paragraph applies only to specific licensees.

IV.llll. Comment

“b. Paragraph 1.a.1: Forty hours of classroom training - no issues there;

c. Paragraph 1.a.2: One year of on the job training under an authorized user, radiation safety officer.

i. One year of on-the-job training seems excessive if the Department will be soliciting Radioactive Materials Licenses from numerous operators of existing E&P facilities who do not currently have an RSO on staff and will not be allowed to contract with a third party RSO.

ii. How is "authorized user" defined?” (Williston page 11)

IV.llll. Response

The Department will remove the one year of on-the-job training requirement.

The Department concurs with removing the one year of on-the-job training requirement for the radiation safety officer and will remove Paragraph (2) of NDAC Subdivision 33-10-23-28(1)(a).

An authorized user is a person authorized to handle licensed material.

IV.mmmm. Comment

“I believe Paragraph (2) of 33-10-23-28 has a typo: "on the". In this same paragraph a requirement for apprenticeship is being set up. Since no one in the solid waste business in North Dakota would have had experience disposing of wastes over 5 pCi/g, how do you propose that an entity meet this requirement? I think it would be appropriate to Grandfather in those entities with Radiation Safety Officers who had worked at the subject facility for at least one year and accept the certification of such an RSO who had taken and passed the RSO 40 hour course from other accredited institutions and/or instructors.” (IHD)

IV.mmmm. Response

See Response IV.llll.

IV.nnnn. Comment

“(2) One year of on-the-job training under the supervision of a qualified individual (authorized user, radiation safety officer) that includes supervised experience performing the task(s) authorized ~~on the~~ during routine and emergency situations.” (ND Petroleum Council)

IV.nnnn. Response

See Response IV.IIII.

IV.oooo. Comment

“Paragraph (2) of 33-10-23-28 has a typo: "on the". In this same paragraph a requirement for apprenticeship is being set up. Since no one in the solid waste business in North Dakota would have had experience disposing of wastes over 5 pCi/g, how do you propose that an entity meet this requirement? Propose a clause to grandfather Radiation Safety Officers who have worked at a facility for at least one year and accept the certification of such an RSO who had taken and passed the RSO 40 hour course from other accredited institutions and/or instructors.” (ND Petroleum Council)

IV.oooo. Response

See Response IV.IIII.

IV.pppp. Comment

There were a number of comments relating to House Bill 1113.

IV.pppp. Response

Comments related to House Bill 1113 are not being addressed because they are beyond the scope of the rulemaking.

IV.qqqq. Comment

“However, the proposed rule for North Dakota TENORM wastes would establish a much higher precedent for the acceptable modeled doses to a member of the public and/or untrained radiological workers of 100 millirem (mrem)/year. Lower regulatory limits were allowed for exempting radioactive wastes regulated by the US Nuclear Regulatory Commission or Agreement States as outlined below.

1. US Nuclear Regulatory Commission (NRC) 20 CFR 20.2002
Exemption of LLW for Alternate Disposal Approval, excerpt from
SECY-06-0056, March 2006.

"Licensee[Waste Generator] must demonstrate that potential dose to public and workers are less than "a few millirem " [Most examples implemented are at a 1 mrem/year model dose limit].

2. US Nuclear Regulatory Commission (NRC) 10CFR 61.41 Protection of the general public from releases of radioactivity (this pertains to licensed and monitored low-level radioactive waste disposal facilities in the United States).

"Concentrations of radioactive material which may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any

member of the public. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable."

3. The State of Utah, in its implementation of 10 CFR 61:41 for licensed, low level radioactive waste facilities, adopted a more stringent standard of 4mrem/year for a groundwater dose pathway for 500 years.

4. Tennessee Department of Radiological Health (TDRH), Bulk Survey for Release Licensing Guidance - Landfill Analysis Requirements, March 2010

"For each radionuclide and concentration requested, perform and submit an analysis verifying that the dose, to the maximally exposed individual, will not exceed 1 millirem per year (mrem/yr) total effective dose equivalent (TEDE). A separate analysis shall be submitted for each operation identified above and shall include the delivery driver, landfill workers affected and post landfill use, as outlined below, using the most current RESRAD computer code. For each analysis, use the entire useable disposal area of the landfill beginning when the conditional disposal program started. "

4 International Atomic Energy Agency (IAEA) Application of the Concepts of Exclusion, Exemption and Clearance, RS-G-1.7, August 2004

" 3.4. The primary radiological basis for establishing values of activity concentration for the exemption of bulk amounts [more than 1 ton] of material and for clearance is that the effective doses to individuals should be of the order of 10 uSv [1 mrem] or less in a year"

Energy Solutions recommends that North Dakota regulation should re-evaluate the disposal concentration limits, with the new limits being based upon <1 mrem/year RESRAD and TSD-Dose modeling. The risk based models should examine both non-radworker landfill worker/disposal dose pathways and also dose pathways to affected members of the public consistent with NRC, Agreement State, and IAEA International protocols. The current proposition to establish nuclide disposal concentrations limits derived from a 100 mrem/year modeling is 100 times higher than all accepted nuclear exemption regulation and should be reconsidered prior to promulgation." (**Energy Solutions**)

IV.qqqq. Response

Within North Dakota Radiological Health Rules Chapter 33-10-04.2 "Standards for Protection Against Radiation," 10 CFR 20.2002 is a general provision that allows licensees or applicants to obtain approval of alternative "low-level" waste (LLW) disposal procedures. If approved, these alternatives allow disposal of what is frequently referred to as "low-activity" waste (LAW) in a facility other than a LLW disposal facility licensed under 10 CFR Part 61. Although the United States has no official legal definition for the term, the National Research Council (NRC) of the National Academies has defined LAW as including all types of conventional low-level radioactive waste produced by generators in the nuclear fuel cycle, discrete sources, slightly contaminated solid materials, uranium and thorium ore processing wastes, and wastes containing technologically enhanced naturally occurring radioactive materials (TENORM). Thus, LAW is considered to be radioactive waste that may contain radionuclides in concentrations that are sufficiently small to allow the radionuclides to be managed in ways that

do not require all of the radiation protection measures that are needed to manage materials with higher activity levels.

The Department chose to use 100 mrem/yr because this is the public exposure limit permitted by the NRC.

See Response II.a.

IV.rrrr. Comment

“2. The proposed limit for equipment contaminated with TENORM of 100 uR/h seems relatively high, especially when large amounts of this kind of item are handled in one load or stockpiled in one area. No documented basis for this value has been presented and no exposure scenario for this limit was developed in the ANL report. We suggest that you publish the basis for this proposed rule.” **(MH Chew)**

This rule needs clarification. Accepting individual pieces of equipment at < 100 uR/hr can work but truckloads can be problematic. For example, a single joint of TENORM impacted tubing may read less than 100 uR/hr, but a truck load going to landfill could easily read 20x this value. Landfill operators will need more detailed direction to ensure compliance. **(Secure Energy)**

IV.rrrr. Response

Table 4.2-07.1 “Standards for Unrestricted Release for NORM and TENORM” of Chapter 33-10-04.2 of the North Dakota Radiological Health Rules lists the total surface contamination limits for fixed beta-gamma emitters at a maximum of 250 uR/hr at 1 cm from the surface. The Department used a value of 100 uR/hr as a conservative approach.

V. Waste Management – Solid Waste Program Rule Comments

V.a. Comments

Several comments were received regarding siting criteria and the application process, such as:

“First - You propose here the development and operation of a multi site landfill system for the disposal of low level radioactive waste from the oil industry. However you do not have the basic information needed to even start this process.” **(Fargo page 38)**

“According to what I see here, there is no limit. You just make one choice/landfill. As was eluded to earlier, if other states get this stuff, they just come here. They can build a landfill here; they’ll get permitted.” **(Fargo page 57)**

“Raising the allowable radioactive levels of this material will allow it to be dumped in North Dakota landfills that are not suited to handle it...these landfills have been known to leak.” **(C. Coen)**

“If the companies are allowed to dispose of higher levels of radioactive waste, that may not be visible on the surface. However, it may cause pollution to our ground and water systems that will be felt in the future and therefore cause health problems for the residents.” (L. Kimball)

V.a. Response

All proposed landfill sites and horizontal expansions must be screened through a preapplication process intended to avoid sites in sensitive areas as follows:

NDAC 33-20-03.1-01. Preapplication procedures...

- 3. An application may be filed only after approval of the preapplication and a finding by the department, after consultation with the state geologist and state engineer, that the site is geologically and hydrogeologically suitable for further evaluation and consideration.*

Once a site has a preapplication approved, they can begin the process of submitting an application which includes a hydrogeologic investigation among many other items. The application also has to address the location standards. All landfills in the State of North Dakota are required to meet the location standards in the NDAC 33-20-04.1-01. General location standards. Those location standards are:

- 1. No solid waste management facility may be located in areas which result in impacts to human health or environmental resources or in an area which is unsuitable because of reasons of topography, geology, hydrology, or soils.*
- 2. Sites for new, or for lateral expansions of, land treatment units, surface impoundments closed with solid waste in place, municipal waste landfills, industrial waste landfills, and special waste landfills must minimize, control or prevent the movement of waste or waste constituents with geologic conditions and engineered improvements. Sites should be underlain by materials with low permeability to provide a barrier to contaminant migration.*
 - a. The following geographic areas or conditions must be excluded in the consideration of a site:*
 - 1) Where the waste is disposed within an aquifer;*
 - 2) Within a public water supply designated wellhead protection area;*
 - 3) Within a one hundred-year floodplain;*
 - 4) Where geologic or manmade features, including underground mines, may result in differential settlement and failure of a structure or other improvement on the facility;*
 - 5) On the edge of or within channels, ravines, or steep topography whose slope is unstable due to erosion or mass movement;*
 - 6) Within woody draws; or*
 - 7) In areas designated as critical habitats for endangered or threatened species of plant, fish, or wildlife.*
 - b. The following geographic areas or conditions may not be approved by the department as a site unless the applicant demonstrates there are no reasonable alternatives:*

- 1) *Over or immediately adjacent to principal glacial drift aquifers identified by the state engineer;*
- 2) *Closer than one thousand feet [304.8 meters] to a down gradient drinking water supply well;*
- 3) *Closer than two hundred feet ;60.96 meters] horizontally from the ordinary high water elevation of any surface water or wetland;*
- 4) *Within final cuts of surface mines; or*
- 5) *Closer than one thousand feet [304.8 meters] to any state or national park.*

c. The department may establish alternative criteria based on specific site conditions.

- ...
4. *A minimum horizontal separation of twenty-five feet [7.62 meters] must be maintained between new or lateral expansions of solid waste management units and any aboveground or underground pipeline or transmission line. The owner shall designate the location of all such lines and easements.*

If a site has met the location conditions and has a complete application, a draft permit is prepared and put out for a 30-day public comment period. This is the public's opportunity to provide the Department with their input. Once the public comment period is over, the Department will consider all comments and has the option to deny the permit, sign the permit as drafted or modify the permit based on the comments provided.

The preapplication process, location standards and permit application process is designed to ensure that these sites are protective of human health and the environment. The study conducted by ANL modeled existing site conditions at the landfills proposed to take TENORM waste and also assumed the conservative worst case scenarios such as lack of liners, leachate collection systems, etc.

These landfills are located out in western North Dakota because that is where the waste is being generated. Most landfills are located close to the area where they are providing a service for.

V.b. Comment

"I also know that Tervita, has a Blue Buttes landfill that was specifically identified in the Argonne Study that Tervita Blue Buttes waste sites is just outside of the Fort Berthold boundary on the west side is within driving distance of Mandaree, and I understand that there's a drainage area that leads to Mandaree from that area. So I'm concerned about that." (Bismarck page 17)

V.b. Response

The processes used to site, design, and operate landfills in North Dakota have multiple components to prevent release of contaminated surface water.

The first step in the process is a pre-application review by the Department, with consultation by the State Geologist and State Engineer to determine a proposed site is "geologically and hydrogeologically suitable for further evaluation and consideration." Landfills have location standards that prohibit them from being constructed "in areas which result in impacts to human

health or environmental resources or in an area which is unsuitable because of reasons of topography, geology, hydrology, or soils.”

During the permitting of a new landfill, the applicant must demonstrate that the design will “prevent the run-on and runoff of surface waters resulting from a maximum flow of a twenty-five-year, twenty-four-hour storm.”

When the landfill is in operation, the owner or operator is required to inspect run-on and runoff water controls structures at least monthly and after storm events. Once a landfill is closed, there is a thirty (30) year post-closure care period in which groundwater monitoring is continued, ongoing maintenance of the cap to ensure its integrity, storm water controls, etc. NDAC 33-20-04.1-05 states:

- 1. Each owner or operator shall close their facility in a manner that achieves:
 - a. Minimizes the need for further maintenance; and*
 - b. Controls, minimizes, or eliminates any escape of solid waste, constituents, leachate, fugitive emissions, contaminated runoff, or waste decomposition products.**

V.c. Comments

There were several comments related to zoning, such as:

“I question how much the surrounding land is going to be devalued by a radioactive oil waste dump site.” **(Bismarck page 17)**

“Our county government said no to it, our township government recommended the no to the county, our soil conservation district in South McLean - Turtle Lake voted against it, and our county commissioners voted against it. I see this whole thing is an end run to get that dump back and I’m not happy about it.” **(Bismarck page 19)**

“And so where would those landfills be located? And we know historically as Native people the tendency is going to be the place right next door to us, or amongst people of poverty or next to water.” **(Bismarck page 27)**

“My last comment is about local control, that we denied it and we rally together as a county and we denied the waste dump that we did not want and that was at a much lower level than 50. As a county we decided that we did not want it where we lived and we feel as a group that was against it that you’re just going around what we’ve decided and that we’ve already shut this down in our area and we just do it. We were just pushed off to the side like we don’t know anything of what’s going on in our area and I don’t think that’s right.” **(Fargo page 51)**

V.c. Response

The North Dakota Solid Waste Management Rules do not supersede local zoning and the Division does not get involved with local zoning decisions. While the applicant will have to obtain the right to use the property before the facility is established, the applicant provides

information that it has zoning at the time of the application. The Division's permits do not supersede local zoning.

Regarding the proximity of the landfill to homes in the area, the North Dakota Solid Waste Management Rules do not establish setback criteria for homes and believes this is a local issue. The Division is keenly aware of the sensitivity of local residents and has heard similar concerns in the past regarding siting of similar facilities. Again, the Division does not have a direct role in the issues of land use zoning, voting or proximity to residences.

V.d. Comment

“Also no mention was made of the setbacks in the placing of these landfills!” (L. Weisz)

V.d. Response

See Response V.a which includes the exclusion areas and setback distances for specific environmental and cultural features in NDAC 33-20-04.1-01.

V.e. Comments

There were a number of comments regarding landfills that take TENORM waste would become Superfund sites, such as:

“The proposed special waste sites in western ND amount to a plan to turn beautiful western ND into a Superfund site. (Bismarck page 18)

“Second- You start by simply assuming that this waste can be accommodated in already existing industrial landfills. Radioactive waste and chemical or industrial waste are very different and require different disposal techniques. They should not be mixed or disposed of together. The sites suggested are almost all in Williams and McKenzie counties. What happens to these counties when all these sites become superfund cleanup sites as they almost inevitably will? Radioactive waste dumps require special geologic features that will prevent leakage over time. The waste must be confined for a long time. Before any sites are selected or used, there needs to be a full geologic survey of the entire state to determine where the safest places are if any exist.” (Fargo page 39)

V.e. Response

Siting criteria for landfills was covered in Response V.a.

If a site has met the location conditions and has a complete application, a draft permit is prepared and put out for a 30-day public comment period. This is the public's opportunity to provide the Department with their input. Once the public comment period is over, the Department will consider all comments and has the option to deny the permit, sign the permit as drafted or modify the permit based on the comments provided.

The preapplication process, location standards, design standards, operation requirements, closure and post-closure care requirements, groundwater monitoring and corrective action requirements, financial assurance requirements and the entire permit application process is designed to ensure that these sites are protective of human health and the environment instead of

becoming Superfund sites in the future. The study conducted by ANL modeled existing site conditions at the landfills proposed to take TENORM waste and also assumed worst case scenarios such as lack of liners, leachate collection systems, etc.

These landfills are located out in western North Dakota because that is where the waste is being generated. Most landfills are located close to the area where for the waste is being generated.

North Dakota's TENORM waste is currently being disposed of in mixed waste landfill sites in Colorado and other states already. The proposed rules would only allow TENORM waste to be disposed of in landfills that take other wastes related to the drilling such as drill cuttings, etc. or in large volume industrial waste landfills. Disposal in Inert Waste landfills and Municipal Solid Waste landfills is not included in the proposed rules and would be prohibited.

V.f. Comment

“Currently, there are no North Dakota landfills permitted to take TENORM waste at concentrations of 50 pCi/gr. Although the proposed disposal limit of 50 pCi/gr is consistent with some states, there will continue to be a lack of facilities located in North Dakota capable of accepting common oil field wastes, such as used filter socks, that have moderate levels of TENORM contamination. Establishing the disposal limit solely on a scientific study does not give proper consideration to economic or public policy. Considering the well-documented transportation problems within the state related to truck traffic, NDDoH should consider providing additional flexibility for in-state landfills to accept more oilfield wastes by adopting disposal limits and landfill standards similar to California.” (Continental Resources)

V.f. Response

In order for an oilfield special waste landfill to accept TENORM waste at concentrations between 5 and 50 pCi/g, they will have to apply for and receive approval of a major permit modification per NDAC 33-20-02.1-06. Permit modification, suspension, or revocation.

- 4. The following changes at a permitted solid waste management unit or facility require a permit modification:
 - c. A change in the solid waste characteristics;*
 - j. Other changes that could have an adverse affect on the safety, health, or welfare of nearby residents, property owners, or the environment.**

The facility will be required to submit a revised Plan of Operations and Waste Acceptance Plan. Depending on the initially permitted design of the facility, they may be required to submit revised engineering drawings. The facility will also be required to submit a Health and Safety Plan. The Department will then decide if a draft permit may be issued for a 30-day public comment period where the public will have an opportunity to provide comments.

The Department did not take the decision lightly to propose raising the disposal limit for TENORM and commissioned a study by ANL to ensure that raising the limit would still be protective of human health and the environment. The Department is not aware of the factors on which approval was given for a landfill facility in California to dispose of waste up to 1800 total picocuries per gram. Economics and public policy did not factor into the Department's decision as it should be based on the science.

V.g. Comments

Several comments were received regarding the lack of tracking of TENORM waste in the past and how much TENORM waste is being produced each day. Here are some examples:

“What’s the range of picocuries? What’s moderate? What’s acceptable? What’s the lowest you’ve seen? What’s the highest you’ve seen? Are you going to track it and once you track it, is it public knowledge and how do access it?” **(Fargo page 56)**

“One question that’s come up in the past is how much of this kind of waste is generated every day. We heard from varying 10 to 75 tons a day, we’ve heard 200 tons a day from an industry person; that’s a lot of stuff.” **(Fargo page 57)**

“1. The State of North Dakota does not currently know who the generators are **or** how much is being generated! I found this admission astounding. Were I to build a CAFO for my cattle herd, I would have to apply for many different permits from both the state, federal and local government agencies. I would also be given a identification number for my herd. And this is all to track cowpies, which could be burned in a pot belly stove to keep me warm in the winter! You are not tracking radiation pies which everyone at the public meeting in Williston stated as dangerous.” **(L. Weisz)**

V.g. Response

Previously, the Department had no requirement to track TENORM waste. In 2014, the Division of Air Quality – Radiation Control Program implemented tracking of TENORM waste. The Department has been monitoring the various amounts and concentrations of TEMORM waste materials and continues to improve the TENORM waste recording processes. Licensed TENORM waste transporters are required to submit quarterly TENORM transport reports using an established spreadsheet available on the Department’s website. The goal is to track TENORM waste from generation to final disposal. Also see Response IV.b.

The Department has seen a range of less than 5 pCi/g (typically dirt, most drill cuttings, some filter socks, produced water) to over 10,000 pCi/g. Sludges and filter socks have a variable range from low to high for pCi/g. The amount of TENORM in North Dakota did not have a direct bearing on the ANL study or on the proposed rules. Landfills will be limited on the amount and concentration of TENORM waste they can accept. Higher levels or higher tonnages will have to be disposed elsewhere in compliance with the appropriate state rules.

V.h. Comment

“And it’s not clear to me who is required to make the decision. Who is actually certifying what is coming into the landfill. Is it the generator? Or is it the person who owns the landfill who is disposing of it?.... So getting back to the point, who makes the measurements? Who’s responsible for the measurements being correct? And how do you enforce that measurement to make sure that’s it’s actually being made and that you know it’s being made right? That’s the real crux of it.” **(Williston page 5)**

V.h. Response

Each landfill makes the decision on whether or not they are allowed to accept a load of waste. The landfill makes this decision based on their approved Plan of Operations, Waste Acceptance Plan, permit and any analytical results. The landfills also consult with the Department if they are unsure as to whether or not they are permitted to take a particular waste.

The typical process for waste acceptance at an Oilfield Special Waste Landfill and/or Large Volume Industrial Waste landfill is the generator or waste hauler will contact the landfill to see if they can accept the waste. The landfills require preapproval of all incoming waste. The landfill will ask them what type of waste they want to dispose of, the quantity and where it is coming from. Based on the information provided, the landfill will indicate what analysis if any needs to be conducted and who can conduct the analysis. Once the landfill has received the analytical data, they will let the generator or waste hauler know if they are able to take the waste.

V.i. Comment

“How are you now measuring pCi’s and monitoring operators in the oil patch?” **(Bismarck page 18)**

“10. Use of a waste **rejection** screening criteria for a trailer load that is based on a small multiple of background (i.e. "twice background") may be too restrictive, will vary depending on location in the state where the measurement is made, and could result in waste loads being needlessly rejected from landfill disposal. If a load of waste fails to pass waste rejection screening criteria that should not necessarily mean the waste cannot be accepted into the landfill, it should mean that additional sampling and analysis may be needed before a definitive acceptance or rejection decision is made.

...12. The process used to obtain a sample of the waste should be defined. Does each load need to be sampled? Can samples be composited? How many samples are required to characterize a waste shipment? Answers to these questions could have a major effect on the cost of determining waste acceptance.

13. Who is responsible for collecting and analyzing samples and ensuring the sample is accurately analyzed? Is it the waste generator or the landfill operator?

14. How will compliance inspection sampling and analysis be done? It would be useful for waste generators and landfill operators to have a defined enforcement process.” **(MH Chew)**

V.i. Response

Waste acceptance for each individual facility will be addressed during the permitting process. Each facility will be required to submit a waste acceptance plan which will detail which waste streams they intend to accept, how they will characterize the waste, sampling procedures, random load inspections, etc. Specifics for waste acceptance are not addressed in the rules due to changing technologies and site specific criteria. Also see Response IV.a.

V.j. Comment

“So stuff that is highly radioactive that comes in a container where the container’s not broken and it’s put intact into the landfill, that would represent very little danger to the workers and the public. But if that would come in a bunch of loose material that would be pushed around with a

Caterpillar or something it would probably be the most dangerous material you'd have. So there's nothing in the standards that they're really talking about handling the different materials that we would be taking." (**Bismarck page 21**)

V.j. Response

See Response III.q.

V.k. Comment

"Both liquid and solid radioactive oil and gas waste need further evaluation. There should be no exceptions. The comingling of exempt radioactive waste and regulated radioactive waste in landfills poses a significant, additional threat to public health and safety, as does the proper monitoring and disposal of higher-level radioactive waste." (**Dakota Resource Council**)

V.k. Response

See Response I.a. and V.o.

V.l. Comment

"The proposed rule does not include evaluation or disposal of drill stem, drill pipe or downhole equipment. Earthworks encourages the State to evaluate the TENORM levels of all downhole equipment, including drill stem and drill bits. In addition, the disposal of this equipment and all byproducts produced by the re-conditioning, cleaning and grinding of this equipment must be addressed in the proposed rule to ensure the protection of workers and the public.

The proposed rule does not include evaluation of storage tank bottom sludge or byproducts from gas refining separation processes, which are recognized as largely unregulated TENORM material(s). Earthworks encourages the State to evaluate the TENORM levels of these sludge and byproducts at production facilities, as well as drilling facilities, and include methods for their disposal in the proposed rule." (**Earthworks**)

V.l. Response

See Response IV.k.

V.m. Comment

"33-20-01.1-03. Definitions

1. Exclusion of drill cuttings from TENORM is a significant oversight for public safety by the Department and is a decision that should be reconsidered immediately. Drill cutting are known to be radioactive and adding this waste to TENORM waste will change the level of radioactivity in a landfill." (**Dakota Resource Council**)

"The exclusion of drill cuttings from the TENORM rule was addressed by the Department of Health (DoH) at their public meeting in Williston, North Dakota in January 2015. The DoH explained their reasoning to exclude drill cuttings was because adding drill cuttings to the rule would mean that soil excavated from house foundations would also need to be identified as TENORM. Earthworks encourages the State to evaluate and articulate the differences between these activities, including depth and chemical differences. We believe that such an evaluation will show that the State should adhere to EPA's definition of TENORM with regard to drill cuttings.

Very little is known about the levels of TENORM found in drill cuttings or their rate of degradation. In addition, minimal information is available about the radioactive daughter products, granddaughter products and leads that occur through the TENORM decay process. Data is needed to determine the amount of TENORM that will occur in the breakdown products as the drill cuttings are brought to surface through the drilling process and then buried and disposed of.” **(Earthworks)**

V.m. Response

The definition of TENORM is found in NDAC 33-10-23-03. Definitions. and says:

15. *“Technologically enhanced naturally occurring radioactive material (TENORM)” means naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices. TENORM does not include background radiation or the natural radioactivity of rocks or soils. TENORM does not include “source material” and “byproduct material” as both are defined in the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011 et seq.] and relevant regulations implemented by the United States nuclear regulatory commission.*

Drill cuttings have not been concentrated by human activity, not meeting the definition of TENORM listed above. The Department’s experience is that such waste only contains low levels of NORM (naturally occurring radioactive material) and the waste would not be regulated as TENORM under the proposed rules. Drill cuttings are regulated as special waste as defined in NDCC 23-29-03(16) and subject to those requirements. The Department has not observed elevated levels of NORM in drill cuttings. Such waste does not normally trigger radiation detectors at specific disposal sites that have already taken hundreds of thousands of tons of such waste.

V.n. Comment

“The NDDOH should confirm whether "spent filter socks" from oilfield waste filtration will be an acceptable waste stream according to the disposal facility's permit. Currently, acceptable wastes are listed in the Operations Plan included as part of the facility application, but are not specifically referenced within the issued permit for the site. By including "spent filter socks" as an acceptable waste stream, it can be expected that the proper disposal of this waste would increase. In addition, further clarification is requested on whether filter socks under the 50 picocurie per gram level require segregation and independent analysis, or if incorporation with solids is acceptable practice.” **(ND Petroleum Council)**

V.n. Response

As part of the current permitting process, landfills are required to have a detailed waste acceptance plan as part of their application. The waste acceptance plan details waste characterization procedures, random load inspection, and random load testing. Specific waste streams that are suspect TENORM are discussed in the waste acceptance plan. TENORM waste generators and transporters will require licensing from the Department and blending or dilution of TENORM waste will be addressed in the licensing process.

Spent filter socks may be considered an acceptable waste stream for a facility to accept if they are listed in a facility’s waste acceptance plan and they are below the proposed disposal limit of

50 pCi/g limit for Radium 226 + Radium 228. Spent filter socks should be segregated and independently analyzed to determine if they are below the disposal limit, they should not be mixed with other solids. The waste acceptance plan is listed in the facility's permit and is approved at the time the permit is signed unless revisions to the waste acceptance plan are required by the permit.

V.o. Comment

“So what are we going to do in terms of dealing with radioactive liquid waste?” **(Bismarck page 33)**

V.o. Response

The Department addresses liquid waste issues at special waste landfills through the application process and permit conditions. Current special waste landfill permits prohibit disposal of free liquids in the landfill. If a facility wishes to receive liquid wastes, the waste must be solidified prior to disposal and the process will be described in the solid waste permit.

Produced water is a solid waste in North Dakota, but is not TENORM. Also, see Response I.a.

V.p. Comments

There were a number of comments regarding the amount of TENORM waste each landfill could accept in a year, such as:

“One thing with this regulation, it says that each landfill cannot exceed 25 thousand tons per year. That doesn't take long at those rates to hit some of these limits. It continues there's a monthly limit of how much can go into one, but it also gives you a grants of wavier right in there....So the limit per month on each one of these sites is 3000 tons, unless larger amounts in one month resulting from special cleanup projects are preapproved by the department. So there's a loophole right there, they come ask you and they say yea, and then they can do whatever they want. I don't see any limit on that.” **(Fargo page 57)**

“It is unclear how the 25,00 tons per year or 3,000 tons per month quantity limit for TENORM waste will be monitored by landfills and communicated to the regulated community for disposal option decision-making.” **(Continental Resources)**

“One area of consideration in development of the final rule would be an increase to the annual volume restriction of 25,000 tons at any one approved disposal locations. The demand for disposal may be supported currently by this volume and the anticipated landfills that will seek permit modifications and ultimately be approved. Future demands resulting from increased development and operation will likely increase this demand. The rule allows for a variance to accommodate a large volume project but does not provide for increased and or future demands for this disposal. Resultant could be increased request to the Department for annual limit variances and/or increases in improper disposal. These issues could create a situation where the rule needs amendment for volume changes. Determining the required volume of future disposal is difficult but an increase volume initially will delay the aforementioned issues.” **(Gibsons)**

“Lastly, we are concerned that the 25,000 tons per year limit on TENORM waste disposal at the approved special waste landfills may not provide North Dakota special waste facilities with enough capacity to dispose of all of the TENORM waste generated in North Dakota. This could create a situation similar to right now where some will look to save money through illegally disposal of the TENORM waste.” **(McKenzie County)**

“Often measurements of waste made at the point of generation are based on estimates, and will differ from measurements made with the use scales found at disposal facilities. We suggest language be added to both this section and 33-10-23-08.7-8 that recognized the Department's anticipation of incongruent manifested weights.” **(ND Petroleum Council)**

Section 33-20-11-05: Reporting, related to section 33-10-23-08.7-8

Often measurements of waste made at the point of generation are based on estimates, and will differ from measurements made with the use scales found at disposal facilities. We suggest language be added to both rules that recognizes the Departments anticipation of incongruent manifested weights.” **(R360)**

V.p. Response

In 1991 the state legislature enacted NDCC 23-01-22, to require facilities that accept more than 25,000 tons per year of hazardous waste, industrial waste, nuclear waste, or municipal solid waste incinerator ash to have a full time Department facility inspector. The Department decided to limit the volume of TENORM waste, in keeping with the legislature distinction between small volume and large volume facilities that need a full time Department inspector. The Department does not have the authority to promulgate rules that require additional employees to be hired. The volume limits were also modeled after NDAC 33-20-01.1-11, which includes the monthly limit of 3,000 tons, with a possible exception for special circumstances.

The 25,000 tons per year was the amount of waste used by ANL in their study. The resultant 50 pCi/g limit was based on that tonnage. ANL's conclusions state (page 73):

“North Dakota solid waste regulations may be safely modified so that the maximum exposure to any landfill worker does not exceed 100 mrem/yr, to allow TENORM wastes containing an average concentration of less than or equal to 50 pCi/g of total radium (independent of background radium levels) to be disposed of in either Special Waste or Industrial Waste Landfills, based on the following conditions: No more than 25,000 tons of TENORM wastes are disposed of in a single landfill per year.”

In addition, using previous industry stake holder estimates of 70 tons per day total TENORM produced in the state, it would only require one facility to handle all of the TENORM produced. If the total TENORM generated were 200 tons per day, as provided in another industry estimate, then it could be handled by three facilities. There are currently 12 facilities that could be eligible to accept TENORM waste if they decide to seek a permit modification.

The Department believes the limit is adequate to handle the TENORM waste that is between 5 and 50 pCi/g as much of the waste will still end up being transported out of state. If a facility

believes they will receive more than 3,000 tons in any given month, they will need to receive approval from the Department. The facility will not be allowed to exceed the 25,000 tons/year limit. The 25,000 tons/year limit for industrial waste was set to ensure protection of public health and the environment.

The limit will be monitored by the facility and the recorded weights of TENORM waste. The Department accepts the tonnage as measured at the landfill. This is what the landfills report to the Department in their annual report.

V.q. Comments

There were a number of comments regarding previously rejected loads and what will happen with rejected loads in the future, such as:

“Second thing I’d like to know is what happens to the radioactive waste? In 2013, I believe in McKenzie County Landfill, they rejected 1000 loads of oilfield waste that were coming in because they were measuring it, using a Geiger counter or some kind or another. I would like someone from the health department to tell me what happened to those 1000 loads, and I have asked. I would like to know where the radioactive waste from North Dakota has been going for the last five years.” **(Williston page 6)**

“I also heard there’s like a 100 or thousand loads of waste that were rejected from Watford city’s dump. Where did they go? Someone told me that they asked the health department where did those loads go that were rejected because they were too high (radiation levels). The health department has yet said, we don’t know.” **(Bismarck page 19)**

“4. None of the proposed rules address procedures to follow for waste that exceeds the proposed increased levels. The five-day reporting window for landfills to notify the NDDH of rejection of a load creates ambiguity for what happens to the load once it is turned away and where it will be stored until a permanent disposal location is found. Outlining procedures for this process are necessary for accountability.” **(Dakota Resource Council)**

“Although the Solid Waste Department strongly supports the proposed rule changes, it is our belief that rules alone will not improve TENORM waste management in North Dakota. There also needs to be strong enforcement. This past year there were multiple instances where haulers attempted to dump filter socks and other TENORM waste that are not allowed by permit at the McKenzie County Landfill.

These cases were caught by County staff and the haulers were turned away, or required to clean up their dumped waste and take it offsite. For each of these cases a Waste Rejection Report form was completed and sent to the DENR. This form includes information about the company or individual that brought the unacceptable waste to the landfill. NDDH could use these forms to investigate these instances and determine if there are repeat offenders of deliberate intention by some customers to dump these wastes illegally.” **(McKenzie County)**

V.q. Response

Loads that were rejected from landfills in 2013 and before were not required to be reported to the Department and thus were not tracked. After receiving numerous reports from landfills in the western part of the state that they were rejecting loads, the Department developed a waste rejection report form that the haulers were required to submit to the Department within five (5) days of the waste rejection. The Department would then follow up on waste rejection report. In 2014, any waste hauler that had a load rejected was required to send in the waste rejection report form. Not all waste haulers who had a load rejected were sending in the waste rejection report, so in February 2015, the Department changed the waste rejection report to require the landfills to send the waste rejection report to the Department within five (5) days of the waste rejection. The Department has been following up on those waste rejection reports to ensure that the rejected waste is being properly disposed. A permit condition is being added to all landfill permits and waste hauler permits that are new or are being renewed that states the requirements for waste rejection reporting to the Department. A copy of the waste rejection report form can be found at:

www.ndhealth.gov/wm/Publications/Forms/WasteRejectionReport.pdf

V.r. Comment

“7. No penalties are set out in the rule makings. Specific and quantifiable fines and suspension actions must be set out to encourage proper procedures are followed and ensure contamination cleanup does not come at the cost of the taxpayers.” **(Dakota Resource Council)**

V.r. Response

Currently, the administrative penalties prescribed in NDCC Chapter 23-20.1, Ionizing Radiation Development, are up to a maximum \$10,000 per day per violation, and in NDCC Chapter 23-29, Solid Waste Management, are up to a maximum \$1,000 per day per violation. Both of these laws were modified in the 2015 North Dakota legislative session to be up to \$12,500 per day per violation, and will take effect August 1, 2015. Penalty provisions are set by the legislature, not by a state agency in administrative rules. The maximum penalty for a specific violation is not determined until after the Department investigates the circumstances of the apparent violation, and takes into account factors such as: how and why a violation occurred, was there any actual impact to the environment or was it just a paperwork violation, what was the potential for affects to human health, is there a history of previous violations, cooperation by the responsible party in correcting the violation, and was the violation done accidentally, carelessly, or intentionally? While the Department agrees that penalties are a significant tool to encourage and require compliance, we believe that they must be assessed on a case-by-case basis.

V.s. Comment

“Although Earthworks supports the construction and monitoring guidelines for landfills outlined in the report, we encourage the State to require TENORM to be disposed of in a separate area of the landfill, specifically engineered to accept TENORM waste. This would ensure TENORM waste is isolated when there is a need to reinforce containment of the waste, or should any type of down-blending or remediation be undertaken.” **(Earthworks)**

V.s. Response

The Department works with all types of landfills in North Dakota to maintain a maximum open area of exposed waste. Maintaining a maximum open area is preferred specifically for oilfield special waste landfills because it will minimize potential operating problems associated with the production of storm water and leachate (water contaminated by contact with waste). Separate disposal areas would require more open landfill area for a facility; the area designated for current disposal operations and the additional area needed for TENORM disposal. The Department places a high value on keeping the open area in a waste management facility to a minimum; and separate disposal areas goes against this regulatory philosophy.

There is no need to segregate TENORM waste from non-TENORM waste due to the low level of Ra-226 and Ra-228 in the TENORM waste. In addition, commingling of waste and covering TENORM waste with non-TENORM waste is more protective and was assumed in the study and modeling by ANL.

V.t. Comment

“It is a known fact that radiation dust is carried on the land. This report does not even mention the effects in North Dakota winds and completely downplays the effects of inhalation. I ask that the health department require adequate dust suppression with no visible dust emissions and to include dust monitoring.” **(Fargo page 40)**

V.t. Response

The Department understands the concerns related to dust which is a concern at all landfills. The oilfield special waste landfills have a permit condition that states:

“The Permittee shall construct, operate, maintain, and close the waste management units and the facility according to the criteria of law and rule, conditions of this permit, and other reasonable precautions to prevent or minimize, if applicable, any environmental impacts including, but not limited to, fugitive dust emissions, objectionable odors, air toxics and gas emissions, spills, litter and contamination of surface water and groundwater.”

The facility’s Plan of Operation also must include information on how they plan to control dust at the facility and ensure that it does not leave the property. This will apply to all landfills that are proposing to take TENORM waste.

V.u. Comments

“Most of North Dakota is covered with loose glacial till, soil and gravel through which water percolates with ease. Only in the southwest is there any areas of bedrock and these are mostly soft shale, crumbly and water permeable.” **(Fargo page 39)**

“Raising the allowable radioactive levels of this material will allow it to be dumped in North Dakota landfills that are not suited to handle it...these landfills have been known to leak.” **(C. Coen)**

“If the companies are allowed to dispose of higher levels of radioactive waste, that may not be visible on the surface. However, it may cause pollution to our ground and water systems that will be felt in the future and therefore cause health problems for the residents.” (L. Kimball)

V.u. Response

In addition to the siting criteria and Pre-application procedures discussed in Response V.a., landfills in North Dakota must meet design standards with liners and leachate collection systems intended to remove liquids percolating through waste, operational requirements, groundwater monitoring and corrective action requirements, post-closure care requirements, and financial assurance provisions all combined to reduce the amount of liquid in the bottom of a landfill cell, maintain separation between the landfill cell and any potential groundwater receptors, detect any groundwater impacts quickly and correct any issues during the operating and post-closure period.

Facilities must be adequately characterized and monitored to ensure a facility is protective:

33-20-13-02. Groundwater quality monitoring.

1. An owner or operator of a resource recovery unit, a land treatment unit, a surface impoundment, or a landfill, except an inert waste landfill, must incorporate a groundwater monitoring system into the design of the facility.

33-20-13-03. Water quality standards.

All solid waste management systems, operations, units, and facilities must be designed, constructed, operated, maintained, closed, and maintained after closure so as to be in compliance with North Dakota Century Code chapter 61-28, and water quality standards defined in articles 33-16 and 33-17. Compliance with these standards is enforceable at the compliance boundary of the facility.

V.v. Comments

Several comments were received stating “...because radium is highly soluble in water...”, there will be releases of radium into the environment and groundwater around a permitted landfill, such as:

“Because radium is highly soluble in water, rain water percolating throughout the landfill will allow the radioactive constituents of the material to leach out into the environment and potentially into aquifers or surface water for drinking water supplies.” (C. Coen)

“Federal drinking standards limit radioactive waste to 5pCi/L. If North Dakota raises the limit to the proposed 50pCi/L, the state's ground water would be at risk for contamination. Argonne's study is not nearly in depth enough to even be considered research in the area, and should not be considered a reliable source to encourage an increase in the radioactive waste limit.” (M. Courtney)

V.v. Response

While some radium compounds are highly soluble, especially those used in medical procedures and research, radium found in oilfield scales is generally very insoluble and is not expected to leach out of the waste and move with the groundwater.

The following 3 quotes are from a US Geological Survey publication regarding oilfield NORM, titled: Naturally Occurring Radioactive Materials (NORM) in Produced Water and Oil-Field Equipment— An Issue for the Energy Industry. (<http://pubs.usgs.gov/fs/fs-0142-99/fs-0142-99.pdf>)

“Many studies of radioactive scale from oil-field equipment have documented that barite is the primary host of oil-field NORM and that the radioactivity is from isotopes of radium and their decay products.”

...

“Once formed, barite is a very insoluble mineral. One liter of water at the Earth’s surface dissolves only 0.0025 grams of barite.”

...

“The extreme insolubility of barite under natural conditions limits the rate of release of radium to water and suggests that dispersal of radium will be dominated by physical transport of barite particles.”

Federal drinking water standards have several standards concerning radionuclides. There is a Maximum Contaminant Level (MCL) of 5 pCi/L for Radium-226 and Radium-228 combined. Landfill design and permitting address water protection standards to monitor for potential contamination at the permit boundary.

ANL performed hydrogeologic modeling with a 10,000 year time period. This modeling assumed that the synthetic liner and leachate collection systems are no longer in place. With these conditions, potential groundwater contamination from radionuclides did not limit the TENORM disposal in the landfill.

V.w. Comments

“I didn’t see anything on post accident, no cleanup plan if something should wrong. I can only imagine if there was a leachate out of the pit for confinement that it would require deep excavation of soil. It’s almost ridiculous to think about. And I want to reiterate the comments another gentleman made about risk downstream that we’re currently dealing with from Montana, and that what this could do actually to states all the way down to Louisiana. Most of these are proposed in tributaries from the Missouri and Mississippi Rivers....the administration today hasn’t proved that it’s able to handle the regulations that it has in place already and I don’t see a reason why we should increase them and see what happens after that because others said there’s no qualifications for safety or anything so are we just going to do it on the fly?” **(Fargo page 51)**

“In regards to the Glendive cleanup, why is ice tampering it? Apparently they didn’t put the factor in that we have six months winter up here...what is your plan to take care of wintertime, or when blizzard (word unclear) hits and everything shuts down and you can’t get in there to

even approach it. When it comes to radioactivity leaking, when there's no travel, you can't get over there to deal with it and it's going to spread with the wind." (**Fargo page 55**)

V.w. Response

Each facility is required to have a Plan of Operations, per NDAC 33-20-04.1-03, which requires a section on contingencies that include:

- 1. Fire or explosion;*
- 2. Leaks;*
- 3. Ground water contamination;*
- 4. Other releases (for example, dust, debris, failure of run-on diversion or runoff containment systems); and*
- 5. Any other issues pertinent to the facility.*

Obviously, a facility cannot have a contingency plan for every possible real life scenario, but the list above includes the most common incidents that have the potential to occur at a facility.

V.x. Comments

There were several comments concerning the 30 year post-closure care period, focusing on the fact that the half-life of TENORM isotopes is longer than the post-closure period. For example:

“There was a mention of 30 years to monitor the sites, however, that should not be the case. The sites need to be monitored for the life of the radiation, thorium, and radons, etc.” (**B. Jorgenson**)

V.x. Response

The postclosure monitoring period is the time following closure of a landfill unit during which the owner must perform postclosure activities such as maintenance, inspections, leachate collection (if any) and groundwater monitoring. The landfill application and permit define the scope of these required activities. The owner typically has to maintain the effectiveness of the final cover, prevent erosion, maintain and operate any leachate collection system, and maintain and sample the groundwater monitoring system. During this period, the Department may require the owner to amend the postclosure plan, do additional monitoring and may extend the postclosure period.

The postclosure period currently specified for special waste landfills and industrial waste landfills is 30 years. Because the operational and postclosure time periods are small in comparison with the time it would take a possible leak from a landfill unit to reach off site groundwater and small in comparison with the decay rates of some of the TENORM components, ANL performed hydrogeologic modeling with a 10,000 year time period. This modeling assumed that the synthetic liner and leachate collection systems are no longer in place. The model also conservatively assumed the landfill was underlain by 20 feet of loamy sand, contrary to the state siting criteria. With these conditions, potential groundwater contamination from radionuclides did not limit the TENORM disposal in the landfill. Since groundwater contamination was not a limiting factor for changing the TENORM disposal limits, the Department decided that a requirement for a longer postclosure period for landfills receiving TENORM was not required.

Comments related to NDAC 33-20-01 Definitions.

V.y. Comment

“AMEND Section 33-20-01.1 -02 Applicability as follows:

1. This article does not apply to the following:

h. Disposal of TENORM solids and TENORM contaminated equipment in Oil and Gas wells which are to be plugged and abandoned, provided such procedures are performed in a manner to protect the environment, public health, and fresh waters; and occur below the lowermost underground source of drinking water.

i. Disposal of TENORM into wells permitted to do so under approved permits.

j. Any Oil and Gas TENORM disposal method approved by NDDOH shown to be protective of public health, welfare, and the environment.” **(ND Petroleum Council)**

V.y. Response

Regarding the recommendation to add subsections (h) and (i) shown above, to NDAC § 33-20-01.1-02(1), the Department does not have authority to allow (or prohibit) disposal of TENORM waste into abandoned oil and gas wells. What is allowed to go into those wells is under the authority of the NDIC Oil and Gas Division, as long as the source of the material is from oilfield exploration and production activities. Oilfield TENORM wastes of any concentration are already allowed to be disposed into Class II Underground Injection Control wells regulated by the NDIC Oil and Gas Division. Proposed Chapter 33-20-1.1 only provides disposal requirements for landfills regulated by the Department. Recommended subsection (j) shown above appears to be very broad and bypasses all of the public notification requirements. The Department does not intend to add these amendments to the proposed rules for TENORM disposal.

Comments related to NDAC 33-20-07.1-01(4) Small Volume Industrial and Special Waste Landfills

V.z. Comments

Several comments from the energy production facilities related to NDAC 33-20-07.1-01(4), such as:

“The insertion of the text "or special waste landfill" adds all of the requirements of this subsection, requirements that were not previously applicable to special waste facilities. To clarify this apparent issue, we suggest a slight modification to the wording, such as "or special waste landfill *receiving TENORM waste*". Italics added for emphasis.....As currently proposed, the Department's new rules would increase the regulatory requirements for electric utility special waste landfills. Since the Department's stated purpose of the proposed rules is "to implement regulations to properly manage TENORM". It is clear that additional requirements for facilities that do not accept TENORM are not necessary nor appropriate.” **(Basin Electric)**

V.z. Response

The EPA has issued new rules related to coal combustion residuals (CCRs) and those rules will become effective in October 2015. The Department had seen information related to those rules while developing the proposed TENORM rules and made the decision to incorporate that

information into the proposed rules. The proposed rules will also coincide with the currently proposed requirements of the new EPA rules for CCRs.

V.aa. Comment

“33-20-07.1-01. Performance and design criteria.

1. Six months is too long for radioactive loads to remain uncovered. Given the extreme weather fluctuations in North Dakota, this time should be lessened to account for precipitation, wind and other external factors.
2. Landfill requirements for barriers in transmitting radioactive elements into the environment are not sufficient for public safety.” **(Dakota Resource Council)**

V.aa. Response

The Department believes that the comment stating “Six months is too long for radioactive loads to remain uncovered” is in fact referring to NDAC 33-20-04.1-05(3) which states:

“Closure must be implemented within thirty days after receipt of the final volume of waste and must be completed within one hundred eighty days following the beginning of closure activities, unless otherwise specified and approved under subsection 5. Prior to beginning closure, the owner or operator must notify the department in writing of the intent to close.”

TENORM waste will not be left uncovered for six months because the proposed rules under NDAC 33-20-11-01(3) require that all TENORM waste be covered by the end of the day or within 24 hours for continuous operations with a minimum of 1 foot of non-TENORM containing material.

ANL conducted the study based on the current designs of the facilities and ran the model assuming that the landfill liners and leachate collection system had either failed or was non-existent. Based on those parameters, the acceptable disposal limit was calculated.

The liner requirements for special waste landfills are in NDAC 33-20-07.1-01(4)(e), which states... “the liner must consist of at least three feet [91.4 centimeters] of recompacted clay with a hydraulic conductivity not to exceed 1×10^{-7} centimeters per second overlain with at least a sixty mil flexible membrane liner.” The liner requirements for large volume industrial landfill are found in NDAC 33-20-10-03(1)(e) and is similar to the liner standard for a special waste landfill, but requires an additional eighty mil flexible membrane liner and secondary drainage layer. The liner and leachate collection system must be designed and maintained to ensure its integrity during operation and post-closure care.

Comments related to NDAC 33-20-10 Large Volume Industrial Waste Landfills

V.bb. Comment

“..landfills regulated under chapter 33-20-07.1 should be prohibited from managing any NORM or TENORM materials unless they are constructed to the standards of chapter 33-20-10.

The design for a landfill to safely and effectively manage TENORM should be a composite liner system which includes: (1) At least three feet of recompacted clay with a hydraulic conductivity not to exceed 1×10^{-7} centimeters per second; (2) A synthetic flexible membrane liner at least sixty mil; (3) A secondary drainage layer with a hydraulic conductivity of 1×10^{-3} centimeters per second or greater throughout and with sufficient thickness to provide a transmissivity of 3×10^{-2} centimeters squared per second or greater; (4) A single Geocomposite Clay Liner (GCL); (5) A synthetic flexible membrane liner at least eighty mil; and (6) A drainage layer with a hydraulic conductivity of 1×10^{-3} centimeters per second or greater and with sufficient thickness to provide a transmissivity of 3×10^{-2} centimeters squared per second or greater.

Additionally, landfills that manage TENORM should have a full time, onsite inspector employed by the NDDH. The inspector should be trained in operations and safety procedures on handling and disposal of TENORM.” **(Clean Harbors)**

V.bb. Response

ANL ran the model assuming that the liners and leachate collections systems had failed or weren't even there. Both oilfield special waste landfills and large volume industrial waste landfills have protections in place and those protections were covered in Response V.a. However, the limiting factors in determining the TENORM concentration disposal limit was landfill worker exposure, not leakage and groundwater migration, which is why the liner requirements for oilfield special waste landfills are adequate.

All of the oilfield special waste landfills and large volume industrial waste landfills are required to meet the location criteria discussed in Response V.a. and must meet the design criteria listed in NDAC 33-20-07.1 and NDAC 33-20-11(5). All landfill facilities that want to accept TENORM waste will be required to have a plan of operations that details safety procedures on handling and disposing of TENORM. An on-site Department inspector is not required for landfill facilities wanting to dispose of TENORM waste because the disposal operations will be under the supervision of a Radiation Safety Officer as required by NDAC 33-10-23-27.

The Department will require recordkeeping and reporting per NDAC 33-20-04.1-04 and will also conduct periodic, routine inspections at each of the landfills.

V.cc. Comment

“Chapter 33-20-10 Large Volume Industrial Waste and MSW Ash Landfills

33-20-10-03. Waste disposal.

1. As oil and gas waste that is not classified as TENORM is still radioactive, landfill requirements for barriers do not take this into account and are not sufficient for public safety.
2. Part two, subsection C- Open impoundments will encourage the transmission of radiation and other hazardous chemicals through the air significantly elevating the risk to public health of nearby residents and communities.” **(Dakota Resource Council)**

V.cc. Response

Available testing data shows that drill cuttings rarely exceed 5 pCi/g and if they do exceed, it is not significantly over 5 pCi/g. The vast majority of drill cuttings are less than 5 pCi/g. This

level is analogous to surficial soils in most of the state. Leachate impoundments will cause no measurable increase in Radon due to immediate open air dispersion.

V.dd. Comments

“Earthworks also encourages the State to identify and evaluate the landfills already being used as disposal facilities, in order to determine any threat to the environment, workers and public from these existing disposal sites. Where needed, clean up must be conducted and monitoring put in place in and around the sites.

Without full investigation of equilibrium status of the waste, it is unknown how the waste stream will change. The radioactivity could significantly increase over time. To adequately investigate equilibrium status, radiation detection systems with specific characteristics are needed in all current, proposed and previously used TENORM disposal sites.” **(Earthworks)**

“(1) It will cost ALL people in North Dakota more in garage bills because the land fills will raise the garage bills on everyone.

Why

- A. Will need more employees
- B. Need to buy more land for land fills
- C. Will cut the cost to oil co. so the little people will pay more” **(R. Hamers)**

V.dd. Response

Municipal solid waste landfills, which handle waste from households, and inert waste landfills, which handle construction and demolition waste, are prohibited from accepting TENORM waste per proposed NDAC 33-20-11-02. Prohibition which states:

“Disposal of TENORM waste subject to regulation under article 33-10 is prohibited in all municipal solid waste landfills and inert landfills.”

Residents in North Dakota should not expect to see an increase in their garbage bills due to the proposed rule change because this will not affect the landfills that take waste from their households.

The ANL study carried out modeling to 10,000 years and it included decay products of the TENORM materials in the landfill.

Comments related to NDAC 33-20-11 Proposed TENORM disposal rules

V.ee. Comment

“With regard to Chapter 33-20-11-LANDFILL DISPOSAL OF TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL WASTE:

1. Section 33-20-11-01.1: "accumulated amount must not exceed twenty-five thousand tons per year or three thousand tons in any one month..." On page 72 of the Argonne Study, researchers concluded that workers involved in receiving and handling or waste placement activities would receive the highest dose. Mitigation recommendations included placing a cap on total waste disposed of in a year in a single landfill *or alternatively*, limit the number of hours that workers are exposed to the TENORM wastes. Despite both alternatives, only the former, capping annual

waste receipts at 25,000 tons (and 3,000 tons per month), made it into the rule. I believe that the waste limit can be effectively raised with proper controls in place to limit worker exposure. Employee exposure limits are a key component to the ALARA (As Low As Reasonably Achievable) principle and are employed by other industries, including the medical services industry.” (Williston page 11-13)

V.ee. Response

The Department did not consider allowing higher concentrations of TENORM waste at landfills that limit the number of hours that workers are potentially exposed. It would be very difficult for the Department to monitor and enforce that type of requirement. The Department decided that having the same limits for all landfills would be easier for the Department to enforce and for the landfills and generators to understand. Landfills will be required to obtain a specific license from the Radiation Control Program. As an added precaution, the Department will require, through the Radiation Control licensing requirements, that landfills have their employees wear dosimetry badges for at least the first year of operation when accepting TENORM wastes to verify that the employee’s exposure is below the 100 mrem/year limit, until historical data is obtained for the possible relief of this requirement. This will be handled through the permitting process. The Division of Waste Management will work with the Division of Air Quality to ensure compliance with the regulations.

V.ff. Comment

“2. Section 33-20-11-01.1: Defines acceptable waste at TENORM waste up to but not exceeding a 50 pCi/g combined Ra 226, Ra 228). I understand the science and logic behind establishing this limit; however, this limit will create segregation concerns for industry: sludges exceeding 50 pCi/gm vs. sludges that fall below that number; filter socks exceeding 50 vs. filter socks that do not. For example, are ALL sludges going to be considered TENORM suspect and require TENORM analysis despite some sludges NOT exhibiting TENORM activity?”

SLUDGES THAT DO NOT TYPICALLY TEST HIGH FOR TENORM

- Hydro vac cuttings on location
- mixtures of wastes in super suckers
- residuals in vac trucks
- super suckers
- dump trucks
- side dumps

Further - since there is no rapid (meaning "instant result") test for TENORM, is the expectation that all suspect TENORM will be staged or set aside until TENORM analyses can be completed? Or will all TENORM waste require analytics prior to leaving the generator site. If this is not well defined in the rules, it needs to be.

Segregation requirements may make TENORM management too labor and logistically intensive, and operators may decide to continue with current practice of shipping all waste outside ND. (Williston page 11-13)”

V.ff. Response

The process of waste characterization and segregation that is performed by TENORM waste generators to determine if a specific waste stream can be disposed of in North Dakota or whether it has to be shipped out of state is currently occurring and will continue to happen regardless of what the specific disposal limit is. This is also true for testing procedures to determine if the waste stream meets a specific standard for disposal.

The landfills are required to have detailed wastes acceptance plans as part of their application. The waste acceptance plans detail waste characterization procedures, random load inspection, and random load testing. Specific waste streams that are suspect TENORM are discussed in the waste acceptance plan. TENORM waste generators and transporters will require licensing from the Department and blending of TENORM waste will be addressed in the licensing process. Also see Response V.n.

V.gg. Comment

“3. Section 33-20-11-01.1: Similar to EPA's published list of RCRA Exempt E&P waste, or the list of Class II injection fluids, the Health Department, should publish a comprehensive and detailed list of products that will be considered "TENORM suspect." (Williston page 11-13)

V.gg. Response

The Department believes that a list of “TENORM suspect” wastes will change due to changes in exploration and production (E&P) technology and a list should be maintained in correspondence and guidelines, not in the rules. A current description of TENORM suspect wastes can be found in “Guideline 42 – Oilfield Exploration and Production Associated Waste Activities” at <http://ndhealth.gov/wm/Publications/Guideline42OilFieldExplorationAndProductionAssociatedWasteActivities.pdf>

V.hh. Comment

“4. Section 33-20-11-01.2: The rules need to define the term "Equipment," so there is no confusion over whether a filter sock, for example would be considered equipment or not...
a. Will tubulars be considered equipment, fragments of pipe, a casing collar or a scaled-up packer...” (Williston page 11-13)

V.hh. Response

In general, the Department only considers durable items such as pumps, meters, etc., to be equipment, not items intended to be disposable supplies, such as filter socks, absorbant pads, etc. The Department will encourage recycling of metal items to the maximum extent practical and does not intend to allow disposal of large volumes of tubular goods that can be cleaned and recycled. The waste acceptance plan and waste screening procedures for each facility must indicate how a facility will handle different waste types. See also Response IV.l.

V.ii. Comment

“5. Section 33-20-11-03: Authorization. This section details the procedures that must be followed to apply for approval for acceptance of TENORM waste by a landfill not previously authorized to accept such waste in it permit. This section directs the operator to permit modification procedures defined in 33-20-02.1-06 (Permit modification, suspension, or

revocation, and *within that rule*, to full application procedures as identified in 33-20-03.1-02. This process appears to be a full reapplication for a facility. Is there not a way to streamline this permit modification process to allow special and industrial waste landfills to be responsive to industry needs? And can the department provide any information with regard to processing timelines?

Currently, clients report that a typical special waste landfill permit modification, depending on scope, can take from 1-3 years to move through the regulatory process start to finish and with engineering, hydrogeologic investigations and permitting costs close to \$400k.” (Williston page 11-13)

V.ii. Response

If a facility wants to accept TENORM waste, they will be required to submit an application for a major permit modification under NDAC 33-20-02.1-06. The facility will be required to revise their plan of operations, waste acceptance plan, monitoring parameters and possibly their engineering design. The permit modification will NOT require a new hydrogeologic investigation as that will have been completed with the initial permit application.

For new oilfield special waste landfills, the entire permitting process can take anywhere from one to three years. A permit modification for an existing site will typically take significantly less time.

V.jj. Comment

“6. Section 33-20-11-04: Monitoring -The reference to "drinking water maximum contaminant levels" should provide a regulatory reference to the respective, and presumed, North Dakota code.” (Williston page 11-13)

V.jj. Response

The Department acknowledges that this needs clarification. NDAC Subsection 33-20-11-04 will be changed to the following:

33-20-11-04. Monitoring. *The leachate collection system and groundwater monitoring network shall be analyzed for background concentrations of naturally occurring radionuclides prior to receipt of any TENORM waste. Leachate shall be analyzed for radionuclides at the same frequency as groundwater samples are collected. If radionuclides are detected in the leachate at a concentration greater than the concentrations listed below, then the groundwater monitoring network must begin analysis for radionuclide parameters.*

Radon: 4,000 picocuries per liter (pCi/L)

Combined Radium-226 and Radium-228: 5 pCi/L

Alpha particle activity (including Radium-226, excluding radon and uranium): 15 pCi/L

Uranium: 30 micrograms per liter (ug/L)

V.kk. Comment

“7. Section 33-20-11-05. Reporting -This section is nearly, but not quite identical to the reporting requirements in Chapter 33-10-23-08.7 of the Regulation and Licensing TENORM rules. To streamline operator reporting efforts, is it possible to kill two birds with one stone and allow one report to satisfy both rule sets? If so, I think a statement to such affect should be added to the respective sections of the proposed rules.” (Williston page 11-13)

V.kk. Response

The Department has reviewed the reporting requirements in Section 33-20-11-05 and Section 33-10-23-08(7). While the differences are minor, the Department agrees that the reporting requirements should be the same in both sections and will make this change. The reporting requirements for Section 33-20-11-05 will read as follows:

“Landfills approved for the disposal of TENORM waste shall file with the department a quarterly summary report stating the date, type and total quantity by weight in tons, generator and final disposal facility of each TENORM transferred. Each report shall be filed within thirty days of the end of each quarter. If no transfers of TENORM have been made during the reporting period, the report must so indicate.”

V.ll. Comment

“8. Section 33-20-11-06: Worker training and safety: This section currently reads: "Landfills approved for the disposal of TENORM waste shall implement a worker training and safety program so that no individual shall receive an annual dose greater than one hundred millirems per year from activities conducted in the landfill."

I am not aware of any safety training program in any industry that offers similar guarantees. This language needs to be revised to restructure this rule taking the focus off any perceived guarantee. In addition, I believe "training requirements" should be segregated from "safety program" and specific expectations identified TENORM Williston Public Hearing 1/20/15 Page 13 of 60 NDDoH - Division of Waste Management for each component (e.g., required PPE, training logs, specifications for exposure times, etc.)” (Williston page 11-13)

V.ll. Response

The Department did not intend that this rule would be perceived as a guarantee to limit exposure to less than one hundred millirems per year. The specifics of the training program and safety program will be addressed through the solid waste landfill permit and the radiation control program license for the facility. These will be implemented by the facility Radiation Safety Officer as required in NDAC 33-10-23-27. The Department will change the wording of the subsection to:

“33-20-11-06. Worker training and safety. Landfills approved for the disposal of TENORM waste shall implement a worker training program and safety program to meet the requirements of Section 33-10-23-27, so that protection of workers complies with radiation protection standards of NDAC Chapters 33-10-04.2 and 33-10-10.1. The

training and safety program shall be approved by the department prior to receipt of any TENORM waste.”

V.mm. Comment

“9. Both rules will require a significant shift in administrative paperwork relative to manifesting, reporting, permit modifications. Has the Department budgeted for web-based improvements, online reporting, data retrieval, etc that can improve efficiencies for both the regulators and the regulated industry?” **(Williston page 11-13)**

V.mm. Response

The Department will streamline the process as much as possible and will strive to incorporate on-line capabilities as soon as practicable.

V.nn. Comment

Several comments were received regarding the basis for the additional two feet of cover on facilities with final cover slopes exceeding 15% and also regarding how that will be measured, such as:

“The basis for the need to provide an additional 2 feet of cover on facilities that have final cover slopes in excess of 15% is unclear in the documents. This requirement is found in 33-20-11-01 Paragraph 5..... You may also want to add to paragraph 4 "as measured at a right angle to the surface of the final cover" in order to more fully explain the intent of the requirement. **(IHD Environmental)**

V.nn. Response

Due to the long half-life of Radium-226 and Radium-228, the Department wanted to ensure long-term erosion control protection beyond the 30 years post-closure requirement. Regarding the “as measured at a right angle to the surface of the final cover”, this is standard engineering practice and the Department does not see the need to add in this wording to the rules.

V.oo. Comments

“I failed to find 33-10-03 that is cited in 33-20-11-01 and 33-20-11-03. Is this a typo, have I missed something or is it a new regulation: as 33-10-03 appears to have been repealed?” **(IHD Environmental)**

“Two sections of this proposed Chapter (NDAC 33-20-11-01 and NDAC 33-20-11-03) include reference to NDAC 33-10-03 - Licensing of Radioactive Material, which was repealed effective January 1, 2011. ***This citation may be in error and NDPC wanted to draw attention to this oversight.***” **(ND Petroleum Council)**

V.oo. Response

This is a typographic error; it should reference NDAC Chapter 33-10-23 in both locations. This will be corrected in the final proposed rules.

V.pp. Comment

“33-20- 11-01.3 states: TENORM must be covered by at least one foot of non-TENORM waste or daily cover material by the end of each operating day. This is misleading as it could cause the licensee to believe that they could place 1 foot of non-TENORM waste or daily cover material without also adding the 8 inches of compacted clay required in 33-20-10-03.6 if the licensee stops using the area for more than a month. We want to ensure that licensees follow both requirements and suggest adding clarifying language to tie these two requirements together. (ND Petroleum Council)

V.pp. Response

This comment actually deals with two separate issues. TENORM waste must be covered with at least one foot of non-TENORM waste or daily cover material by the end of each operating day. All of the waste in the landfill must be covered with an additional 8 inches of compacted clay if they are not working in an area for more than one month.

This requirement is the same as for landfills that take asbestos. Landfills that take asbestos have not had an issue understanding the difference between the daily cover requirement and the interim cover requirement.

V.qq. Comment

“Though studied by Argonne, Lead 210 (Pb-210) is not stated within the legislative rule updates for picocurie limits. The draft Section 33-20-11-01 (1) reads, **“TENORM waste up to, but not exceeding 50.0 picocuries per gram of Radium-226 plus Radium-228, maybe disposed in a landfill...”** Based on this statement, *it* is assumed that Pb-210 does not fall under the 50 picocurie per gram limit applied to Ra-226 and Ra-228. The NDDH should outline within the rules the types of TENORM constituents it expects waste to be tested for. As well, within current operating permits Pb-210 is listed as an acceptable waste as long as the picocurie limit is below 5. The NDDH should confirm whether this permitted limit will be retained or will change based on the new rules.

33-20-11-01. Radioactive waste disposal

Pb-210 should be specifically listed as an isotope of concern and should be subject to the 50 pCi/g limit.” (Secure Energy)

V.qq. Response

Gas processing equipment is most likely to have Pb-210 and is not a significant source of TENORM waste, though it may increase in the future. Pb-210 is also not a limiting factor in sludges, pipe scale, etc. This will be addressed in permitting, waste acceptance and through the 100 μ R/hr limit on equipment. Table 6.17 of the ANL report shows that for Pb-210 the allowable landfill concentration would be 4,200 pCi/g to result in a landfill worker dose of 100 mrem/yr, which is not of concern in relation to a limit of 50 pCi/g of Ra-226 + Ra-228. If the waste is less than 50 pCi/g of Ra-226 + Ra-228 then it will also be safe in respect to Pb-210.

V.rr. Comments

“NDPC is concerned that the disposal facility volume limits, as proposed, in NDAC 33-20-11-01(1), are too low. Our members estimated per operator generation volume of TENORM waste

presented above represents approximately half of the proposed disposal facility allowable volume, on a per facility basis.

These volume limits could become an issue, depending on the number of disposal facilities permitted by the NDDH. Based on these volume estimates, disposal facilities will be at capacity very quickly, if there are not numerous permitted facilities by the NDDH. These volume limit assumes all accepted waste into a landfill will be 51.6 picocuries per gram; this seems to be a manipulation of conditional probabilities.

Could safe volume limits be derived from more basic axioms of likelihood, specifically the probability that on average TENORM material to be delivered to a disposal facility will be in fact below the level assumed in the study? Additionally the study itself mentions alternative methods for risk mitigation, both through worker exposure monitoring and through a cap placed on TENORM waste. Would disposal volumes be based on employee exposure rates incorporated into a Radiation Safety Program (RSP)? This method could be regulated through applicants Specific License, after NDDH review and in accordance with 33-10-23-12.2.” **(ND Petroleum Council)**

“Section 33-20-11-01.1: Volume limits.

This proposed rule, based on the ANL study, limits disposal to 25,000 tons annually and 3,000 tons monthly. It appears this limit assumes all waste accepted into a landfill will be 51.6 picocuries per gram; this method appears to be overly conservative. Could safe volume limits be derived from more basic axioms of likelihood, specifically the probability that on average TENORM material delivered to a disposal facility will in fact be far below the level assumed in the study? Additionally the study itself mentions alternative methods for risk mitigation, both through worker exposure monitoring, and through a cap placed on TENORM waste. We believe it would be reasonable to allow for disposal volumes to be based on employee exposure rates incorporated into a Radiation Safety Program (RSP).

This method could be regulated through applicants Specific License, after NDDOH review and in accordance with 33-10-23-12.2.” **(R360)**

“Proposed in-state TENORM disposal facility volume limits (at 25,000 tons annually) may be too low to handle total volume, especially considering the anticipated difficulty of getting major permit modifications approved by local and county officials....When compared with a *blanket* state limit on TENORM activity levels and annual volumes limits for landfill, SECURE Energy would generally be an advocate for site-specific RESRAD modeling and landfill design that would, potentially, produce higher acceptable levels of radioactivity and/or volumes of TENORM-impacted waste in specific landfills.” **(Secure Energy)**

V.rr. Response

The Department feels that the proposed yearly tonnage limit is appropriate based on previous estimates that were provided by the stakeholders. Based on the previous estimates provided to the Department, it is believed that a small number of facilities will be able to handle the TENORM waste that falls below the proposed limit of 50 pCi/g. See also Response V.p.

The Department did choose to use the assumption that all 25,000 tons of TENORM waste that can be accepted at a landfill was at the maximum allowable concentration, in this case 50 pCi/g. It is impossible to know what the true, average concentration will be in the future. Due to the inherent uncertainties involved in sampling bulk quantities and uncertainties in screening and analytical procedures the Department felt it was prudent to follow the recommendations in the ANL report and set the limit for all waste received at a facility at 50 pCi/g for protection of the landfill works. Trying to use a system where a landfill could accept higher concentration TENORM waste as long as the average concentration stayed below 50 pCi/g would be extremely difficult for the Department to monitor and enforce.

V.ss. Comment

“Disposal facilities should be required to have portal monitoring equipment that closely monitors TENORM activity levels at the point of entry. Without consistent monitoring and enforcement (and preferably automated, electronic reporting) the state cannot hope to truly regulate TENORM in its approved landfills. Currently approved disposal facilities should have their licenses amended accordingly (requiring portal monitoring), especially those who are not submitting major permit modifications for acceptance of TENORM waste. The public deserves a good faith effort by Solid Waste to enforce the TENORM regulations as a majority of the waste processors have already proven that they have not pursued licensing and compliance on their own. **(Secure Energy)**

V.ss. Response

The Department is considering requiring portal monitoring at facilities. This will be handled through the permitting process as part of the waste acceptance plan.

V.tt. Comment

Scrap yards and recyclers should also be enveloped under these same rules. Current compliance with TENORM guidelines by recyclers is haphazard at best. More consistent and accurate reporting and proof of compliance should be required. **(Secure Energy)**

V.tt. Response

The Department currently does not issue Solid Waste permits or regulate materials processed by recyclers or in scrap yards. Scrap metal is currently banned from landfills in North Dakota, so the Department does not consider scrap metal a major source of TENORM entering disposal sites. Activities in North Dakota that create, process, or transport TENORM will fall under the jurisdiction of the TENORM rules under NDAC Chapter 33-10-23. The Department notes that reputable scrap yards already screen for TENORM as such materials are not accepted by end markets and also may be rejected at the U.S. – Canadian Border.

V.uu. Comment

“Additionally, disposal facilities approved to receive TENORM waste must be required to show that they possess the ability to identify TENORM impacted waste streams quickly and they should be required to have a fully qualified RSO on staff in ND. Eight hours of training is insufficient to oversee the licensing requirements of a TENORM facility.” **(Secure Energy)**

V.iii. Response

Any landfill that will accept TENORM is required to have a Radiation Safety Officer due to the requirements for the radioactive materials license in NDAC 33-10-23-27. The Division of Air Quality – Radiation Control Program will handle this during the licensing process.

V.vv. Comment

“Will the major permit modifications detail the acceptable (and unacceptable) waste streams? We know enough now about the impact of geography and typified waste streams to ascertain which waste streams and regions deserve extra scrutiny. Tank bottoms should require analytical prior to acceptance with dilution should be explicitly forbidden. Filter socks, scaling in pipes/equipment, and virtually all TENORM-impacted waste streams from the Watford City/Alexander area deserve extra scrutiny and analysis as they are displaying very high levels of radioactivity.” **(Secure Energy)**

V.vv. Response

As part of the permit modification process, a revised waste acceptance plan will be required. Part of the waste acceptance plan is detailing out how wastes will be screened and analyzed prior to acceptance at the facility.

V.ww. Comment

“Workers are covered by some federal radiation protections, although a 1989 safety bulletin from the Occupational Safety and Health Administration noted that NORM sources of exposure "may have been overlooked by Federal and State agencies in the past." Where does that leave TENORM? Quoting from the last paragraph in the same report, Radionuclides in Fracking Wastewater: "the current patchy understanding of radioactive fracking waste's fate in the environment precludes making good decisions about its management." **(Brenda Jorgenson)**

V.ww. Response

Wastes containing Naturally Occurring Radioactive Material (NORM) are not regulated by federal agencies. Instead, it has been left to states to regulate handling of NORM. Currently, 15 states specifically regulate NORM, while other states more generally regulate radioactive wastes. Waste materials generated during the processing or filtration of flow-back (fracking liquids) are characterized as TENORM waste and are regulated under the North Dakota Radiological Health Rules. One of the key purposes in proposed NDAC Chapter 33-10-23 is to improve the tracking of TENORM waste from generation to disposal. Worker protection at facilities that do not generate regulated TENORM waste materials is beyond the scope of the proposed rules.

VI. Miscellaneous Comments and Issues

VI.a. Comment

“2) No one at the Fargo meeting provided enough background on how the current 5 picocuries per gram limit came into effect. All that was stated was that it was chosen because it "was similar to background soil radiation." **More information should be provided by why 5 picocuries/gram was selected in the first place.**” **(J. Mosbrucker)**

VI.a. Response

The basis for the current disposal limit is not relevant to the current proposed rule changes based on the recommendations in the ANL study report. The 5 pCi/g disposal limit came from a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, otherwise known as Superfund) cleanup standard for surface soil cleanup of uranium ore processing sites. This standard is discussed in a National Research Council publication, titled: "Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials", 1999. The 5 pCi/g level of Radium-226 at the surface was a health-based standard that would return a site to unlimited public use. At the time it was included in the Radiation Control Rules it was not intended to be the limit for waste acceptance at landfills; however, the definition of radioactive waste in the Solid Waste Rules made all solid waste that is subject to the requirements of Article 33-10 not allowable in landfills.

VI.b. Comments

There were several comments related to public education such as:

“I do believe ongoing public awareness campaigns about TENORM are important. People need to understand that there is very little risk to individuals unless they ingest or inhale particulates. The public should know who to call if they come across TENORM waste, and emergency responders should be trained in radiation safety like a TENORM transporter might.

The Department should establish a conduit between themselves and local citizens - similar to the Report all Poachers program, we need a Report Illegal Dumping "RID" hotline or a high visibility button on a website, or an smart-phone app - that allows our citizens to assist regulators with compliance by reporting those that break the law... with a system to gather as much information to make a defensible case against those that break the rules.” **(Williston page 13)**

“... there needs to be a greater amount of education, probably coming from the health department, a website would be specifically developed for TENORM education, public service campaigns, website development, links placed on a website that people can learn more, or maybe even contact an expert.” **(Bismarck page 27)**

“6. The Department of it’s own accord, or by way of rules, needs a public education program to facilitate access to information on radiation exposure and how to proceed if exposed to radiation from oil and gas waste is critical for public health.” **(Dakota Resource Council)**

VI.b. Response

The Department agrees that public education and information on TENORM management and potential health risks is important. The Department has some information on its website already and more on these specific issues is planned to be added. The Department is currently considering how to best implement an online citizen spill and dumping hotline.

VI.c. Comments

There were several comments related to the Federal Interstate Commerce Law, such as:

“Dave Glatt, the top regulator of the North Dakota Department of Health said that due to the federal commerce clause, North Dakota will have to start accepting out-of-state radioactive waste if North Dakota proceeds with this policy.” **(Bismarck page 17)**

“Another thing that people may not realize is that federal guidelines require that if we have a place capable of taking this product, we have to take it regardless where it’s from, doesn’t matter what state. So we could become a real dumping ground.” **(Fargo page 58)**

“I also don't think it is a good time to allow more waste in the state that is already pushed to it limits in growing and containing all that comes with the growth of the oil industry. If there are facilities in other states that are willing and capable of handling the waste I don't think it is a good idea to take the chance that everyone will follow the new rules if the state allows the higher levels.” **(B. Lee)**

VI.c. Response

Waste is transported into and out of North Dakota every day. Federal interstate commerce law prohibits individual states from having requirements that are different based on the origination of commercial activity. In this case, if North Dakota allows waste that meets certain criteria to be disposed in landfills here, then it cannot make a restriction based on where the waste was generated if the waste meets those criteria. Likewise, Colorado or Idaho have facilities that are permitted to accept waste that meets their radioactivity limits. Those states cannot restrict North Dakota waste that meets those limits. Landfill operating companies still have wide discretion on who they do business with, but the state cannot restrict disposal based solely on where the waste was generated.

It should be noted that if North Dakota continued to have no in-state options for TENORM disposal and if those out-of-state facilities closed for any reason, then the state would face a very real problem of accumulation of TENORM and possible increased illegal dumping.

VII. Summary and Conclusions

The Department did not receive any substantive scientific data or documentation to change the proposed special waste and industrial waste landfill TENORM limit of 50 pCi/g Ra-226 + Ra-228. Following are the areas where changes will be made to the proposed rules based on comments received:

- For clarification, the Department will change the wording of NDAC Subsection 33-10-23-04(2) from “materials TENORM” to “materials containing TENORM”.
- In response to Comment IV.w., the Department concurs with changing the exemption wording in NDAC Subsection 33-10-23-04(7) from “coal combustion products” to “coal

combustion residuals (i.e., fly ash waste, bottom ash waste, slag waste and flue gas emission control waste)”.

- In response to Comment IV.ii., the Department will remove the word “shall” after the word “survey” in NDAC Subsection 33-10-23-07(1).
- In response to Comment IV.z., the table reference in NDAC Section 33-10-23-07(2) will be changed from “table 4.2-07.1” to “table 4.2-07.1 of chapter 33-10-04.2”.
- For clarification, the Department will insert the word “section” before “33-10-23-11” in NDAC Subsection 33-10-23-07(4).
- In response to Comment IV.nn., the Department will add the words “or while in transport” before the word “storage” in NDAC Subdivision 33-10-23-08(2)(c).
- In response to Comment IV.oo., the Department will change the wording in NDAC Subdivision 33-10-23-08(3)(a) to the following:

“a. The licensee shall develop a schedule and procedure for assessing the condition of each tank containing TENORM waste. The schedule and procedure must be adequate to detect cracks, leaks, corrosion and erosion that may lead to cracks, leaks, or wall thinning to less than the required thickness to maintain vessel integrity. Procedures for emptying a tank to allow entry, procedures for personnel protection, and inspection of the interior must be established when necessary to detect corrosion of the tank sides and bottom. The frequency of these inspections shall be performed at intervals not to exceed 12 months. Records shall be maintained for a period of 5 years.”

- In response to Comment IV.xx., the Department will add the words “or cubic yards” after the word “tons” in NDAC Subdivision 33-10-23-08(4)(e).
- In response to Comment IV.rr., the Department will add the words “or cubic yards” after the word “tons” and add the wording “Quarterly summary reports shall be maintained for a period of 3 years.” in NDAC Subsection 33-10-23-08(7).
- In response to Comment IV.jjj., the Department will remove the words “treatment or disposal unless otherwise authorized in writing by the department” in NDAC Subsection 33-10-23-11(3).
- In response to Comment IV.kkk., the Department will add the following Subsections to NDAC Section 33-10-23-11:

“4. A specific license is required to possess or use TENORM for the purposes of processing, treatment or disposal.”

“5. A specific license is required to transport TENORM upon public roadways.”

- For clarification, the Department will add the word “specific” before the word “license” in NDAC Subsection 33-10-23-28(1).
- In response to Comment IV.llll. and Comment IV.nnnn., the Department concurs with removing the one year of on-the-job training requirement for the radiation safety officer and will remove Paragraph (2) of NDAC Subdivision 33-10-23-28(1)(a).
- In response to Comment V.oo., two sections of this proposed Chapter (NDAC 33-20-11-01 and NDAC 33-20-11-03) include reference to NDAC 33-10-03 - Licensing of Radioactive Material. This is a typographic error; it should reference NDAC 33-10-23 in both locations. This will be corrected in the final proposed rules.
- In response to Comment V.jj., the Department will change the wording of NDAC Subsection 33-20-11-04 to the following:

“33-20-11-04. Monitoring. The leachate collection system and groundwater monitoring network shall be analyzed for background concentrations of naturally occurring radionuclides prior to receipt of any TENORM waste. Leachate shall be analyzed for radionuclides at the same frequency as groundwater samples are collected. If radionuclides are detected in the leachate at a concentration greater than the concentrations listed below, then the groundwater monitoring network must begin analysis for radionuclide parameters.

Radon: 4,000 picocuries per liter (pCi/L)

Combined Radium-226 and Radium-228: 5 pCi/L

Alpha particle activity (including Radium-226, excluding radon and uranium): 15 pCi/L

Uranium: 30 micrograms per liter (ug/L)”

- In response to Comment V.kk., the Department will change the wording of NDAC Section 33-20-11-05 to the following:

“33-20-11-05. Reporting. Landfills approved for the disposal of TENORM waste shall file with the department a quarterly summary report stating the date, type and total quantity by weight in tons, generator and final disposal facility of each TENORM transferred. Each report shall be filed within thirty days of the end of each quarter. If no transfers of TENORM have been made during the reporting period, the report must so indicate.”

- In response to Comment V.ll., the Department will change the wording of NDAC Section 33-20-11-06 to the following:

“33-20-11-06. Worker training and safety. Landfills approved for the disposal of TENORM waste shall implement a worker training program and

safety program to meet the requirements of Section 33-10-23-27, so that protection of workers complies with radiation protection standards of chapters 33-10-04.2 and 33-10-10.1. The training and safety program shall be approved by the department prior to receipt of any TENORM waste.”