

MATRIX OF PEER REVIEW COMMENTS: Radon Vapor Intrusion Screening Level Calculator

Notes: [Brackets in comments comprised additional explanation inserted by the peer review contractor.]

Yellow highlighting is used to indicate responses to charge questions. The table can be sorted by color in column B to show only these responses.

Commenter	Charge Question No.	Document	Line No. (Home Page and FAQs only)	Section No. (User's Guide only)	Paragraph	Line	Other Descriptor	Comment	EPA Resolution
Avila	A1							Yes, I think the website is clearly organized, easy to navigate, generally "user friendly" and appropriate to the target audience.	No further action.
Avila	A2							The text in the home page is too long and could be improved. I provide suggestions in the attached pdf (RVISL Home Page and FAQs)_Avila).	No further action.
Avila	A3							Yes, the objectives have been met.	No further action.
Avila	A4							None.	No further action.
Avila	B1							I would add a link to a Glossary page. This can be added to the existing list of links in the Home Page.	No further action.
Avila	B2							The User's Guide adequately explains the concepts and their limitations. I have included some comments in the attached pdf.	No further action.
Avila	B3							The assumptions are clear and reasonable. I have added some comments to the assumptions in the attached pdf.	No further action.
Avila	B3							The sources and citations cover well the US literature, but it would be good to add references to sources from other countries and international organizations.	No further action. EPA does cite international and other national sources when that is the source of the information we are using. Otherwise, citing large numbers of such information may be confusing since they are generally using risk management and regulatory approaches that differ from Superfund's.
Avila	C1							The questions are generally clearly stated. I proposed some changes in the wording of questions 3, 4, 7 and 8, see the attached pdf (RVISL Home Page and FAQs)_Avila) [Reproduced in this table].	No further action.
Avila	C2							Some of the answers are not concise and accurate. I proposed some changes in the attached pdf (RVISL Home Page and FAQs)_Avila) [Reproduced in this table]. In particular, the answer that is provided to question 8 is not adequate.	No further action.
Avila	C3							One helpful question could be: How do deal with situations where more than one Radon isotope, for example Rn-220 and Rn-222, is present?	No further action. This is a remedy selection issue that for some situations is already addressed in other existing guidance.
Avila	D1							The results are clearly presented, but not explained. There are explanations in the User's Guide, but it is not obvious where exactly in the Guide each particular result is to be found. One solution could be that each result column points to the corresponding equation listed in the Calculator and/or the User's Guide. This might require that the Equations be numbered. Another alternative would be to provide a footnote to the Table of results, where each result included is listed with a short description and references to the User's Guide. The above shortcoming is illustrated in the attached pdf (Resident_rad_rvisl_results), which presents the results generated by the Calculator for the screening levels of Dose-Type; using default parameter values. It is not obvious what the results presented in the columns Inhalation RVISL, Submersion RVISL and Target Indoor Air Concentration and the terms used in the User's Guide for these results are somewhat different. In the same pdf, I have also added some comments to the table of results.	No further action. Resolution of suggestions more appropriate where comments detailed in User Guide.
Avila	D2							The results are mostly appropriated described and qualified in the User's Guide. It is stated in the User's Guide that results obtained using default parameter values correspond to the Reasonable Maximum Exposure (RME), since conservative values are selected as defaults. However, it is not always demonstrated that the chosen default values are conservative. An example is the Attenuation Factor as explained in the comments to the User's Guide (see attached pdf).	No further action. RME is a combination of upper bound and central tendency default values, not all upper bound.
Avila	D3							Sufficient explanations of how the results were derived are provided in the User's Guide.	No further action.
Avila	D4							In my opinion this is not required for screening assessments which is the intention with the RVISL. If such mechanisms are considered, it would be anyway difficult to estimate generic default parameter values, without unduly overestimation of the RVISL.	No further action.
Avila	D5							The use of several conservative parameters in the same equation, might lead to over conservative estimates. This is a result of multiplication of errors. For example, if several parameters in an equation are multiplied with each other and a low probability value (like a 95 percentile) is given to each parameter; then the probability of the obtained result might be extremely low. One possible approach to overcome this, would be to perform calculations using central values for the parameters and apply an uncertainty factor to the results, so that the screening value is set at a reasonable percentile (like the 95 percentile).	No further action. EPA's Superfund approach to risk assessment is usually to use a high end receptor under the Reasonable Maximum Exposure Scenario, which is a combination of upper bound (e.g., 95th or 90th percentile) and central tendency (e.g., 50th percentile) default parameters.
Avila	E							Nothing more comes to my mind right now.	No further action.
Avila		Welcome	10					Delete: comparison values and	Revised text to "screening."
Avila		Welcome	12-14					Delete: Note that for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions, dose assessment is generally done only to show compliance with a dose-based Applicable or Relevant and Appropriate Requirement (ARAR).	No further action. This is an important point for Superfund sites.
Avila		Welcome	17					Delete: , which also may be potential ARARs.	No further action. This is an important point for Superfund sites.

Avila		Welcome	22				Change: "site-specific risks" to "site-specific conditions"	This change was made.
Avila		Welcome	26-28				Delete: Below is a general description of screening levels for radon. If the calculator is used with non-default inputs in a decision on a Superfund site, it is recommended that the inputs be clearly identified and justified by the user.	No further change. This is standard Superfund guidance on risk assessment.
Avila		Welcome	37-38				Delete: which were developed to predict potential human exposure from radon concentrations in indoor air	This sentence has been revised.
Avila		Welcome	38				Change: "highly iprecise for an individual house" to "inaccurate for a particular house"	The sentence has been revised as follows "While RVISLs may be imprecise for an individual house or structure they are protective in nature for screening a wide variety of buildings."
Avila		Welcome	40-42				Delete: In particular, testing of groundwater or soil gas is not required to demonstrate compliance with RVISL WL, pCi/L, risk, or dose targets.	No further action.
Avila		Welcome	43-49				Delete: Users should note that since background radon levels are typically outside the risk range, the RVISL calculator is likely to be used primarily for ARAR compliance. For example, the UMRCA indoor radon standards 40 CFR 192.12(b)(1) and 192.41(b) were identified as likely Federal ARARs for Rn-222 and Rn-220 in Attachment A of the EPA guidance document "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination." There are some state standards expressed in pCi/l or mrem/yr that, if more stringent than the UMRCA standards, may be selected as ARARs.	No further action. This is an important point for Superfund sites.
Avila		Introduction	54				Change: "screening level" to "Radon Vapor Intrusion Screening Levels"	This change was made.
Avila		Introduction	58				Change: thorium to thorium-232	This change was made.
Avila		Introduction	59				Change: actinium to actinium-227	This change was made.
Avila		Introduction	76				Delete: Note: No consideration is given to ecological effects in the values presented in this calculator.	The text was reworked in a new section on the Home page "Related CERCLA Calculators and Guidance", however the same point is still made.
Avila		FAQs	84				Change: "exterior" to "collected exterior to buildings"	This change was made.
Avila		FAQs	84				Delete: "Agency staff"	This delete was made.
Avila		FAQs	84-85				Change: "vapor intrusion determination" to "radon vapor intrusion screening"	This change was made.
Avila		FAQs	85				Add: The RVISLs are defined as...	This add was made.
Avila		FAQs	90				Change: "target indoor air concentrations" to "RVISLs for indoor air"	This change was made.
Avila		FAQs	91				Delete: "generic"	This delete was made.
Avila		FAQs	92				Delete: "generally reasonable"	This delete was made.
Avila		FAQs	106-111				Delete: "The factors listed above may negate the appropriate application of the recommended attenuation factors and the sub-slab, groundwater, and soil gas VISLs for purposes of identifying sites or buildings unlikely to pose a health concern through the vapor intrusion pathway. On the other hand, further evaluation of the vapor intrusion pathway is still appropriate when the sub-slab, groundwater, and soil gas VISLs are exceeded for samples from a building or site where these specific factors are present."	No further action.
Avila		FAQs	112				Insert: "default" before "attenuation"	This insert was made.
Avila		FAQs	114				Change: "methane" to "radon"	This change was made.
Avila		FAQs	112-123				Propose removing since these situations are not relevant for indoor exposures to Radon	Some of the text was deleted, other text was revised to make it more relevant to indoor radon.
Avila		FAQs	124-125				Rephrase to: the assumptions made for deriving the attenuation factors are valid for a given site.	Are text was reworked fa a new section then are Home page "Related CERCLA Calculators and Guidance", however are same pofaq made still made.
Avila		FAQs	125				Change: "attained" to "valid"	This change was made.
Avila		FAQs	126				Change: "VISLs" to "RVISLs"	This change was made.
Avila		FAQs	128-129				Change: "Where the assumptions regarding the subsurface attenuation factors do not or may not apply" to "in this case"	This change was made.
Avila		FAQs	129				Delete: "generally"	This delete was made.
Avila		FAQs	131				Change: "for" to "using"	This change was made.
Avila		FAQs	137-138				[Last sentences is] Vague. Propose removing or making more accurate	No further action.
Avila		FAQs	139				Change: "forward" to "cancer risk"	This change was made.
Avila		FAQs	140				Delete: "In addition to calculating screening levels,"	This delete was made.
Avila		FAQs	146				Change: "their site data" to "site-specific data"	This change was made.
Avila		FAQs	149				Insert: "to a site-specific value" at the end of the sentence.	This insert was made.
Avila		FAQs	150-151				Sentence is repeated. Propose removing it.	No further action.
Avila		FAQs	154				Equation is missing.	This has been fixed.
Avila		FAQs	160				Change: "a formula" to "equations"	This change was made.
Avila		FAQs	161				Change: "equation is" to "equations are"	This change was made.
Avila		FAQs	173				Change: "were" to "are"	This change was made.
Avila		FAQs	182				Change: "risk-based versus dose-based versus WL" to "risk-based, dose-based, or WL"	This change was made.
Avila		FAQs	198				Change: "transport portions of the RVISL." to "calculations of transport in soil included in the RVISL calculator."	This change was made.
Avila		FAQs	198-200				Delete sentence.	No further action. This is restating Superfund policy.
Avila		FAQs	204-205				Delete: "for a J256difference in the risk results"	This delete was made.
Avila		FAQs	230				Change: "collocated" to "distributed"	This change was made.
Avila		User's Guide		1	4	1	Have not seen that exposure to tap water is considered	This was changed to "groundwater"
Avila		User's Guide	2.1		4	1	Why direct use of contaminated groundwater in a house has not been considered?. The use in a house (for example for showering) of groundwater containing Radon that is abstracted from a well could lead to increase of Radon concentration in the indoor air.	No further action. There is a tap water scenario in the PRG calculator, which EPA will consider updating with some of the radon information from the RVISL.

Avila		User's Guide	2.1	7	1-2	Bullets 1, 2	I think these sources are not relevant for indoor exposures	No further action. Although unusual, they may be relevant.
Avila		User's Guide	2.1	8	1-3		Yes but these are not leading to increase concentrations indoors	No further action.
Avila		User's Guide	2.2	1	1-2	Bullets 1, 2, 3	I do not see why write about what the calculator cannot do. Can be removed	No further action. This is an important point for Superfund users who are familiar with other tools that include these options.
Avila		User's Guide	2.2	2	2		Why then isotopes after Pb-210 are included in the results presented by the calculator?	If they were not included, users would ask why they were not. Therefore, we chose to include them even though they have zeros for AEQ values.
Avila		User's Guide	6.5			Footnote for Attenuation Factors Table	An explanation of why these has been selected and the implications for the use of the screening levels should be discussed. The EPA recommends using measured Radon concentration values for comparison with the screening levels. If the concentrations have been measured then the type of residence is known and there is no reason for using attenuation factor for all types of residences.	No further action.
Avila		User's Guide	7			Table 1	Insert: ", unitless" following (WL)	This insert was made.
Avila		User's Guide	7			Table 1	This [Resident Air Submersion (pCi/m3)] and the following are concentrations [Resident Air Total and Worker Air Inhalation] that are derived differently and therefore should have a different definition	No further action. The explanation is sufficient and the presentation in calculator output are in different sections which should not result in any confusion.
Avila		User's Guide	7			Table 1, Row DCFsub	Change: "risk/year" to "mrem/year"	This change was made.
Avila		User's Guide	7			Table 1, Row Ssub	Change: "cm" to "cm3"	This change was made.
Avila		User's Guide	7			Table 1, Rows CDI, Cvp, ELCR, Feq, TCR, TD, TWL, ACH, Aeq	Units?	This was corrected with "pCi or pCi-year/m3"
Avila		User's Guide	7			Table 1, Row Efres	The same definition as the next?	No further action. First is combination of child and adult, but the second is adult only.
Avila		User's Guide	7			Table 1, Row IRAW	Why the worker has a higher inhalation rate during 24 hours? He is working only 8 hours/day	He text was reworked us a new section workern e Home page "Related CERCLA Calculators and Guidance", however He same pouse a still made.
Barr	A1						Yes the web site is clearly organized, easy to navigate and user friendly.	No further action.
Barr	A2						I am unsure what the "objectives" of RIVSL calculator are. However, the RIVSL appears to do the following as explained in the User's Manual: <i>This tool provides screening level concentrations of radon for groundwater, soil gas (sub-slab and exterior), and indoor air to assist Agency staff with making a radon vapor intrusion screening level (RIVSL) determination based on limited, initial data. In addition to calculating screening levels, this tool can calculate indoor air concentrations from radon in soil gas and groundwater concentrations entered by the user. The cancer risk and dose from calculated indoor air concentrations and user-provided indoor air concentrations can also be calculated.</i> Several comments are provided in the pdf files of the User's Manual and other documentation that if incorporated I think would provide increased transparency and support for the methodology.	No further action. Comments addressed elsewhere.
Barr	A3						Yes, several comments were made on the homepage graphic (see file RIVSL Home Page and FAQs csb comments.pdf) [Reproduced in this table]	No further action. Comments addressed elsewhere.
Barr	A4						See comments in pdf files. [Reproduced in this table.]	No further action. Comments addressed elsewhere.
Barr	B1						Additional detail could be provided. See comments in file RIVSL User's Guide csb.pdf. [Reproduced in this table.] Additionally, it would help to provide screen shots of the forms and the output with simple examples of how to use the calculator.	No further action. Comments addressed elsewhere.
Barr	B2						Yes, the assumptions are generally clear and reasonable.	No further action.
Barr	B3						Additional detail and supporting information could be provided (e.g., support for risk-significant assumptions and parameters and information on dosimetry). See comments in the file RIVSL User's Guide csb.pdf. [Reproduced in this table.]	No further action. Comments addressed elsewhere.
Barr	C1						Please see comments on RIVSL Home Page and FAQs csb comments.pdf file. [Reproduced in this table.]	No further action. Comments addressed elsewhere.
Barr	C2						Please see comments on RIVSL Home Page and FAQs csb comments.pdf file. [Reproduced in this table.]	No further action. Comments addressed elsewhere.
Barr	C3						Yes, include a basic question and answer on how the screening levels are calculated based on default assumptions and parameters. A table of alternative approaches to using the calculator on the main page or in the User's Manual would be helpful. Describe where the generic screening levels are located (it looks like this information is not yet available on the web site, see empty page when you click on the "generic tables" link although that would be helpful).	No current action. EPA generally does not provide alternative approaches. For soil to groundwater EPA did, but with a technical document assessing alternative models.
Barr	D1						See comment above on User's Manual. It would help to provide screen shots of inputs and outputs from the calculator.	No further action.
Barr	D2						Additional detail could be provided as noted in the file RIVSL User's Guide csb.pdf. [Reproduced in this table.]	No further action.
Barr	D3						Additional detail could be provided as noted in the file RIVSL User's Guide csb.pdf. [Reproduced in this table.]	No further action.

Barr	D4						As noted in comment, insufficient information is provided to determine the conservatism or reasonableness of the default values. The capability to adjust the parameter with sufficient support (in addition to adjusting the air exchange rate) would be beneficial particularly if additional credit could be taken to alleviate potential conservatisms using the current approach.	No further action. The default parameters can be adjusted if supported with site-specific information.
Barr	D5						See comments provided in the file RVISL User's Guide csb.pdf [Reproduced in this table]	No further action.
Barr	E						Additional information on any benchmarking, verification, and validation studies, including supporting data, would also increase confidence in the results.	EPA plans to have an independent external verification study done after issuing RVISL. The results of an internal verification study will be available when RVISL is issued. EPA may consider having a future validation study conducted. All such studies will be publicly available on the Home page in the Introduction section.
Barr		Welcome	1-4			Figure and Figure Caption	<p>It would help to show the contamination in the vadose zone soils--it currently looks like the soil contamination is only in the saturated zone. It would help to depict the upside triangle symbol for the water table surface.</p> <p>By atmospheric conditions do you mean wind effects alone? What about atmospheric pressure and barometric pumping? What are the underlying or implicit assumptions in the RVISL calculator.</p> <p>Why does it look like there are building wake effects considered (rising of air currents above the building roof)?</p> <p>Why does it look like most of the radon goes into the indoor buildings rather than to the outdoor air? Note: Underlying assumption is that radon concentrates in indoor air.</p> <p>Why does it look like outdoor exchange only occurs through the roof and why is there a reference to stack effects as if an elevated release is being simulated?</p> <p>If this is purely a conceptual drawing and only loosely reflects underlying assumptions in the RVISL calculator, this should be clearly stated in the caption.</p>	No further action. This picture mimics the picture used for the VISL calculator and the RVISL has an abundance of text talking about the limitations of the calculator.
Barr		Welcome	17				<p>It would be important to note that this screening level approach may not be consistent with the flux or dose modeling approach associated with certain ARARs (e.g., NRC standards). For example, the suggested methodology may not be consistent with NRC standards for LLW and restricted release sites. For LLW disposal, engineered barrier degradation; release and transport of radon and its precursors (e.g., upward radon diffusion and downwards radium transport in infiltrating groundwater) would need to be considered over the performance period. While radon dose does not need to be considered explicitly for decommissioning sites seeking unrestricted release, it may need to be considered for restricted release sites over a 1000 year compliance period.</p> <p>Also, some standards are based on a flux standard and not a concentration standard. How are these type of standards addressed with the current approach which calculates dose, risk or screening levels?</p>	No further action. It is not necessary to mention each type of potential ARAR that is not covered by the RVISL.
Barr		Welcome	38				If they are highly imprecise, then how is the uncertainty managed in a screening calculator which is inherently supposed to err on the side of higher doses and risk?	Revised sentence to "Computer codes such as the RVISL, which were developed to predict potential human exposure from radon concentrations in indoor air, are based on simplified equations and protective assumptions. While RVISLs may be imprecise for an individual house or structure, they are protective in nature for screening a wide variety of buildings."
Barr		FAQs	83				The FAQ should provide a little more information on where these RVISLs are located (e.g., is a table based on default parameters provided outside of the calculator output or does the calculator have to be run). A basic description of the various alternatives to calculating the RVISLs could be provided in this FAQ (and point to User's Manual for more information).	Added new text "RVISLs are preliminary remediation goal concentrations for groundwater, soil gas (sub-slab and exterior), and indoor air to assist Agency staff with making a determination if a potential risk exists from radon intrusion based on limited, initial data. RVISLs can be found on the Generic Tables page or generated by running the RVISL Calculator in default mode. More information can be found in the User's Guide."
Barr		FAQs	84				Explain what is meant by a vapor intrusion determination.	No further action.
Barr		FAQs	85				Provide examples of the types of data needed to make a determination.	No further action.
Barr		FAQs	139				Add text to the question to explain what a forward calculation is as the user may not understand what that means.	The question has been changed as follows "Can I make the RVISL calculator calculate the risk/dose/WL based on my measured data in addition to generating risk/dose/WL based screening levels?"
Barr		User's Guide				General Comment	Any benchmarking, verification, or validation studies related to the RVISL calculator would provide increased confidence in the results and should be cited in the documentation.	EPA plans to have an independent external verification study done after issuing RVISL. The results of an internal verification study will be available when RVISL is issued. EPA may consider having a future validation study conducted. All such studies will be available and linked to from the Introduction section on the Home page.

Barr		User's Guide				General Comment	It would also be useful to provide example output and explain the information provided in the report.	No further action.
Barr		User's Guide	1.3				<p>It is unclear if the latest ICRP recommendations are considered in the calculator. ICRP 115, "Lung Cancer Risk from Radon and Progeny and Statement on Radon," published in 2010 proposed a significantly higher nominal risk coefficient of 5x10-04 per working level month (WLM) compared to the value of ICRP Publication 65 of 2.83x10-04 per WLM. ICRP intends to publish dose coefficients for radon isotopes calculated based on biokinetic and dosimetric models. Hunt [2014] presented preliminary values of ICRP dose coefficients including a value of 13 mSv per WLM effective dose using an equilibrium factor of 0.4 and unattached fraction of 8 percent for exposure in the home. Please clarify if dose coefficients consistent with the ICRP 115 recommendations are available in the calculator database, and if not, if there are any plans to include updated values in the future.</p> <p>Hunt, J., "Current and Forthcoming ICPR Recommendations on Radon Exposures", Presented at the International Conference on Occupational Radiation Protection, Vienna, Austria, Occupational Radiation Protection in the Workplace Involving Exposure to Radon. John Hunt for John Harrison, Public Health England, December 2014.</p> <p>http://www-ns.iaea.org/tech-areas/communication-networks/orpnet/documents/cn223/8-hunt-presentation.pdf</p>	The RVISL is currently using risk coefficients and dose conversion factors from <i>Radon Cancer Risk Coefficients & Age-Specific Effective Dose Coefficients</i> ORNL/TM-2017/47. This report includes tabulated coefficients that are based on biokinetic and dosimetric models developed for application in upcoming reports of the International Commission on Radiological Protection (ICRP) on occupational and environmental intake of radionuclides.
Barr		User's Guide	1.3.2	1	2		[DFCs] should be DCFs.	This has been fixed.
Barr		User's Guide	1.3.2	1			It appears from running the calculator with default parameters that the submersion dose is dominating the concentration based RVISLs. Is that correct?	This has been fixed.
Barr		User's Guide	1.8	4	1		Typo, missing the "n" in demonstrates.	This has been fixed.
Barr		User's Guide	1.9	3	1-2		It might be helpful to point out the availability of tools such as RESRAD to assess the risk/dose of radon using more complex transport models to provide a more realistic estimate of dose if needed and adequately supported. Parameters such as the emanation coefficient, diffusion coefficients, building air exchange rate, and others may be important to a site-specific dose assessment.	No current action. EPA has not made a recommendation on other alternative tools.
Barr		User's Guide	2.1.1			Figure	What groundwater dependent pathways are (implicitly) considered by the calculator (e.g., it looks like radon from sink water is depicted on this figure)? Is groundwater used for showering also considered? Please be clear on what pathways that could contribute to radon/progeny air concentration and dose are considered (explain what pathway or other assumptions are made in determining appropriate attenuation factors).	Revised sections 4.1.1 and 4.1.2 of User's Guide by adding this sentence "For this media (air) there are no underlying assumptions of radon migration from a source to the air."
Barr		User's Guide	2.1.2			Figure	See comments on the figure above for the residential scenario. Additionally does it make more sense to depict waste in the unsaturated zone leaching to groundwater?	No current action. No picture will represent every situation, but EPA has addressed sites with waste in the saturated zone.
Barr		User's Guide	5			Table 1, Rows Feq, Aeq	<p>Define and use consistent terminology throughout the documentation. How do the "activity equilibrium factor" and "radon equilibrium factor" (or "inhalation fractional equilibrium factor" referred to in the ORNL 2020 reference on the topic) relate to commonly used terms "equilibrium factor" and "unattached fraction" in radon dosimetry? Additional text on the various terms and how they are used by the calculator would provide increased clarity and assurance that the factors are not being double-counted (or could provide additional information on what additional credit could be taken).</p> <p>The value of Feq and Aeq could be risk-significant and the values should be demonstrably conservative. While this appears to be the case, additional discussion in the supporting documentation on how the air exchange rate was selected to err on the side of conservatism, for example, would provide support that uncertainty in the dose and risk estimates is adequately managed.</p>	Revised Table 1 so that Feq is "inhalation fractional equilibrium factor (Feq)." This change has been made consistently throughout the text.
Barr		User's Guide	5			Table 1, Rows AFgw	The reference for these values appears to be this document (i.e., the User's Manual). Please confirm. If the groundwater and sub-slab gas attenuation factors are used to calculate RVISLs, then it appears that these attenuation factors could be risk-significant. While underlying assumptions that may invalidate the attenuation factors are provided, adequate support for the default values selected should be provided in supporting documentation. Support could include data on subsurface and indoor concentrations for a variety of site conditions.	No further action. The reference to the User Guide is for the chemical VISL calculator, not this calculator the RVISL.
Barr		User's Guide	5			Table 1, Row IRAs-c	The resident inhalation rate is a little low compared to the characteristics of the average member of the critical group used in NRC screening calculations (see NUREG/CR-5512, Volume 3). The ability to change exposure parameters to account for differences in regulatory approaches is beneficial.	No current change. The parameter can be changed in site-specific mode. The RVISL resident inhalation rate is consistent with that used for Superfund calculators.
Barr		User's Guide	5			Table 1, Row IRAw	While less of a concern to NRC, the worker inhalation rate used in the RVISL calculator is higher than assumed for the building occupancy inhalation rate of 1.4 m3/hr in NUREG/CR-5512, Volume 3. The ability to change exposure parameters to account for differences in regulatory approaches is beneficial.	No current change. The parameter can be changed in site-specific mode. Building occupancy and industrial workers are different. The inhalation rates are consistent with other Superfund calculators.
Barr		User's Guide	6			Ref 8	Update to Rev. 1 of the document.	The User's Guide now cites the 2020 Final version.

Schierman	A1						<p>On the homepage the reviewer would include the purpose of the screening tool. The user's guide, under the disclaimer has an appropriate statement that could be included in the homepage:</p> <ul style="list-style-type: none"> •"Purpose of this guidance is to provide a radon vapor intrusion screening level (RVISL) calculation tool to assist risk assessors, remedial project managers, and others involved with risk assessment and decision-making at CERCLA sites in developing RVISLs or preliminary remediation goals for indoor radon-222, radon-220, and radon-219 that are risk or dose based and for showing compliance with the UMTRCA indoor radon standards for radon-222 and radon-220." •The limitations of the calculator, as discussed under "Potential Problems and Limitations" as well as assumptions made by the calculator, should be more clearly identified as a bullet on the home page. The bullet could be listed as "Assumptions and Limitations." The reviewer understand that under the first paragraph of the user's guide it states to read disclaimer first however, to prevent misuse of the calculator identifying the limitations and assumptions up front may deter misuse. •Additionally, it should be stressed on the home page that the recommendation contained in Section 3.4 "EPA would recommend, where possible, Regions use measurements of radon indoors rather than rely on the transport portions of the RVISL. In particular, testing of groundwater or soil gas is not required to demonstrate compliance with RVISL WL, risk, or dose targets." •On the original homepage the reviewer recommends as done in other sections in the user's guide a clarifying statement that screening levels are synonymous with preliminary remediation goals. 	No further action. This is an important point for Superfund sites.
Schierman	A2						The objectives for the RVISL calculator, as stated in the user's guide have been met as described. One item that may be prudent to discuss more in depth is the current shortfall and the need for the RVISL calculator. Discussing how the calculator closes this shortfall would be beneficial.	No further action.
Schierman	A3						<p>Developers may want to consider changing the graphic to state that the soil contains radium instead of radon. Radon is not attached to the soil particle. It is a nuance and may not be worth changing.</p> <p>The Graphical representation under Radon Vapor Intrusion Screening Level Equations/Air Screening Level Equations/Residential Air and Workers Air is misleading. Representing sources of radon as drums of waste may lead to misconceptions on sources of radon. I prefer the homepage graphic depiction of the source as solely soil containing radon (radium) or just a radiation symbol.</p>	No further action.
Schierman	A4						<p>On the homepage the "Welcome" and "Introduction" seem to be a little verbose and could be consolidated into one section.</p> <p>Generic Tables Bullet is not functional</p>	No further action.
Schierman	B1						The reviewer agrees that the guide adequately explained the concepts addressed by the calculator. The reviewer would recommend adding a bullet under "Radon Vapor Intrusion Screening Levels (RVISL) table" stating "Assumptions and Limitations" All assumptions and limitations should be clearly documented under this bullet.	No further action.
Schierman	B2						See response to B. User's guide question 1.	No further action.
Schierman	B3						<p>Additional resources for the author to consider:</p> <p>ICRP, 2014. Radiological Protection against Radon Exposure. ICRP Publication 126. Ann. ICRP 43(3) ICRP, 2017. Occupational Intakes of Radionuclides Part 3. ICRP Publication 137. Ann. ICRP 46 (3/4) While ICRP Publication 137 does not specifically address public exposures, it is intended that this same dose coefficient applies to exposures in homes.</p> <p>NCRP Report 97. Measurement of Radon and Radon Daughters in Air</p> <p>NCRP Report 160. Ionizing Radiation Exposure of the Population of the United States. 2009. <i>Radon Equilibrium factors</i>.</p>	No further action.
Schierman	C1						The questions are clearly worded, I have no further recommendations.	No further action.
Schierman	C2						I found no issues with the responses and they appeared to be accurate.	No further action.
Schierman	C3						<p>I would add the following question: Can I change a radon equilibrium factor or activity equilibrium factor to site specific data?</p> <p>With an exchange rate of zero the radon equilibrium fraction is 1 to 1 or 100%. NCRP and other organizations have proposed other equilibrium factors. While I understand the equilibrium factor can be modified using air exchanges, the reviewer believes it would be good to clarify in the frequent question section how equilibrium can be changed.</p>	No further action.
Schierman	D1						When selecting the target dose (mrem/yr) under the dose-based screening level type the default is 1 mrem. I am unsure where the 1 mrem/year comes from. In the supporting document Analysis of what Radiation Dose Limit is Protective of Human Health at CERCLA Sites (Including Review of Dose Limits in NRC Decommissioning Rule) it states EPA has considered cancer risk from radiation in a number of different contexts, and has consistently concluded that levels of 15 mrem/yr. EDE (which equates to approximately a 3×10^{-4} cancer risk) or less are protective and achievable. Why not set the default to 15 mrem/yr?	No further action. The user would adjust the dose level to match the ARAR being complied with.

Schierman	D2							From the limited testing of the calculator, the results correspond with the equations described in the user's guide. The question of whether they may be relied upon or defended is harder to answer. The calculator purpose from the reviewer's understanding is to assist risk assessors, remedial project managers, and others to make decision at CERCLA sites in developing screening levels or preliminary remediation goals. As stated in the user's guide "Predicting the amount of radon gas available for vapor intrusion in the natural environment, is not an ideal setting. Several factors make it impossible for this calculator to confidently predict suitable target indoor air concentrations from sources in soil and groundwater." The reviewer agrees with the language in the user's guide and there are such variabilities that make it hard for the calculator to be defensible. With measurement however, the results become much more defensible.	No further action.
Schierman	D3							I think the user's guide adequately describes how the equations were derived.	No further action.
Schierman	D4							Ultimately, there are many factors that influence radon concentrations indoors. Incorporating the above items may improve the estimate, however it would also introduce more uncertainty in the estimate. The answer to the question is whether the calculator as presented provides a conservative estimate of the radon air concentrations. As EPA implements the calculator and sets screening levels, it will be interesting to compare actual measurements with what was predicted to understand if more variables are needed in the calculation.	No further action.
Schierman	E							I think it is important to note that the calculator is a tool to assist decision making at CERCLA sites in developing screening levels. It is not a regulatory requirement or the only way to set screening levels. While the calculator is helpful, as stated by EPA in the documentation where possible regions should use measurements of radon indoors rather than rely on the transport portions of the calculator. Testing of groundwater or soil gas is not required to demonstrate compliance with RVISL, working levels, risk, or dose targets. The calculator is to be used at CERCLA sites. However, the user's guide and the calculator frequently refer back to UMRCA applicable or relevant and appropriate requirements (ARAR). The reviewer understands that a few UMRCA sites are also listed as CERCLA sites. Is the utility of the calculator comparing UMRCA ARAR only for these UMRCA sites listed as CERCLA? Outside of UMRCA, is there utility in comparing it back to these standards? Is it the intent of the developers that the calculator would be used outside of CERCLA facilities? These are items to consider that are not clear upon review of the calculator and the accompanying documentation.	No further action. The intent is to use the RVISL at CERCLA sites. The UMRCA indoor radon standards are often ARARs at CERCLA sites which is why the RVISL includes a significant mention of UMRCA, since the RVISL is intended to facilitate showing compliance with UMRCA as an ARAR at CERCLA sites.
Spreng	A1							The website is clearly organized; it progresses from topic to topic generally in a logical sequence. The instructions and descriptions necessarily vary in detail, which likely matches the range of knowledge among the target audience(s).	No further action.
Spreng	A2							The calculator was created to develop PRGs or SLs that "predict potential human exposure from radon concentrations in indoor air". It meets those objectives.	No further action.
Spreng	A3							The graphic adequately portrays the various vapor transport concepts. The source – the "soil containing radon" blob – looks like it may have been copied from a chemical spill figure.	No further action.
Spreng	A4							No. The instructions and information seem to fit the range of potential users. Links to the references cited also improve the usability of the website.	No further action.
Spreng	B1							Yes, the concepts are fully and clearly explained. The Guide describes uncertainties, assumptions and defaults, and the inherent problems with predicting air concentrations from subsurface sources. It also explains that it does not establish binding rules.	No further action.
Spreng	B2							The assumptions are generally reasonable and clearly worded. Suggested revisions are shown in an attached file in the text edit/comment mode of Adobe Acrobat.	No further action.
Spreng	B3							The sources and citations are appropriate and seem to be up to date. The only additional reference that I suggested was in Section 1.7 where it might be worth mentioning that EPA participates in the radon industry-led ANSI/AARST voluntary consensus-based standards (VCS) process: https://standards.aarst.org/ "EPA Guidance on the Use of Voluntary Consensus Standards for State Indoor Radon Grant Recipients." https://www.epa.gov/sites/production/files/2019-08/documents/august_2019_sirg_vcs_program_guidance_epa402-b19-080.pdf I have also noted in several places where links to documents do not open.	A sentence referring this website was added to section 6.4 of the User Guide.
Spreng	C1							The questions are generally clearly worded. Suggested revisions are shown in an attached file in the text edit/comment mode of Adobe Acrobat.	No further action.
Spreng	C2							The responses are generally clearly worded and accurate. Suggested revisions are shown in an attached file in the text edit/comment mode of Adobe Acrobat.	No further action.
Spreng	C3							The list of questions/answers seems adequate.	No further action.
Spreng	D1							The calculator results are clearly displayed. A minor comment: The "time stamp" at the bottom of the output spreadsheet is Eastern Time. If the time is necessary for complete documentation of calculator runs, that should probably be noted.	No further action at this time, EPA will investigate further.
Spreng	D2							Yes, the results are appropriately described and qualified. The Home Page and User's Guide describe uncertainties and assumptions.	No further action.
Spreng	D3							The best test of a calculator that tries to replicate natural phenomenon is whether it consistently produces reasonable results. Several "test runs" with various input parameters seem to produce reasonable results.	No further action.

Spreng	D4					Section 1.1 states that several factors affecting the indoor Feq were omitted for "simplification". It is assumed that the "other mechanisms" may also be minor enough that they, too, could be ignored. Section 1.8 mentions research that provides data on some of these mechanisms, but this research demonstrates how difficult it is to predict Feq values because of them. It is also assumed that additional research may someday allow the effects of some of these "other mechanisms" to be included in the calculator.	No further action.
Spreng	D5					No - no additional recommendations beyond those in the comments in the attached files.	No further action.
Spreng	E					No - no additional recommendations beyond those in the comments in the attached files.	No further action.
Spreng		Welcome	29-30			...developing SLs or PRGs for... Acronyms are already defined above. It might also be useful to distinguish between the two terms (or add a reference that explains the difference, if any). 6.5.2 Scope and Basis for Health-based, Vapor Intrusion Screening Levels EPA developed VISLs for human health protection that are generally recommended, medium-specific, risk-based screening-level concentrations intended for use in identifying areas or buildings that may warrant further investigation of the vapor intrusion pathway.	No further action. These risk management terms are discussed in more detail in other guidance and the NCP.
Spreng		Welcome	43			The term "outside the risk range" may be generally understood within the regulatory community, but probably ought to be explained as being "risk greater than 1 x 10 ⁻⁴ ".	Revised text has made this clear.
Spreng		Welcome	47			Add a link to "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination."	This change was made.
Spreng		Welcome	48			[Change "expressed in pCi/l or mrem/yr that" to] expressed in concentrations (pCi/L) or dose (mrem/yr) that	This change was made.
Spreng		Welcome	48			At Rocky Flats, the state dose standards were determined to be ARARs regardless of whether they were more stringent than federal (CERCLA) risk standards. Both risk and dose values were calculated. Risk values were more stringent and so became the "action levels", but the state dose standard was still an ARAR. Also, "pCi/L" is preferred over "pCi/l" in this document.	Change to pCi/L was made.
Spreng		Introduction	56			It might be useful to add a version of the purpose of SLs as written in Section 6.5.2 of the 2015 OSWER Guidance: "EPA developed VISLs for human health protection that are generally recommended, medium-specific, risk-based screening-level concentrations intended for use in identifying areas or buildings that may warrant further investigation of the vapor intrusion pathway."	This section has been revised.
Spreng		Introduction	57			[insert "as"] referred to as radon	This change had been made.
Spreng		Introduction	59			Clicking on this link yields: "Sign in to access this site. Authorization required by https://epa-visl.ornl.gov/ ". Clicking on "Cancel" takes one to the VISL calculator.	This was fixed.
Spreng		Introduction	61			That section of the User's Guide is titled, "2.2 Groundwater Screening Level Equation". Should be Section 1.2 (?).	No further action. User Guide sections were updated.
Spreng		Introduction	67			Change "occurred" to "began"	This change was made.
Spreng		Introduction	71			Suggest: "The RVISL calculator results were previously verified as documented on the Internal Verification and External Verification pages. Documentation of the peer review for the RVISL calculator is also available."	No further action. Consistent wording with other Superfund calculators.
Spreng		Introduction	72			Clicking on these 3 links yields: "Sign in to access this site. Authorization required by https://epa-visl.ornl.gov/ " Clicking on CANCEL takes the user to the VISL calculator home page.	This was fixed.
Spreng		Introduction	77			Some of the questions unnecessarily use personal pronouns: 2. "How can I change attenuation factors?" (Suggest: "How can attenuation factors be changed?")	No further action. Similar tone to FAQ's in other Superfund calculators.
Spreng		FAQs	81			[Replace "to solve many problems that arise from calculating and using this SL site." with "to solve problems that may arise from using this calculator."	This has been done.
Spreng		FAQs	87			Suggest changing sentence to:] "The main page of the calculator provides default factors, which can be changed."	The sentence has been revised as follows "To change the attenuation factors, run the calculator; the main page has editable cells with the default factors presented."
Spreng		FAQs	91			I cannot find the terms, "empirically-based conservative 'generic'" or "generally reasonable worst-case conditions" described in any VI guidance. These combinations of adjectives seem somewhat redundant and confusing. Suggest using phrases from the guidance: "...target indoor air concentrations using reasonably conservative generic attenuation factors that are empirically based, as described in the EPA's 2015 vapor intrusion guidance."	This has been done.
Spreng		FAQs	139			A more useful title might be: "Can the calculator predict indoor air concentrations and risk from measured concentrations?" In addition to calculating SLs, the calculator allows the user to input data collected from their site using a "forward calculator" function.	The title has been revised as follows: "Can I make the RVISL calculator calculate the risk/dose/WL based on my measured data in addition to generating risk/dose/WL based screening levels?"
Spreng		FAQs	148			This sentence seems redundant with the first sentence of the next paragraph. Could be combined.	This has been done.
Spreng		FAQs	154			The H' equation is not below. The reference to the Fact Sheet is probably sufficient: "An EPA Fact Sheet describing how H' is derived when groundwater temperature is changed can be found ..." Could also refer to Section 4.1 of the User's Guide.	This has been done.
Spreng		FAQs	162			Change cm2 to cm3	This answer has been revised.
Spreng		FAQs	165			x 10 ⁻¹⁵ (?)	This has been fixed.
Spreng		FAQs	173			Suggest rewording: "How were the UMTRCA working level (WL) standards converted to units of concentration?"	This suggested rewording was made.
Spreng		FAQs	175			Unclear what 3 steps are being referred to here. Suggest: "This table depicts the UMTRCA WL standard converted to various units of concentration using different radon equilibrium factors."	Other edits were made in this answer to clarify the process.

Spreng		FAQs	176					The User's Guide only goes to Section 2.4. Should be Section 2.1.1 (?)	This has been fixed.
Spreng		FAQs	187-188					At Rocky Flats, the state dose standards were determined to be ARARs regardless of whether they were more stringent than federal (CERCLA) risk standards. Also, "pCi/L" is preferred over "pCi/l" in this document.	No further action.
Spreng		FAQs	210-212					Not true. The risk options listed on the calculator main page are in 10-6 superscript style. The "6.2E-02 and 7E-03" could be added parenthetically at the end of the previous sentence.	No further action. The calculator output is in the format described.
Spreng		FAQs	213					This mixes scientific notation styles.	No further action. This is intentional.
Spreng		FAQs	220					There is no Section 2.3.1 in the RIVISL User Guide.	The User Guide sections were updated.
Spreng		User's Guide		Introduction	3	1		Here would be a good place to differentiate between SLs and PRGs.	The first sentence now reads "RIVISLs are a type of preliminary remediation goal (PRG) and both are a specific variety of the broad SL category."
Spreng		User's Guide		1.1	1	1-3		Suggest: "...at room temperature. The criteria used to determine if a chemical is suitable for vapor intrusion analysis (see Section 1 of the VISL User's Guide) will be ignored for this RIVISL calculator." With this reference, the following list of criteria could be deleted (why list factors that will be ignored?) and the first 2 paragraphs merged.	No further action.
Spreng		User's Guide		1.1	2	1		Suggest: "... chemicals, these criteria are not suitable..."	This change has been done.
Spreng		User's Guide		1.1	3	4		Suggest "disregarded" instead of "neglected".	This change has been done.
Spreng		User's Guide		1.1	4	1		Could reference the Homepage graphic.	No further action. The graphic is an illustration of how radon intrusion occurs.
Spreng		User's Guide		1.1	6	4-6		Suggest: "On the other hand, further evaluation of the vapor intrusion pathway is still appropriate when sub-slab, groundwater, and soil gas samples from a building or site exceed the RIVISLs."	This change has been done.
Spreng		User's Guide		1.1	7		Bullet 2	The concept of radon vapor density resulting in downward (advective ?) transport needs to be further explained.	Transport text was reworked us s new section ofn transport Home page "Related CERCLA Calculators and Guidance", however transport same pouse vapor still made.
Spreng		User's Guide		1.1	9	1-5		Suggest: "The previously-mentioned assumptions and warnings involving attenuation factors are for generic chemicals and generally apply to radon. Users of the RIVSL calculator should also consider additional radon-specific factors that affect radon concentrations in buildings:"	This change has been done.
Spreng		User's Guide		1.1	10	1		...concentrations... Having 2 adjacent lists of factors that influence radon concentrations seems confusing and largely redundant. Suggest combining the 2 lists.	No further action.
Spreng		User's Guide		1.1	10		Bullet 1 of #4	How is this different than "Barometric pressure changes" listed under "Climate and meteorological factors"?	Some are indoor (man made) some are outdoor (natural).
Spreng		User's Guide		1.1	10			Ventilation (air exchange rates)	This change has been done.
Spreng		User's Guide		1.2	3	3		Bullet 3 of #4 The abbreviated forms (e.g., Rn-219) are used elsewhere.	No further action.
Spreng		User's Guide		1.3.1	1			This link (and some others referenced on this site) cannot be reached on my non-government computer. The error message states that the computer is correctly configured, but the "resource (EPA-visl.ornl.gov) is not responding."	This is working now.
Spreng		User's Guide		1.4	1		#2	...Antoine Equation: $\log P = A/(B+C + T)$. ???	This equation has been fixed by adding minus sign "A-(B/(T+C))"
Spreng		User's Guide		1.7	1	4-5		It might be worth mentioning that EPA participates in the radon industry-led ANSI/AARST voluntary consensus-based standards "EPA Guidance on the Use of Voluntary Consensus Standards for State Indoor Radon Grant Recipients." https://www.epa.gov/sites/production/files/2019-08/documents/august_2019_sirg_vcs_program_guidance_epa402-b19-080.pdf	A sentence referring this website was added to section 6.4 of the User Guide.
Spreng		User's Guide		1.8	1	7		This link [to RAGS Part A] does not open.	This is working now.
Spreng		User's Guide		2	1	2		The term "compliance levels" should be explained in relation to the term "screening levels" in this sentence.	This has been done.
Spreng		User's Guide		2	1	3		Source-specific equations seems more appropriate than "land use equations."	No further action. Land use is used in other Superfund calculators.
Spreng		User's Guide		2	1	8		[Rephrase to:] Both the RIVISL and the VISL calculators follow...	This has been done.
Spreng		User's Guide		2.4	1	4		...air screening level (see Section 2.1)...	No further action.
Spreng		User's Guide		2.4	1	5		[Rephrase to:] "To make this comparison, no equations are necessary..."	This has been done.
Spreng		User's Guide		3	1	3		The term "compliance levels" should be explained in relation to the term "screening levels" in this sentence.	No further action.
Spreng		User's Guide		3	1	3		Source-specific equations seems more appropriate than "land use equations."	No further action. Land use is used in other Superfund calculators.
Spreng		User's Guide		3	1	9		[Rephrase to:] "Both this calculator and the VISL calculator follow..."	This has been done.
Spreng		User's Guide		4.2	1	15		Deposition on surfaces is among the conditions described in Section 1.1.	This sentence has been revised.
Spreng		User's Guide		4.3	1	4		Deposition on surfaces is among the conditions described in Section 1.1.	This sentence has been revised.
Spreng		User's Guide		4.4	1	12-18		These sentences could be combined to avoid the redundancy. If the "more detailed papers" mentioned in the first sentence are the 2 referred to in the last 2 sentences, then the first sentence could simply be deleted. The second sentence could begin: "Air exchange rates can be measured..." The links to the documents do not work (at least on non-government computers).	This has been corrected.
Spreng		User's Guide		5				Change multiple references to 2 5°C to 25°C	This has been corrected.
Spreng		User's Guide		6			Ref 10	Most of the links to EPA documents cannot be opened.	This has been corrected.

Williams	A1						<p>Is the website clearly organized, described, easy to navigate, and generally "user friendly" and appropriate for the target audience?</p> <p>The welcome section provides good information but it needs to be simplified with similar topics moved together. When the website is final the links will make it easy to navigate and user friendly, but they currently are not pointing to the right documents. The info contained is appropriate, but it is hard to absorb as some of the thoughts are broken apart.</p> <p>Also there needs to be some care as the document uses a lot of the information in the VISL for the RVISL and it sometimes is not clear that the concepts and science used in the development of the RVISLs is based in part on the work and concepts utilized in the VISL. It is also not clear if the RVISL will be completely different than the VISL or if it will be incorporated into it.</p> <p>If not, what do you recommend?</p> <p>Breaking apart some of the longer paragraphs and keeping some of the similar info and thoughts together. Also providing some basic information on the information that is being applied from the VISL in a unique chapter that describes vapor intrusion in general and then how radon vapor intrusion is similar.</p>	First paragraph was broken apart in a similar manner.
Williams	A2						<p>Have the objectives of the RVISL calculator, as stated in the documentation, been met?</p> <p>The objectives should be more clearly and simply stated so it is hard to understand if they have been met.</p> <p>If not, what do you recommend?</p> <p>Clearly state what the objective is. It appears that besides the calculator that there is another goal to provide updated guidance on how to develop screening values. There might be others.</p>	No current action.
Williams	A3						<p>Do you recommend any modifications to the Homepage graphic?</p> <p>Understanding that that CVI and PVI behaves similarly to radon VI, it might be more appropriate to develop a specific graphic for RVI or instead of using it as a RVI graphic use the graphic as a more general representation of VI in general. Would recommend using the graphic on Page 14 and 18 of the UseGuide or a similar one/color scheme.</p>	No current action. The Homepage graphic provides an illustration of indoor radon sources and transport, while the graphics cited by the commenter in the User Guide are illustrating what two of the RVISL scenarios address.
Williams	A4						<p>Do you have any other recommendations to improve the usability of the website?</p> <p>I think as radon is using a lot of the similar concepts of VI and that web page that there is some additions to that web page that point a user to the radon VI web page.</p>	Home page has been altered to include a section "Related CERCLA Calculators and Guidance" which more clearly refers the user to VISL if assessing chemical vapor intrusion and other Superfund calculators as appropriate.
Williams	B1						<p>Does the User's Guide adequately explain the concepts addressed by the calculator and its limitations?</p> <p>No. If it does, the chapter titles do not make it clear on where a person would go to even find it. The chapter section titles (e.g., 1. Understanding the RVISL Website and 2. Radon Vapor Intrusion Screening Level Equations) do not point to where the information can be found for a user. It does discuss how radon concentration are influenced but it does not appear to describe how the calculator addresses it.</p>	No further action. The user can view the sub section titles, and the table of contents format is consistent with other Superfund calculators.
Williams	B2						<p>Are the assumptions clear and reasonable? If not, what do you recommend?</p> <p>The assumptions should be provided under a single section of the report.</p>	No further action. The assumptions (e.g., equations, default parameters) in different sections is consistent with other Superfund calculators.
Williams	B3						<p>Are the sources and citations appropriate, and do they represent the current state of knowledge?</p> <p>Based on my understanding of the VISL the references seem applicable.</p>	No further action.
Williams	C1						<p>Are the 11 questions clearly worded? If not, what do you recommend?</p> <p>Q2 - Doesn't really tell the user how "To change the attenuation factors." There is a lot of info here that is not related to the specific question. Recommend that the question is answered with additional detail and the rest is removed or moved to a different FAQ if the developer feels that it is important.</p> <p>Q5 - The first paragraph answers the question. The second paragraph should be moved to a unique FAQ</p>	Q2 answer revised by adding a link to read FAQ 11 for more information. Q5 answer revised with the addition of the equation image from User's Guide.
Williams	C2						<p>Are the 11 responses clear, concise, and accurate? If not, what do you recommend?</p> <p>The recommendations are provided under charge question C1</p>	No further action.
Williams	C3						<p>Are there other helpful questions and answers that should be added? If yes, please list the questions.</p> <p>Recommendations include breaking questions Q2 and Q5 into 2 different questions.</p>	No further action.
Williams	D1						<p>Are the results clearly explained and presented? If not, what do you recommend?</p> <p>Yes</p>	No further action.

Williams	D2						Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend? Yes	No further action.
Williams	D3						Do the results provide defensible explanation of how they were derived, or are they the result of a "black box?" Do you recommend anything different? They are a black box. It is however, a calculator. Possibly put some type of note or link where the explanations can be found.	No further action. A link to the equations page and user's guide is on the output page. The output page gives user a table of the inputs. The main calculator page has hover text instructions.
Williams	D4						RVISL calculation of the equilibrium level (Feq) of radon progeny that would be present in indoor air is based on air exchange rate. Should other mechanisms (seasonal atmospheric changes, building construction, surface plating, aerosol sizes, regional geology, air flow) be incorporated in the calculation? I would make this modification, but as a higher level site-specific calculator as most users will not have that information.	No further action.
Williams		Welcome				General Comment	My background is in chemical vapor intrusion (PVI and CVI) and naturally occurring radon. It took several times reading the title and then the introduction to sort out that the radon that being discussed is from radionuclide contamination and not naturally occurring radon or from chemical vapor intrusion, especially as the figure you are using is the exact same figure that was generated for chemical vapor intrusion and the links take you to the VISL vs the RVISL. I would recommend making the title more specific and/or adding some type of call-out box so that when someone hits the homepage that it is clearer what type of vapor intrusion they are dealing with.	Changed the title to "RVISL Home" for consistency with other EPA calculators. Changed the first sentence to "This figure depicts the migration of radon in soil gas from radioactively contaminated soil and groundwater into buildings at a Superfund site."
Williams		Welcome	1			Figure	Recommend that a figure for RVISL be different then what is used for the chemical VISL similar to the figures in the user guide	No current change. The RVISL and VISL are generally consistent, using similar Home page pictures is appropriate
Williams		Welcome	1			Figure	Figure did not appear correctly on the website and only was observable on the supplied PDF	No current change. We were unable to replicate this issue.
Williams		Welcome	1			Figure	This figure is typically associated with chemical vapor intrusion. I would recommend that you change the language so that it states: This figure depicts the migration of radon from radionuclide contaminants in soil gas from contaminated soil and groundwater into buildings. Radon in soil gas from radionuclide contaminants is shown to enter buildings through cracks in the foundation and openings for utility lines similar to other forms of contamination. Atmospheric conditions and building ventilation are shown to influence radon soil gas intrusion.	Added at the end of the first sentence "buildings at Superfund sites."
Williams		Welcome	1			Figure	Recommend that you do not start with the figure. Move the figure down.	No current change. Maintain consistency with each of the other six Superfund radiation calculators and the VISL that start with a picture.
Williams		Welcome	2			Figure caption	Insert: "from radionuclide contaminants" after radon	This insert was made.
Williams		Welcome	20-23			Links	the Preliminary Remediation Goals link takes you to the right page but the "What's New", "User's Guide", "Frequently Asked Questions" and "Fact Sheet" links do not.	No current change. We were unable to replicate this issue.
Williams		Welcome				Green callout box	All links in the green box titled "Radon Vapor Intrusion Screening Levels (RVISL)" actually takes you to the EPA's VISL (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator) and not the radon-VISL page. Apparently this was a caching issue which may be a problem for others.	No current change. We were unable to replicate this issue.
Williams		Welcome	29-49				Recommend the 2nd and 3rd paragraph be moved from the Welcome and into the Introduction	No current action.
Williams		Welcome	12-14				Note similar to "Note that for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions, dose assessment is generally done only to show compliance with a dose-based Applicable or Relevant and Appropriate Requirement (ARAR)." should be in a call out box.	No current action. Bolding text is sufficient for emphasis. Use of call out boxes would be inconsistent format for other calculators.
Williams		Overview		Call out box		Green callout box	Recommend that the first paragraph be broken apart to make it easier to read	Changed title to "RVISLs for Radon."
Williams		Welcome	29-30				"The RVISL calculator provides updated guidance for developing screening levels (SLs) or preliminary remediation goals (PRGs)" is technically not correct. The website is providing the updated guidance and the calculator is providing calculated cleanup values.	No current change. The RVISL calculator is a guidance tool instead of a guidance document.
Williams		Introduction	57-62				This paragraph seems out of place.	No current action.
Williams		Introduction	59				The chain link in the "Click the decay chain link" should be a link to where you want the user to go.	No current action. This is a link to an image of the decay chain.
Williams		Introduction	59-62				"Click the decay chain link to see the decay series for Rn-222, Rn-220, and Rn-219. The metal groups in these images are based on Los Alamos National Laboratory literature. See section 2.2 of the User's Guide to learn what progeny are evaluated in this web calculator. More details about the decay chains can be found in the EPA's Decay Chain Tool." This is an example where there appears to be the same though separated by a different one. "Click the decay chain link to see the decay series for Rn-222, Rn-220, and Rn-219." AND "More details about the decay chains can be found in the EPA's Decay Chain Tool." is the same thought and could be combined and the other sentence "See section 2.2 of the User's Guide to learn what progeny are evaluated in this web calculator." can be moved to the end.	No current action.
Williams		Introduction	71-73				Links go to the wrong page	No current action. Cannot replicate this issue.
Williams		FAQs	82			Question 1	It should be made clear that this	No current action.

Williams		User's Guide		Introduction	3	1		It should be made clear that the RVISL calculator doesn't provide the updated guidance, the user guide does.	No current action. Both the RVISL calculator and the User Guide provide updated guidance.
Williams		User's Guide		Introduction	2	7-9		I would break the following into a callout box to emphasize: "Note that for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions, dose assessment is generally done only to show compliance with adose based Applicable or Relevant and Appropriate Requirement (ARAR)."	No current action. This point is sufficiently made.
Williams		User's Guide		Introduction	3	4-7		This seems to be pretty important and should be called out or emphasized by making only this statement bold: "The RVISL therefore supersedes the risk assessment approach in Preliminary Remediation Goals for Radionuclides in Buildings (BPRG) electronic calculator, the dose assessment approach in ARAR Dose Compliance Concentrations Goals for Radionuclides in Buildings (BDCC) electronic calculator, and Q17 of the guidance document "Radiation Risk Assessment At CERCLA Sites: Q & A" issued on May 2014.	No current action. This is already bold in the opening text and disclaimer.
Williams		User's Guide					General Comment	There should be some description and overview of each section that is in the user's guide	Added some to the beginning of section 2.
Williams		User's Guide		1.1	6	1		This section identifies specific factors that may render the use of the values inappropriate, but it should also provide direction on what to do and that the values should not be used.	No current action. It will be a site-specific decision on what to do if the site-specific CSM does not match the calculator.
Williams		User's Guide		1.1	9	4-5		It would seem that the concentration of radon (in vapor though not specific) in a building also depends on the distance of the vapor source to the building.	No current action.
Williams		User's Guide		1.3	1			This statement is important and should be moved to the beginning of the document as well "EPA classifies all radionuclides as Group A carcinogens ("carcinogenic to humans"). Group A classification is used only when there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer. The following sections discuss the sources of inhalation and external exposure via submersion in gas cloud SFs and DCFs used in this cal..."	No current action. The format should be consistent with other Superfund calculators.
Williams		User's Guide		1.5.2				Is the "One-Hit Rule" a specific rule or just a "concept" Further explanation is warranted.	No current action. The terminology "One-Hit Rule" is consistent with the other Superfund risk assessment calculators. The approach is sufficiently explained.
Williams		User's Guide		2	1	1		Section 2. Radon Vapor Intrusion Screening Level Equations states: This section presents the screening levels for human exposure to contaminated air. This is not correct. This section provides the equations that are used in the RVISL (but also in combination with Sections 3 and 4 as well. The equations and technical discussion are aimed at developing compliance levels for risk-based and dose-based RVISLs.	No current action.
Williams		User's Guide		2.1.1			Figure	It appears that the "graphical representation" is aligned with a conceptual site model. Conceptual site model is the term that is used in the VISL and in discussion VI it should be	No current action. The "graphical representation" figures that illustrate what exposures are addressed by the equations can also be used as a conceptual site model, as can the figure used in section 3.1. Similar figures are used in the six other radiation risk and dose assessment calculators.
Williams		User's Guide		2.1.1			Figure	Recommended to use this graphic as part of the overview along with the figure in 2.1.2	No current change.
Williams		User's Guide		2.1.2			Figure	It appears that the "graphical representation" is aligned with a conceptual site model. Conceptual site model is the term that is used in the VISL and in discussion VI it should be	No current action. The "graphical representation" figures that illustrate what exposures are addressed by the equations can also be used as a conceptual site model, as can the figure used in section 3.1. Similar figures are used in the six other radiation risk and dose assessment calculators.
Williams		User's Guide		2.1.2			Figure	Recommended to use this graphic as part of the overview along with the figure in 2.1.1	No current action.
Williams		User's Guide		2				Sections 2, 3, 4 are all equations and should be placed in a single chapter for ease of discussion	No current action. This would appear to be a more difficult read if it was put in one section.
Williams		User's Guide		3				Sections 2, 3, 4 are all equations and should be placed in a single chapter for ease of discussion	No current action.
Williams		User's Guide		4				Sections 2, 3, 4 are all equations and should be placed in a single chapter for ease of discussion	No current action.
Williams		User's Guide		4.2	1	1-3		Air Exchange Rates is described differently then what is presented in EPA's VISL documentation and should be alligned with that definition	No current action. The analysis of air exchange rates on radon progeny has been completed and should not be redone. The VISL does not include a similar analysis there was no need for consistency on this definition.
Williams		User's Guide		4.2	1	4-6		Inhalation Fractional Equilibrium Factor is unique to radon and it should be emphasized that it is different then chemical VI and how it impacts the calculated results	Revised definition of Feq in user's guide to be consistent throughout. Feq is unique to the RVISL.
Williams		User's Guide		4.4				The collection of ACH should also be described to the user it the calc will allow an inputed value and where it place it	Sentences were added in sections 6.2 and 6.3 of the User Guide explaining further how to make site-specific adjustments for ACH.
Williams		User's Guide					General Comment	There should be some screen shots of the actual input screen with a description of what inputs are placed in each section.	No current action. EPA does not provide step by step graphics in other Superfund risk tools, but does provide hover text on calculator page.
Williams		User's Guide		5				Some of the input values are not specifically input paramters so a more generic term would be appropraite	No current action. Changing the name of the secon would lose consistency with other Superfund calculators.

Williams		Welcome	6-28				<p>Recommend the first paragraph be broken apart as follows for clarity:</p> <p>Welcome to the "Radon Vapor Intrusion Screening Level (RVISL) Calculator Home Page for Radionuclide Contaminants at Superfund Sites". This website was developed with DOE's Oak Ridge National Laboratory (ORNL) under an Interagency Agreement with the U.S. Environmental Protection Agency (EPA).</p> <p>The RVISL website is now the generally recommended source of radon screening levels for all EPA regions. The RVISL calculator output provides comparison values and risk and dose estimates for residential and commercial/industrial exposures to radon in soil gas, air, and groundwater. The unified use of the RVISLs to screen radon at Superfund sites promotes national consistency. The RVISL uses the same database of toxicity values, chemical parameters, and inhalation exposure equations as the Preliminary Remediation Goals (PRGs) for Radionuclide Contaminants at Superfund Sites calculator.</p> <p>Note that for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions, dose assessment is generally done only to show compliance with a dose-based Applicable or Relevant and Appropriate Requirement (ARAR).</p> <p>The RVISL calculator provides default parameters that can be modified to reflect site-specific risks. In addition, the calculator presents the option to compare the indoor air concentration, entered by the user or derived from groundwater or soil gas activities, to state standards or Uranium Mill Tailings Radiation Control Act (UMTRCA) standards, which also may be potential ARARs. If the calculator is used with non-default inputs in a decision on a Superfund site, it is recommended that the inputs be clearly identified and justified by the user.</p> <p>To ensure proper use of the calculator, please review the What's New, User's Guide, and Frequently Asked Questions links.</p> <p>The EPA has prepared a fact sheet for the general public that describes RVISL uses, RVISL calculator operation,</p>	First paragraph was broken apart in a similar manner.
Williams		User's Guide		Introduction	3	4	<p>What the RVISL supersedes is an important concept that should be moved to a callout box to provided added emphasis</p>	No current action. The text is sufficiently clear.