Hi Cynthia, thanks for the opportunity to review the NRC 1757 NUREG-1757, Volume 2, Revision 2, "Consolidated Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria." We would like to provided additional comments to our original submission. We will provide our comments by the April 8 deadline, thanks so much for your coordination, Jennifer

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Review Comments of the NUREG 1757, Vol 2, Rev 2

APRIL 2021

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General			The inclusion of lessons learned and references with examples is helpful for perspective on implementation of the requirements.
General			There are multiple references to the draft NUREG-2175. DOE believes that such references are inappropriate for a regulatory document because the Commission has directed that significant revisions be made to draft NUREG-2175. DOE made a similar comment on the GUIDANCE FOR THE REVIEWS OF PROPOSED DISPOSAL PROCEDURES AND TRANSFERS OF RADIOACTIVE MATERIAL UNDER 10 CFR 20.2002 AND 10 CFR 40.13(A) and in the comment response NRC staff did not remove the citation in that guidance. DOE does not agree with that comment resolution and continues to believe that citing a draft document on which the Commission has directed substantial revisions is not appropriate.
Iv	*ABSTRACT*	*Para. 1, Line 3*	Clarify what Scenario B is - Change “implementation of Scenario B” to “implementation of final status survey statistical test Scenario B”.
viii	*Table 2*	*5th item under Subject*	Change “implementation of Scenario B” to “implementation of final status survey statistical test Scenario B”.
xxxi	*Glossary*	*Para. 2, Line 9*	Change “RESRAD Code” to “RESRAD-ONSITE Code” and add in the discussion “RESRAD code, RESRAD (onsite) and RESRAD-ONSITE in the document all refer to current RESRAD-ONSITE code.” RESRAD code is identified as RESRAD-ONSITE beginning July 2016, with version 7.2.

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2-3	2.1	7	The risk-informed approach to site-specific dose modeling for compliance demonstration through allowing for the site-specific selection of risk-significant exposure scenarios, exposure pathways, and critical groups, selection of conceptual models, numerical models, and computer codes incorporating risk-significant elements of a site, as well as expecting site-specific data for the more risk-significant input parameters is an essential addition to the document. May want to include the required verbiage in the contract documents used to ensure the site-specific data is provided. Noting it is *expected* may not indicate it is a requirement.
2-11	2.6	2	It is stated that for site-specific analyses, the peak of the mean dose over time (e.g. 1,000 years) may be used to estimate dose for compliance with 10 CFR Part 20 Subpart E. This 1,000-year time period is consistent with requirements of Subpart E and DOE supports the use of a 1,000-year time period for strict compliance with the dose standards.
2-12	2.7	Footnote 3	Footnote 3 advises caution when using a peak of the means that is significantly different than the mean of the peaks. This seems to potentially lead to a situation where licensees would be forced to report extreme mean of the peaks results for what will be a very subjective comparison with the peak of the means (e.g., how much difference does staff consider significant?). Any comparison of peak of the means and extreme results reflected by mean of the peaks has the potential to lead to misinterpretation by stakeholders. It is recommended to not imply a need to calculate and report extreme results like the mean of the peaks. It seems more appropriate to provide guidance on how to identify distributions that may be overly broad that could lead to risk dilution.

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4-19	4.5.1.2.3	Lines 27 & 29	Change "DCGLW" to "DCGLw".
4-20	4.5.1.2.4	Line 31	Define Type I and Type II errors or reference where they are defined in the document.
5-6	5.2	3	"*The intake-to-dose conversion factors from Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," issued September 1988 (EPA 520/1-88-020) (EPA, 1988b), which are based primarily on adults, should be used when calculating internal exposures*." Is use of EPA 1988b a firm requirement or can licensee's substitute other more recent internal dose conversion factor (DCF) reference documents? More recent internal DCF are available in DOE's *Derived Concentration Technical Standard* (DOE 2011), which are based on ICRP Publication 72 (ICRP 1996),
5-8	5.2	4	If the "mean of the peaks" dose is significantly higher than the "peak of the mean" dose, then "risk dilution" may be an issue in the probabilistic model. As stated in previous comment, mean of the peaks represent extremes and reporting such results could result in misinterpretation of reasonably expected impacts by stakeholders. Recommend focusing guidance on identifying other indicators of risk dilution, such as overly broad ranges for input distributions, rather than implying the need to calculate and report mean of the peaks results.
5-13	5.4.2	1	It is stated that "*In rare instances, an exposure scenario involving offsite use of residual radioactivity may be the critical exposure scenario*". Does the NRC expect offsite exposure scenarios to be evaluated in the DP and what is NRC's criteria for evaluating offsite exposure scenarios? Offsite use of residual radioactivity may

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			include exposure pathways immediately downstream of a licensee's facility to an exposure pathway associated with a low-level waste disposal facility located 1,000's of miles from the facility in the western United States.
5-21	5.5.2	Line 15	Provide reference for dissolved solids of 30,000 milligrams per liter limit in groundwater use, or change this to read as "a licensee may eliminate the use of groundwater for drinking or irrigation because the near surface aquifer has total dissolved solid that exceeds the water quality for drinking or agriculture use".
5-27	*Table 5.2*	*1st row left column, 2nd bullet*	The NUREG states that residual radioactivity is present in approximately the top 30 cm of soil for screening. DandD code is used for screening analysis and DandD code assumes 15 cm soil thickness in the resident farmer scenario (see Page I-59, Line 8). Explain why 30 cm is used here?
5-24	5.5.2	Line 35+	On page 2-11 it is stated that "For site-specific analyses, the peak of the mean dose over time (e.g. 1,000 years) may be used to estimate dose for compliance with 10 CFR Part 20 Subpart E." Thus, it is inconsistent and does not seem appropriate to include mean of the peaks here. The compliance should be based on "peak of the means" and reference to mean of the peaks should be removed. As discussed in other comments, the "mean of the peaks" reflects extremes that could give the wrong impression to stakeholders about reasonably expected impacts.
E-5	E.6	3	Document denotes, the surveyor will decide whether the signals represent only the background activity, or whether they represent residual radioactivity more than background. Some factors that may affect the surveyor's performance include the costs associated with various outcomes—e.g., cost of missed residual radioactivity versus cost of incorrectly identifying areas as containing residual radioactivity—and the surveyor's expectation of the likelihood of residual radioactivity being present. For example, if the surveyor

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			believes that the potential for residual radioactivity is very low, as in an unaffected area, then a relatively large signal may be needed for the surveyor to conclude that residual radioactivity is present. NUREG/CR–6364, "Human Performance in Radiological Survey Scanning," issued 21 March 1998, contains a complete discussion of the human factors as they relate to the performance of scan surveys. Is there a universal protocol used to ensure the evaluation is more objective?
F-13	F.10	Footnote 4	Current footnote: RESRAD-OFFSITE 3.2 considers sources located below the water table, although guidance on potential use of RESRAD-OFFSITE to consider existing groundwater contamination has not yet been developed. A future revision to this volume may include evaluation of this tool and its efficacy in considering existing residual radioactivity in groundwater. Comment: Section G.5 of the "User's Manual for RESRAD-OFFSITE Code Version 4" has a description of the submerged primary contamination. Sections G.11 through G.14 have the mathematical outline of the formulations to model the submerged primary contamination.
F-16	F.10.2	Para. 3, Line 31	Current text: Notable differences between initial simulations run with RESRAD-ONSITE and RESRAD-OFFSITE included travel times to the point of compliance that were attributable to differences in use of porosity in the transport calculations (i.e., effective porosity is used in RESRAD-ONSITE, while total porosity is used in RESRAD-OFFSITE). Comment: The default expression for retardation factor in the release versions of RESRAD-OFFSITE is the same as the one in RESRAD-ONSITE. The expression for retardation factor used in the prototype version of RESRAD-OFFSITE is available as a user selectable option.

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F-16 Also in I-71	F.10.2 I.5.3.6	Para. 3, Line 35 Para. 1, Line 1	Current text: Another noteworthy difference in results was observed for the water-dependent pathways due to accumulation of radioactivity in soil from application of contaminated irrigation water that is considered in RESRAD-OFFSITE but is not considered in RESRAD-ONSITE. Comment: RESRAD-ONSITE considers accumulation over a single growing season, while RESRAD-OFFSITE models accumulation over multiple years.
F-16	F.10.2	Footnote 7	Add “-ONSITE” as highlighted in the sentence copied as follows. ” It is important to note that RESRAD-OFFSITE also has the capability of mimicking the RESRAD-ONSITE code for calculation of doses to an onsite receptor.”
F-17	F.10.2	Para. 3, Line 24	Current text: Another important difference between the codes tested is related to the calculation of retardation. Because RESRAD-OFFSITE is the only code to consider immobile pore water in the calculation of the retardation factor, the calculated retardation factors can be significantly higher for radionuclides with low retardation factors and if the effective and total porosity are significantly different (e.g., in the Gnanapragasam et al. (2000) study RESRAD-OFFSITE calculated retardation factors are higher by a value of 0.56 (unitless) for all radionuclides due to the difference in total and effective porosity at 0.39 and 0.25, respectively). Differences in retardation factors also have a more significant impact on relatively short-lived[10] radionuclides. Comment: The default expression for retardation factor in the release versions of RESRAD-OFFSITE is the same as the one in RESRAD-ONSITE. The expression for retardation factor used in the prototype version of RESRAD-OFFSITE is available as a user selectable option in the released version.

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G-7	G.3.1	1	Is NRC expecting that licensees develop a contamination concern map (CCM) as part of their decommissioning plan submittal? Should this be included in NUREG 1757 Vol 1 Appendix D?
G-11	G.3.2.1	1	Sheet pilings would preclude surveys of the walls of the excavation. The excavation would require stepped or sloped sidewalls to allow surveying. Suggest some perspective be added for this situation.
G-14	G.3.2.2	1	Are licensees required to submit radioanalytical data for backfill soils used during license termination activities? Does this apply to soil imported from non-impacted offsite sources? Is radioanalytical data for backfill soil expected to be provided as part of the decommissioning plan or final status survey report?
G-14	G.3.2.3	1	Are soil re-use plans a required deliverable of the decommissioning plan or the final status survey process? If a decommissioning plan requirement should re-use plans be referenced in the NUREG-1757 Appendix D decommissioning plan checklist? Do the re-use plans require review and approval from the NRC? Does NRC expect to review characterization and radiological survey plans and results to authorize the re-use of impacted on-site soils?
H-7	Table H.2	NA	According to Appendix I, DandD is inappropriate for analyzing sites that contain hydrogen H-3 and C-14 in soil (see page I-42 lines 11, 12, and 13). Therefore, suggest either removing H-3 and C-14 from Table H.2 or explaining how the surface soil screening values for H-3 and C-14 were determined.
I-4	I.2.1	1st para., Line 4	To be consistent with discussion in Appendix F, use “systems and components” instead of “systems”.
I-14	I.2.3.2	Footnote 5	Current footnote: When a value of “-1” is input into the field for the contaminated fraction for plant food, and the size of the contaminated zone is equal to or greater than 1,000 m^2, RESRAD-ONSITE and RESRAD-OFFSITE assume that 50 percent of the crops consumed by the receptor come from a garden grown in

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			contaminated soil (i.e., no more than 50 percent of the produce comes from the contaminated garden and 2,000 m^2 is needed to support 100-percent home grown produce ingestion rates). For areas less than 1,000 m^2, RESRAD-ONSITE and RESRAD-OFFSITE linearly scale the consumption rates of contaminated produce down from 50 percent for 1,000 m^2 areas to 0 percent for 0 m^2 areas. Comment: -1 flag works as described in the footnote in RESRAD-ONSITE. Can override this by entering a positive value between 0 and 1 to indicate the fraction of contaminated produce from the site. RESRAD-OFFSITE does not use the flag as the agricultural field is not constrained to be atop the primary contamination/contaminated zone. Fraction of produce, meat and milk from the contaminated area is a user input.
I-15	1.2.3.2	1	The document notes, that although the geometry and locations of the elevated areas or "hot spots" differ in the "conceptual model" versus the "actual" configuration, the assumed geometry and elevated area location tends to *overestimate the dose* with the receptor standing directly on top of the hottest contaminated area on the site and in relatively close proximity to the second most contaminated area on site. Depending on the actual size and geometry of the elevated areas being simulated, this method may produce overly conservative results. If less conservative methods are needed to demonstrate compliance, the licensee may propose alternative methods that will require approval by NRC reviewers on a case-by-case basis. Suggest providing further guidance on how this can be achieved.
I-42	I.4.3.1	Para. 3, Lines 11 -13	"As an example, DandD is inappropriate for analyzing sites that contain hydrogen H-3 and C-14 in soil, because DandD considers only the inhalation dose from particulates in the air and does not consider the loss of H-3 and C-14 from the soil to the air as a gas

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			or vapor." Based on this statement, clarify upfront that DandD screening analysis is not appropriate for H-3 and C-14 and explain how the screening values for H-3 and C-14 were derived. Also see Comment on Page No. H-7.
I-57	I.5.3.2	Line 14	Use 2003 version of RESRAD-BUILD User's Manual (ANL/EAD/03-1) instead of "ANL/EAD/LD-3" (ANL 1994).
I-61	I.5.3.6	Lines 7 - 28	This section references old RESRAD-ONSITE and RESRAD-BUILD user's manuals, please update these references with the latest user's manuals.
I-70	I.5.3.6	Line 29	Suggest delete "CE Yu" between "against RESRAD-ONSIE ("and ""benchmarking of".
I-71	I.5.3.6	Line 29	Current text: discharge from surface water Comment: likely referring to contribution from groundwater.
I-72	I.5.3.6	Line 16	Current text: Removal processes include dry and wet deposition, as well as radiological decay. Comment: Ingrowth and decay of short-lived radon progeny during transport in air are modeled.
I-76	I.6.2.3	3rd para, Line 30	Delete Tables 6-1 and 6-3 because these tables do not list default behavioral and metabolic parameters.
I-78	Table I.11 Footnote	Line 12	Current text: There is only one ingestion rate in RESRAD-BUILD. Comment: RESRAD-BUILD has two ingestion rates: receptor indirect and direct ingestion rates (see Table A-6 in NUREG/CR-7627). Receptor indirect ingestion rate: The rate at which an individual ingests deposited dust after it has transferred to hands, foods, or other items at each receptor location. This parameter is used in one of two ingestion pathways. The other pathway is direct ingestion of the contaminated material. The dose from indirect

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			ingestion could be 0 if the ingestion rate is 0 or the deposition velocity is 0. Unlike the direct ingestion rate, the dose from this pathway might be nonzero when the source of contamination and the receptor points are in different rooms Direct ingestion rate: The incidental ingestion rate of contaminated material directly from the source by any receptor in the room. For a volume source, each receptor will ingest the source at a rate determined by the product of the ingestion rate and the amount of contamination in the source at that time. For a point, line, or area source, each receptor will ingest the source at a rate determined by the product of the ingestion rate, the removable fraction, and the amount of contamination in the source at that time.
I-114	I.8	Line 35	ANL/EAD-4 is the reference for RESRAD Manual as stated on Page I-108, Line 16, not for Yu, C., 1999. Please update this reference.
I-115	I.8	3rd para	Line numbers are missing for the last reference. This reference should be moved up in the list of references.
J-1	J.1.1	Lines 28 - 29	Suggest replacing RESRAD with RESRAD-ONSITE. They are also other places in this Appendix, e.g., Section J.3.2, page J-13, Lines 36 and 38, etc.
J-10	J.2.2		The previous scenarios using a residential basement and well for potential on-site exposures after loss of institutional control (Pages J-4-9) are consistent with inadvertent human intrusion scenarios used for low-level radioactive waste (LLW) disposal facilities. However, the newly added “large scale excavation of concrete” scenario described on pages J-10-11 is extreme in the context of what is considered for LLW disposal and was not present in the existing NUREG-1757, Vol. 2, Rev 1. This scenario represents a deliberate, rather than inadvertent,

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			action recognizing that a reinforced concrete structure is present. Excavations deeper than 3 meters were also considered to be too unlikely therefore not included in the original classification calculations for 10 CFR Part 61. Such an action is not consistent with “inadvertent” intrusion, which is assumed to occur when the waste or contaminated material is indistinguishable from soil. Such activities would be expected to involve equipment and workers associated with larger scale projects that would be likely to involve characterization and formal permitting activities (such activities are assumed to not occur for construction of the residential basement and well, although they may also be required). It is recommended to remove this newly added scenario from Appendix J and remove the new sentence added on Page I-36, starting on line 16 and remove the reference to large-scale excavation on P. J-6 in line 3.
N-23	N.3.7	2	Residual radioactivity in a licensee’s groundwater or facility may discharge into surface waters that are utilized downstream as a drinking water source. Is there an expectation that collective dose be included in the ALARA calculation when the concentrations of residual radioactivity in these downstream drinking water supplies are, or nearly are, indistinguishable from background? Large collective doses can be achieved by large populations consuming residual radioactivity that is nearly indistinguishable from background.
L-1	L.3.1	Line 31	This section mentions 30 cm soil thickness as surface soil. This conflicts with DandD code default assumption of 15 cm soil thickness as surface soil. Please clarify or change to 15 cm.
M-8	M 2.2.2	Lines 1 – 10 and	Pond may also get contamination from soil erosion, water runoff, and direct deposition. Deleting aquatic exposure just based on GW

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		Lines 35 - 36	availability at a reasonable depth may not be appropriate in all situations.
P-3 and P-7	P.1.1 and P.1.3	P-3- Lines 14-19 P-7- Lines 10-23	These discussions need to acknowledge more recent research addressing the potential long-term effectiveness of composite covers utilizing clay barriers under a robust HDPE liner. The text is primarily focused on older cover systems that show solely compacted clay is vulnerable to significant degradation but does not sufficiently address research for cases where clay is present beneath an HDPE liner at depths below freeze-thaw. Recent research has shown effective lifetimes for subsurface HDPE liners of hundreds or even thousands of years, which when underlain by a clay layer provides a very robust infiltration barrier.
P-5	P.1.2	3	NUREG-1623 provides guidance for designing erosion protection at uranium mill tailing sites located in arid and semi-arid regions of the western United States. Does the NRC consider the guidance in NUREG-1623 applicable for designing erosion protection for facilities in the humid eastern United States?
P-8	P.1.3	Line 39+	The use of sensors appears to have some appeal, but a great deal of caution is needed when interpreting the results. The text should include some cautions about potential for spurious readings, the real impact of a sensor detecting a crack at one location on the overall performance of the facility, etc. There is a real potential to obtain results that would suggest a problem to stakeholders, when in fact, the measurement may be spurious, or the barriers can be capable of fulfilling their intended function even with a localized change. It poses real communication problems if a single detection from a sensor is interpreted by stakeholders to imply a failure of the barrier.
P-15	P.1.4.1	4	Compacted Clay Barrier

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			"..laboratory and field studies have shown that compacted clay can develop, even within ten years, distinct soil structures such as aggregates and planes of weakness due to pedogenic processes such as wet-dry and freeze-thaw cycling." Are these pedogenic changes associated with compacted clay barriers located/exposed at the surface? Need to include some discussion of the potential for these changes with compacted clay barriers that are located at the base of a modern composite, multi-layer cover system where the clay barrier is well beneath the frost line and protected by an HDPE liner? In general, the text seems to over-emphasize historic, problematic designs with no protection of the clay layer and under-emphasizes modern composite cover designs that have features to mitigate these concerns.
P-16	P.1.4.1	5	United States not Unites States.
P-22	P.2.1	1	The PMP and PMF are calculated from historical site-specific hydrometeorological characteristics, which are likely to change with future climate change. When preparing erosion protection designs for covers and streams in decommissioning plans, is NRC expecting licensee's to evaluate the potential changes in hydrometeorological characteristics of their sites that may be associated with future climate change and incorporate these climate change effects in its PMP and PMF calculations? Should future climate change impacts also be incorporated into dose modeling hydrologic input parameters such as precipitation?
P-26	P.2.7	1	"…*the staff will approve a design that would likely incorporate: (1) covers designed to resist erosion for a stability period exceeding 1,000 years, (2) a long-term surveillance program that monitors the magnitude and rate of erosion;, and (3) sufficient funding for the surveillance, repair, and replacement of some of the erosion*

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			protection. The staff will work closely with the expected long-term custodian to determine the amount of funding needed." Do you have examples of the expectations for Items 2 and 3? The current text is rather nebulous without general perspective regarding expectations.
P-31	P.3		This discussion seems to over-emphasize problems associated with historic cover designs and imply a rather pessimistic view of potential cover performance for modern designs that benefit from lessons learned from these older designs. NUREG/CR-7028 is more than 10 years old now. This discussion should also include more recent research on the durability of HDPE (hundreds to thousands of years) and potential long-term effectiveness of composite covers where the clay is overlain by HDPE to limit potential for drying cycles and exposure to infiltration. It is appropriate to discuss challenges with clay layers in dryer climates, but the potential effectiveness of modern composite designs should also be discussed. As presented, the discussion casts doubt on the effectiveness of cover systems, when in fact, recent research suggests that well designed and constructed composite covers can significantly reduce infiltration for very long times (hundreds to thousands of years).