Uniform Waste Manifest Forms (NRC Form 540, 541, and 542)

Frequently Asked Questions

Date: July 26, 2021

1. Will the NRC will be changing the uniform waste manifest (UWM) format in June 2021 from the version that was issued last year?

The NRC will not be making any additional changes to the UWM beyond what was published on July 2, 2020 (<u>85 FR 39936</u>) and the forms that appear at the end of <u>NUREG/BR-0204</u>, <u>Revision 3</u>.

2. When do the Revision 3 UWM forms need to be implemented?

On June 25, 2021, the U.S. Nuclear Regulatory Commission (NRC) published a Federal Register Notice (86 FR 33783) announcing that the revised UWM Forms, consistent with NUREG/BR-0204, Revision 3, are available. As noted in the FRN, the forms have a 90-day implementation period and users should transition to the revised forms on or before September 23, 2021.

3. Did you mean for the UWMs to be 8.5x11 letter size? Can waste shippers still use legal size 8.5x14?

Yes, waste shippers may use legal size for UWMs. The emphasis of the equivalent form should be on the content and clarity of information. The example forms included in NUREG-BR/0204, Rev 3 are formatted as 8.5 x 11 size for convenience, however, the 8.5 x 14 size included in NUREG-BR/0204, Rev 2 continues to be acceptable for equivalency.

4. Does NRC accept the use of statistics to provide confidence in any analysis of data and development of scaling factors?

Yes, NRC would accept the use of statistics as the basis for scaling factors.

5. Where should the data flags be entered on the Form 541? Block 1 or Block 16? Would the NRC be willing to post examples of their manifest format on their website showing the "*" and "#" indicators for indirect method and LLDs?

The data marking flags in NUREG/BR-0204, Revision 3 are guidance intended to assist disposal facilities with understanding their waste inventory. They are not required by NRC regulations. Waste shippers should consult with the receiving facility to determine if the use of data flags is desired. However, staff provide the example Form 541 below for a hypothetical waste shipment to suggest how the data marking flags may be used in both Block 1 (asterisk) and Block 16 (#).

NUREG/BR-0204, Revision 3 provides instructions on how to fill out the Form 541.

On page 10 the instructions for Form 541, Box 1: Manifest Totals state: ...Any value based on an LLD should be entered in parenthesis.... The activities for the shipment reported in Item 1 should include the sum of the activity developed based on measurements, LLD values, and indirect methods, as applicable. If any portion of the reported activity was determined based on LLD values or indirect methods, <u>mark the reported activity with an asterisk</u> and provide additional details on the method used to determine the activity under Item 16 as described below.

On pages 14-15 the instructions for Form 541, Box 16: Radiological Description state: If the reported activity is developed based on an LLD value or the use of indirect methods, the activity should be marked with <u>parentheses for LLD-based</u> <u>values and with a pound (#) sign for values based on indirect methods</u>. If more than one method is used to develop the activity (e.g., a portion of the activity for a radionuclide is developed based on actual measurements and a portion is developed based on an indirect method or LLD value), <u>write the</u> <u>activity for the radionuclide developed using each method separated by a</u> <u>slash (/) and mark the activity as described above as appropriate</u>. 5,000 / 2,500# / (2,500)

The asterisk may be used in Box 1 because of the limited entry space to point to the more detailed flags that may be noted in Box 16. In Box 16, waste shippers may enter additional flags for radionuclides not listed in Box 1.

See attached example form at the end of these FAQs. Please note there was an error in slide 17 of <u>NRC Staff Presentation (ML21039A763)</u> which shows a # in Box 1 rather than an *.

6. Do I have to quantify the less than ("<") concentrations (sometimes called <LLD values) as actual concentrations and include the "LLD" values in the calculation of the waste class?

NRC staff use the terminology "LLD" to refer to the values that are reported by analytical laboratories as non-detected (e.g., I-129 at <0.0008 μ Ci/cm³), however, staff understands that industry practice often continues to use the term LLD for the concentrations that are scaled up from these initial LLD values (e.g., I-129 at <0.02 μ Ci/cm³). See slides 27 and 28 of <u>NRC Staff Presentation (ML21039A763)</u>. For clarity, NRC staff use the term "< concentrations" for the latter scaled up values in this FAQ.

The values of the radionuclides that are entered onto Form 541, Radiological Description (Box 16 on UWM forms dated 6-2021) should be the waste generator's best estimate of the inventory in the waste. These values should be used to calculate the waste class (Box 17 on UWM forms dated 6-2021).

In some cases, this will be a (LLD) value that is based on the <u>1983 BTP</u>. In other cases, it will be (1) a scaled value based on a detected "key radionuclide" such as Co-60, (2) a constant value, or (3) a measured value. All of these values should feed into the waste classification and all of the values should have adequate justification.

7. What do I do with the less than ("< ") concentrations (sometimes called <LLD values) for radionuclides that I know are not present in the waste? Can I enter an activity of 0 on the manifest and in the waste classification calculation?

NRC staff use the terminology "LLD" to refer to the values that are reported by analytical laboratories as non-detected (e.g., I-129 at <0.0008 μ Ci/cm³), however, staff understands that industry practice often continues to use the term LLD for the concentrations that are scaled up from these initial LLD values (e.g., I-129 at <0.02 μ Ci/cm³). See slides 27 and 28 of <u>NRC Staff Presentation (ML21039A763)</u>. For clarity, NRC staff use the term "< concentrations" for the latter scaled up values in this FAQ.

It is generally not acceptable to assume an activity of 0 for radionuclides present at < concentration values without an adequate basis, such as process knowledge about the waste generated. For example, if a generator has process knowledge that there is no fission occurring in their process to generate waste streams containing specific hard-to-detect radionuclides and the initial radioactivity inventory did not include the specific radionuclide of concern, then it may be appropriate to use a 0 value or a NP on the manifest.

8. Is NRC open to providing additional guidance on Tc-99 and I-129 quantities as part of waste classification? Would NRC consider reconvening a second meeting on the lower- limit of detection (LLD) issue prior to the effective date for Version 3 of the waste manifest forms?

NRC understands based on public comments that there may be limitations with commercial analytical laboratories quantifying the concentrations of the hard-to-detect radionuclides below the LLDs in the <u>1983 BTP</u>. The NRC staff is committed to working with industry and licensees to identify an appropriate approach and/or guidance vehicle for using LLDs to report hard-to-detect radionuclides, separate from issuing Revision 3 of the UWM forms. NRC staff believes developing such guidance is a longer-term effort that would benefit from additional stakeholder interactions.

9. Could the NRC provide "generic scaling factor" guidance for the four hard-todetect reportable nuclides (C-14, H-3, Tc-99, I-129)?

Although the NRC has not endorsed any specific generic scaling factors for the purpose of determining the inventory of hard-to-detect radionuclides in low-level radioactive waste, per regulations in 10 CFR Part 61.55(a)(8), licensees can use indirect methods, such as scaling factors, to determine the concentrations of radionuclides in waste for the purpose of waste classification *if there is reasonable assurance that the indirect methods can be correlated with actual measurements*. In 2015, the NRC published NRC Regulatory Issue 2015-02 to note that licensees have the option to use indirect methods to determine the activity of tritium (H-3), carbon-14 (C-14), technetium-99 (Tc-99), and iodine-129 (I-129) reported on the uniform waste manifest when the radionuclide is present at a concentration less than the lower limit of detection (LLD) and to provide additional guidance on the use of scaling factors. Shippers can use either site-specific or generic scaling factors as long as the reasonable assurance statement above is met.

NRC is not able to provide generic scaling factors for the four hard-to-detect reportable nuclides given the amount of research that would be involved and the heterogeneity of radioactive waste generated. However, NRC staff may be able to review industry submittals of calculated generic scaling factors (e.g., responses to the staff's <u>Request for Additional Information</u> on the previously submitted EPRI report entitled, "<u>Development of Generic Scaling Factors</u> for Technetium-99 and Iodine-129 in Low and Intermediate

Level Waste, November 2015") if requested in the future. Or industry may develop a white paper detailing specific examples and/or approaches to using the data in the EPRI report more generically that the NRC staff could review.

In addition, an individual waste shipper may elect to use the scaling factors in the EPRI report or may chose the approach of developing a maximum or bounding level for hard-to-detect radionuclides based on the data in the EPRI report and this level being used to report inventory on the manifest when the hard-to-detect radionuclide is present at activities that are <LLD. The NRC considers the "bounding level" approach to be an "indirect method" for determining the concentration as is allowed in 10 CFR 61.55 if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The <u>1983 BTP</u> has guidance that this correlation should be within a factor of 10.

To use the scaling factors in the EPRI report or use this "bounding level" approach for a limited set of waste streams would likely be easier than justifying the generic use of such a level. For an individual waste shipper to use the approach of developing a maximum level, the NRC would expect that they would have a justification that data from the PNNL data set that is used to develop the level is applicable to their waste stream and that the level assumed accurately represents or bounds the actual concentration in their waste stream. The evaluation of whether this level is appropriate should be periodically reassessed to ensure that the justification remains valid. This reassessment would not need to include a reanalysis of the data if the waste shipper can technically justify that the maximum level they are assuming is appropriate through other means.

10. Does Box 18 on the Form 540 ask for weight of the container and the weight of the waste or just the weight of the waste?

In former Box 18 of Form 540 (currently Box 17 on Form 540 dated 6-2021), the "Total Weight or Volume" requested is as included in Department of Transportation Regulations found at <u>49 CFR 172.202(a)(5)</u>.

In most cases, the regulations indicate the total weight or volume for the hazardous materials only, and not the container.

However, there are some exceptions for transportation by aircraft $\underline{49 \text{ CFR } 172.202}$ (a)(6), that discuss including the container as gross mass.

On Form 541, Box 8 requests the "Waste and Container Weight".

11. How do we handle scaling factors for the hard-to-detect radionuclides in software that generates the UWM forms for waste shippers? The software is all rules based, so we need to know what the rules are.

NRC staff believes software developers have several options including, but not limited to (1) using generic scaling factors, if they can be justified for the specific waste streams and the specific site (2) using waste-specific scaling factors, (3) using constant values for the hard-to-detect radionuclides, or (4) develop scaling factors based on statistical analysis.

The NRC expects that if a site or software were to use generic scaling factors, they would consider whether the generic information is applicable to the specific facility and waste streams and to understand the range of conditions under which the information is applicable. Scaling factors, whether generic or site-specific, should be periodically assessed to confirm that the values used remain appropriate for the waste stream.

The NRC understands the generator's decision of which method to use can be challenging and depends highly on the range of waste streams generated, the range of concentration levels of the detectable radionuclides, and the volume of waste generated per year containing the hard-to-detect radionuclides.

12. What are the changes to the Forms described by NUREG/BR-0204, Rev 3?

- NRC Form 540/540A
 - Revised certification statement
 - Deleted column 17 on Form 540 (duplicate request for Low Specific
 - Activity/Surface Contaminated Object class)
- NRC Form 541/541A
 - Additional column for waste weight on Form 541
- NRC Form 542/542A
 - Minor formatting changes (applies to all forms)

13. Do I need to use the NRC version of the UWM Forms?

Waste shippers may use the NRC form in the NRC forms library or may also use software to generate an equivalent form. 10 CFR Part 20, Appendix G defines that "Licensees need not use originals of these NRC Forms as long as any substitute forms are equivalent to the original documentation in respect to content, clarity, size, and location of information.

Because NRC must comply with the Paperwork Reduction Act (PRA) as a Federal Agency, use of the NRC forms or any equivalent forms (that are essentially "sponsored" by the NRC) must include the OMB clearance number, the expiration date, and the Paperwork Reduction Act statement that includes the estimated burden to fill out the form.

NRC recommends that waste shippers discuss with the receiving facility first to determine what form they use, in particular if it is located in an Agreement State that may be using equivalent forms that are consistent with their State regulatory program.

14. What if I am shipping to an "Agreement State"?

NRC recommends that waste shippers discuss with the receiving facility first to determine what form they use, in particular if it is located in an Agreement State that may be using equivalent forms that are consistent with their State regulatory program.

The NRC Form 540, 541, and 542 are designated Compatibility Category D, which means adopting the NRC forms is not required for purposes of compatibility. Therefore, Agreements State regulators may make changes to the NRC forms as needed for their regulatory program.

However, the NRC staff recommends that all waste manifest forms be "equivalent" to the NRC forms with respect to content, clarity, size, and location of information to ensure all the data required for efficient waste disposal is included. Agreement State forms should not be labeled "NRC Form" if they are not the exact forms on the NRC forms library that NRC sponsors in accordance with the Paperwork Reduction Act. Agreement State forms also should not include the OMB clearance number, the expiration date, and the Paperwork Reduction Act statement that is present on the NRC forms, so as not to imply that the Agreement State forms have undergone the OMB approval process required of Federal agencies.

15. What are the changes in NUREG/BR-0204, Revision 3?

The primary changes in NUREG/BR-0204 Revision 3 include the following:

- updated instructions to reflect changes to the Uniform Manifest forms
- updated references to DOT regulations to reflect the current DOT regulations
- additional discussion on the reporting of inventories based on lower limit of detection values
- the potential use of indirect methods to determine these inventories
- the use of indirect methods in waste classification calculations
- additional clarification of the certification statement on Form 540 to account for cases where waste is shipped to a processor or collector
- overall improvements to the clarity of the document

16. What is considered to be a significant radionuclide?

A radionuclide (RN) is "significant" if:

- RN concentration > 0.01 x Table 1 of 10 CFR 61.55, or
- RN concentration > 0.01 x the smallest concentration in Table 2 of 10 CFR 61.55, or
- RN concentration > 0.01 x the receiving disposal facility Waste Acceptance Criteria (WAC), or
- the radionuclide is not listed in either the 10 CFR 61.55 tables or a land disposal facility WAC, <u>and</u> it is present in the waste in concentrations > 0.26 MBq per cm³

Significant radionuclides **should** be reported on the UWM and **included** in the waste class calculation.

17. Can we enter our best estimate of what the volume is in the disposal trench instead of estimating bulk shipping volume? We are often now required to put in shipping container on the 541 Form, but there is no disposal -- in the disposal container. Are we allowed to say that it is a bulk unpackaged shipment?

NRC Forms 540 and 541 have different information and purposes. Most of the information on NRC Form 540 (Shipping Paper) is needed to meet the U.S. Department of Transportation shipping paper requirements for radioactive material shipments. Similarly, most of the information requested on NRC Form 541 is needed to meet 10 CFR 20 Appendix G.

The regulations in 10 CFR Part 20, Appendix G (I)(D)(1) refer to "uncontainerized waste" and require that the shipper of the radioactive waste provide its approximate volume and

weight on the uniform waste manifest. Neither the regulations nor the guidance exempt the shipper from reporting the volume of the waste that is shipped on the NRC forms. Therefore, the reporting of the actual as-shipped volume of waste (i.e., the volume that is placed in the ground prior to compaction) on NRC Form 541 is required. Both NRC Form 540 and NRC Form 541 should have accurate information that reflects the properties of the waste as it is shipped. This includes information for uncontainerized waste.

18. Would the NRC be receptive to us looking at the Pacific Northwest National Laboratory (PNNL) dataset, separating out the datapoints from plants that did not have a fuel defect, using those datapoints to develop a level above which nothing was found, and using that number on the manifests? Would NRC allow the plants and shippers to not have to re-certify this level with a new sample? The commercial laboratories are not able to get within a factor of ten of what is actually there.

The NRC is open to the approach of a maximum or bounding level being developed for hard-to-detect radionuclides and this level being used to report inventory on the manifest when the hard-to-detect radionuclide is present at activities that are <LLD. The NRC considers this approach to be an "indirect method" for determining the concentration as is allowed in 10 CFR 61.55 if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The <u>1983 BTP</u> has guidance that this correlation should be within a factor of 10.

From the perspective of safely managing waste, the NRC is concerned about indirect methods that underestimate the concentration and therefore underestimate risk. However, from a regulatory perspective, it is acceptable for a shipper to use an indirect method that results in a conservative estimate that may overestimate the activity by more than a factor of 10. While the use of a conservative approach is acceptable for satisfying the regulations, shippers who use this approach should be aware that this could lead to other consequences (e.g., effects of overestimating the manifested inventory on disposal facility capacity).

The data in the PNNL report are for a relatively limited set of waste streams and these samples were measured over 20-30 years ago. The development and use of a generally applicable maximum level that can be used for a wide variety of waste streams from a wide variety of nuclear power plants, would require a justification that the data is applicable to all waste streams that the level might be used for and that the data from a few decades ago remains valid today. The NRC issued a <u>Request for Additional</u> <u>Information</u> on this topic on EPRI report entitled, "<u>Development of Generic Scaling</u> <u>Factors</u> for Technetium-99 and Iodine-129 in Low and Intermediate Level Waste, November 2015") that used the PNNL data to develop scaling factors that have not been answered, due to EPRI putting the review on hold. The NRC staff anticipates that industry would need to address many of the questions raised for the EPRI report in order to justify the use of a generic level.

The justification for an individual waste shipper to use this "maximum level" approach for a limited set of waste streams would likely be easier than justifying the generic use of such a level. For an individual waste shipper to use the approach of developing a maximum level, the NRC would expect that they would have a justification that data from the PNNL data set that is used to develop the level is applicable to their waste stream

and that the level assumed accurately represents or bounds the actual concentration in their waste stream. The evaluation of whether this level is appropriate should be periodically reassessed to ensure that the justification remains valid. This reassessment would not need to include a reanalysis of the data if the waste shipper can technically justify that the maximum level they are assuming is appropriate through other means.

19. Regarding the current FAQ which states "using constant values for hard-todetect radionuclides is an option for software developers", please confirm that an annual or biennial 10 CFR 61 sample Lower Limit of Detection (LLD) value could be applied to all packages for the applicable period as a constant.

As stated in FAQ# 11, "NRC staff believes software developers have several options including, but not limited to (1) using generic scaling factors, if they can be justified for the specific waste streams and the specific site, (2) using waste-specific scaling factors, (3) <u>using constant values for the hard-to-detect radionuclides</u>, or (4) develop scaling factors based on statistical analysis."

To further clarify, the NRC staff expects that generators that elect to use a constant value(s) for the hard-to-detect radionuclide(s), should justify that the value is a conservative, bounding value that is representative of the waste stream and there is reasonable assurance that the actual concentration of that radionuclide in the waste is below that constant value. Using the LLD values from 10 CFR Part 61 sampling <u>may</u> be appropriate if the value can be justified in this manner. Historic plant information may also be used to justify using such constant values, e.g., if the nuclear power plant has never experienced fuel failure.

However, the NRC staff expects the generator to justify that the constant value applies to the waste characterization for "all packages" that it uses such constant values developed from the 10 CFR Part 61 sample LLD values. For example, assuming a constant value from a sample with low concentrations of Tc-99 may not be applicable to waste streams containing other radionuclides or waste streams expected to contain higher concentrations of Tc-99.

As stated in FAQ#18 "The NRC is open to the approach of a maximum or bounding level being developed for hard-to-detect radionuclides and this level being used to report inventory on the manifest when the hard-to-detect radionuclide is present at activities that are <LLD. The NRC considers this approach to be an "indirect method" for determining the concentration as is allowed in 10 CFR 61.55 if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The <u>1983 BTP</u> contains guidance that this correlation should be within a factor of 10, (i.e., generators should ensure that concentrations are not underestimated by more than a factor of 10)."

Licensees should clearly define the ranges of waste concentrations and/or waste streams over which the constant value (or any selected indirect method) applies in their waste characterization procedures. This range does not need to be entered on the Uniform Waste Manifest.

20. In those cases where an Agreement State does not adopt the change to include LLD values for waste classification, licensees will continue to comply with Agreement State direction. Please confirm continued acceptability of this approach.

As stated in FAQ# 6,

"NRC staff use the terminology "LLD" to refer to the values that are reported by analytical laboratories as non-detected (e.g., I-129 at <0.0008 μ Ci/cm³), however, staff understands that industry practice often continues to use the term LLD for the concentrations that are scaled up from these initial LLD values (e.g., I-129 at <0.02 μ Ci/cm³). See slides 27 and 28 of <u>NRC Staff Presentation</u>. For clarity, NRC staff use the term "< concentrations" for the latter scaled up values in this FAQ.

The values of the radionuclides that are entered onto Form 541, Radiological Description (Box 16 on UWM forms dated 6-2021) should be the waste generator's best estimate of the inventory in the waste. These values should be used to calculate the waste class (Box 17 on UWM forms dated 6-2021).

In some cases, this will be a (LLD) value that is based on the <u>1983 BTP</u>. In other cases, it will be (1) a scaled value based on a detected "key radionuclide" such as Co-60, (2) a constant value, or (3) a measured value. <u>All of these values should feed into the waste classification and all of the values should have adequate justification</u>."

To further clarify, NRC staff do not believe that including the LLD values or "< concentrations" in the waste classification is a "change" to existing NRC guidance. NRC regulations require waste generators to properly classify their waste streams such that they understand the risk appropriately. If including the "< concentrations" for waste classification, as the question asks, changes the waste classification (e.g., from Class A to Class B), then there is uncertainty in what the waste class is and how the risk from the waste should be managed. To reduce this uncertainty, and ensure that the waste is managed appropriately, the generator should evaluate the concentrations in the waste stream further. Alternatively, the generator could dispose of the waste as the higher class.

NRC staff understands that some of its Agreement State partners may provide differing guidance to waste shippers on this issue, and NRC continues to invite discussion and technical partnering with its Agreement States. Waste shippers should rely on the guidance from their regulators. In the case of a nuclear power plant (i.e., NRC licensee) shipping waste to an Agreement State waste disposal or waste processing facility, these waste shipments will be inspected in accordance with NRC guidance and regulations (e.g., NUREG/BR-0204, Revision 3). NRC licensees should expect to provide adequate justification for waste manifesting decisions during an NRC inspection to demonstrate compliance with 10 CFR Part 20, Appendix G and 10 CFR Part 61. The NRC guidance in NUREG/BR-0204, Revision 3 provides a method for justifying waste manifesting decisions. Therefore, the "acceptability" of the approach outlined in the submitted question should be determined on a case-by-case basis.

21. If a 10 CFR 20 App G LLD nuclide (H-3, C-14, Tc-99, I-129) is below the significance threshold conditions, would LLD values only contribute to waste class if exceeding the threshold?

As stated in FAQ# 16,

A radionuclide (RN) is "significant" if:

- RN concentration > 0.01 x Table 1 of 10 CFR 61.55, or
- RN concentration > 0.01 x the smallest concentration in Table 2 of 10 CFR 61.55, or
- RN concentration > 0.01 x the receiving disposal facility Waste Acceptance Criteria (WAC), or
- the radionuclide is not listed in either the 10 CFR 61.55 tables or a land disposal facility WAC, <u>and</u> it is present in the waste in concentrations > 0.26 MBq per cm3

Significant radionuclides **should** be reported on the UWM and **included** in the waste class calculation.

To further clarify, if a radionuclide does <u>not</u> meet the criteria above to be significant, then it does <u>not</u> need to be included in the waste classification calculation.

- 22. Should 10 CFR 20 Appendix G radionuclide LLD values be used on the Form 541 for any other purpose than waste class? An LLD value is not a real value to contribute to other regulatory fractions.
 - Total Package and Shipment activity?
 - Nuclide abundance calculations?
 - Department of Transportation (DOT) A1/A2 calculations?
 - Reportable Quantity calculations?
 - Thermal Watt calculations?
 - Hydrogen generation calculations?
 - NRC Regulatory Guide 1.21 reporting?
 - Should LLD Appendix G nuclides be required on Waste Profile validation reports?
 - Should LLD Appendix G nuclides affect the Radioactive Report, Part 61 report and DOT/NRC Report?
 - Should LLD Appendix G nuclides be factored into "Long Lived Nuclides" calculations?

The reported radionuclide activity in

Form 541, Box 1: **Manifest Totals** (see page 9-10 of NUREG/BR-0204, Rev 3) and **Form 541, Box 16**: **Radiological Description**, (see page 14-15 of NUREG/BR-0204, Rev 3) should represent the best estimate of the total activity and should consider the measured activity, the activity based on the lower limit of detection (LLD) values, or indirect methods, as applicable. See FAQ#5 for use of flags for LLDs in these boxes.

Regulatory Guide 1.21 states that waste shippers should report major radionuclides present in solid waste shipped. If these radionuclides are a considered by a licensee to be a major radionuclide, they should be included and reported.

The data that is reported as <LLD, or a calculated "< concentration" based on a laboratory reported <LLD, is more uncertain than detected concentrations, however, such data provide useful waste characterization information. If the use of such data impact the results significantly for any of these calculations above, then reporting or including the data should be evaluated. The licensee may want to understand the sensitivity of their calculations to the radionuclides that may be characterized as <LLD or "< concentrations". If the use of such data cause high uncertainty in any of the above the calculations, the licensee may want to consider indirect methods or alternate inventory approaches for these calculations.

Waste shippers should consult with DOT for the items above that are related to DOT regulations.

APPROVED BY OMB: NO. 3150-0166 E

Estimated burden per response to comply with this information collection request: 3.3 hours. This uniform manifest is required by NRC to meet reporting requirements of Federal and State Agencies for the safe transportation and disposal of low-level waste. Send comments regarding burden estimate to the Information Services Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects, Resource@mc. ox. and to the Desk Officer. Office of Information and Reculatory Affairs, NEOB-10202. (3150-0166). Office of Manacement and Budget, Washington, DC 20553. If a means used to impose an

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														Co-57 6.14E Co-58 6.14E Co-60 3.15E	:+03 :+04 :+05	
					-									Ni-59 8.75t	Ξ+03	
This For is only pr	m 541 is bi ovided to (ased on a h demonstrat	nypothe e use o	tical ex f the d	ample anc ata flags									Ni-63 2.1 ⁵ Zn-65 7.6 ⁶ Sr-90 3.50 Tc-99 7.69	E +06 3E+03 E +03 E +01	
														Sb-125 9.4 Cs-134 3.6 Cs-137 6.00 Ce-144 1.77	7E+03 :5E+05 0E+05 DE+05	
														Am-241 1/4 Cm-242 3.6 Cm-243 2.1 1-129 (5.1	47E+01 00E+01 8E+01 11E+00)	
														TOTAL: 4.	56E + 06	
NOTE 1: Container - requiring disposal in - code should be follov 1. Wooden Box or C	Description Code: approved structur ved by "-OP." trate 10.	s. For containers/ ral overpacks, the r . Gas Cylinder	waste numerical	NOTE 20. C 21. Ir 22. S	 Z: Waste Desci harcoal ncinerator Ash oil 	riptor Codes. (31. 32.	(Choose up to Anion Ion-ex Mixed Bed Ic Contaminate	, three which pre- change Media 3n-exchange Me- id Equipment	dominate by vc 41. Anima dia Carca:	olume.)	VOTE 3: For hould be follc or all solidific 00=NONE RI	solidification r owed by "-S." cation media, EQUIRED.	nedia that meet dis the vendor (manuf	sposal site structural stability i "acturer) and brand name sho	equirements, the nur uld also be identified Solidification	merical code in item 14. Code
 Metal Box Plastic Drum or F Metal Drum or Pa 	lail 13. ii	. Bulk Unpackage . Unpackaged Cor . High Integrity Co.	d Waste mponents intainer	23. G 24. C 25. A	3as Jil queous Liquid	34. 35.	Organic Liqu Glassware o Sealed Sour	uid (except oil) r Labware ce/Device	Aaterial (e animal car 43. Activa	except 6 cass) 6 ted 6.	60. Speed Dr 11. Celetom 2. Floor Dry/	i 67 68 69.	Florco X Solid A Sorb Chemsil 30	75. Petroset II 76. Aquaset 77. Aquaset II	90. Cement 91. Concrete (92. Bitumen	encapsulation)
 Metal Tank or Lir Concrete Tank oi Polyethylene Tan Fiberglass Tank c Demineralizer 	ler 19 r Liner k or Liner sr Liner	. Other. Describe or additional pag	in item 6, je	26. F 27. N 28. E 29. D 30. C	Ilter Media Aechanical Filter PA or State Haza Demolition Rubble ation Ion-exchan	37. 38. ardous 39. ge Media 40.	Paint or Plat Evaporator f Sludges/Cor Compactible Noncompact	ing Bottoms/ ncentrates Trash ible Trash	Mater 59. Other. Describe ii 12, or addi page	ial 6 itional 6 6	Superfine 33. High Dri 14. Safe T So 5. Safe N Dr 6. Florco	rto 71. 71. 72. 71. 73.	Chemsil 50 Chemsil 3030 Dicaperl HP200 Dicaperl HP500 Petroset	89. Other. Describe in item 1 or additional page	 4, 93. Vinyl Chlor 94. Vinyl Ester 99. Other. Dester or additional patientian 100. None Rec 	ide Styrene scribe in item 14, ge quired

NRC FORM 541 (MM-YYYY)