

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Hondros	1	Is there anything you would recommend to improve the website? In particular:	Please see separate document for improvement opportunities	If possible, will designate alpha decay as α and beta as β . Will do a global removal of daughter and replace with progeny. Will add units to the Mass and branching fraction columns. Variable names will be made consistent. Radon dose conversion factors will be updated if appropriate.
Hondros	1a	Is the website clearly organized, described, easy to navigate, and generally "user friendly"? If not, what do you recommend?	I have some minor concerns about the user interface. Please see separate document.	The scroll bar positions are a balance of readability for working with ten isotopes. The time stamp has been added to all tools. The tool name is part of the download file name. A new tool tip feature has been added eliminating the hover text.
Hondros	1b	Do the online DCC calculator tools match the information provided in the User's Guide and vice versa? If not, what do you recommend?	The user guides match the calculator tools very well. Even though there are examples of the mechanics of data entry, I think some worked examples showing how the tool can be used would be useful. Alternatively the worked examples may be more useful in a training package.	Noted. The tab key can move the user from cell to cell for data entry.
Hondros	1c	Do you have any other recommendations to improve the usability of the website?	See separate document for minor website "annoyances".	The scroll bar positions are a balance of readability for working with ten isotopes. The time stamp has been added to all tools. The tool name is part of the download file name. A new tool tip feature has been added eliminating the hover text.
Hondros	2	Is there anything you would recommend to improve the User's Guide? In particular:	User guides should be clear and easy to read with the ability for the reader to go deeper if necessary. The current user guide is quite dense. I can not offer any improvement suggestions, other than suggesting some on line training material (via a worked example) to help users navigate the document and system.	Noted. Video or archived online training is something we hope to add in the future.
Hondros	2a	Are the tool and website clearly explained?	Yes - however it took a while to read through the user guide. There is a lot of background information.	Noted.
Hondros	2b	Are the assumptions clear and reasonable? If not, what do you recommend?	I think the assumptions are clear and reasonable	Noted.
Hondros	2c	Is the guide well written and clearly organized? If not, what do you recommend?	As noted above, the user guide is quite dense (and long).	Noted.
Hondros	2d	Is the technical support documentation complete, organized and easy to follow? If not, what do you recommend?	I could not find any specific "technical support documentation" and assume that it is contained in the User Guide.	There is a document detailing the Peak DCC calculations (Bateman Equation Adaptation for Solving and Integrating Peak Activity into EPA ELCR and Dose Models at https://epa-prgs.ornl.gov/radionuclides/FINALPEAKTM.pdf) and one for the biota modeling (Biota Modeling in EPA's Preliminary Remediation Goal and Dose Compliance Concentration Calculators for Use in EPA Superfund Risk Assessment: Explanation of Intake Rate Derivation, Transfer Factor Compilation, and Mass Loading Factor Sources at https://epa-prgs.ornl.gov/radionuclides/2021_Biota_TM_Final.pdf).

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Hondros	3	Are the DCC models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?	"For dose factors, the ICRP has released more recent information (ICRP 137) and also specific factors for radon decay products. I checked a number of equations and they are appropriate. Some minor concerns with one citation (as indicated in the separate document) and some definitions. Overall, the models appear complete. "	Applicability of ICRP 137 in conjunction with FGR 15 and 16 radon inclusion will be investigated and incorporated in the near future.
Hondros	3a	Resident	No specific comments	Noted.
Hondros	3b	Indoor Worker	No specific comments	Noted.
Hondros	3c	Outdoor Worker	No specific comments	Noted.
Hondros	3d	Composite Worker	No specific comments	Noted.
Hondros	3e	Construction Worker (Site-specific only)	No specific comments	Noted.
Hondros	3f	Recreator (Site-specific only)	No specific comments	Noted.
Hondros	3g	Farmer	No specific comments	Noted.
Hondros	3h	Soil to Groundwater	No specific comments	Noted.
Hondros	4	Is the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend? Are the standard recommended default factors adequately explained, sourced, and reasonable?	"I mainly reviewed the NORM radionuclides (based on my background) and the radionuclides are appropriate. It is worth noting that there is a different method for assessing the impacts of inhaled radon decay products - see separate document. "	Applicability of ICRP 137 in conjunction with FGR 15 and 16 radon inclusion will be investigated and incorporated in the near future.
Hondros	5	Are the results of the calculator clearly explained and presented for the given scenarios? If not, what do you recommend?	"The scenarios are very clear and well explained in the support documentation. However, the outputs of the calculator are unclear (as noted in the separate document, this may be because I am unfamiliar with the US system). I found the outputs difficult to interpret for practical use and purposes. It may be useful to give a worked example of how the outputs are then practically used (for example; ""the outputs provide values which much be demonstrated through modelling or measurement"")."	Noted.
Hondros	5a	In particular, we are interested in your review of the calculator results when selecting the DCC Output Option "Peak DCC".	The peak Dose Compliance Concentrations feature needs to be used with caution because it can give unrealistically conservative results. These results may then be used as part of a conservative regulatory control system. As noted previously, it is important that users of the system are trained and understand exactly what the system is telling them and what the results mean. I have no opinion peak DCC apart from ensuring that it is well understood by the user and not automatically selected and used as the most conservative case.	Noted. Video or archived online training is something we hope to add in the future.
Hondros	6	Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?	As noted above, I am not sure how the results would be used in practice.	Noted. The DL of 1.0 is not a regulatory value. More reasonable DLs will give more reasonable results. Also, the Superfund program protects the RME individual.

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Hondros	7	Do the results provide a defensible explanation of how they were derived, or are they the result of a “black box”? Do you recommend anything different?	While the equations have been provided, there does remain an element of "black box" as I have noted in my separate comments. I suggest that a training package is necessary so that users understand what they are doing and what the outputs mean. This way the tool can also be used as part of an optimisation process. The tool works and is good, but it does need a qualified or experienced user to get value from it.	Noted. Video or archived online training is something we hope to add in the future.
Hondros	8	Is there anything else you would recommend to improve the utility, accuracy, completeness, or supportability of the calculator?	As noted - a training package or arrangement would be useful and almost necessary.	Noted. Video or archived online training is something we hope to add in the future.
Hondros	NA	Additional Comments	<p>Overall</p> <ol style="list-style-type: none"> 1. Let me start by saying that I am not entirely familiar with the US EPA approach to radiological impact assessment. My comments are therefore based on a quick (over the last few weeks) review of the US EPA approach. 2. The one overall comment is that the approach seems to very overly complex, and this is likely to cause difficulties for users. It is very important that users understand what they are doing rather than blindly punching numbers into a system to obtain a “result” (I note that this is also recognised in the user manual and notes). I would suggest that a training package be developed for casual users and more experienced users. This would make the tool more useful for radiation protection practitioners in an interactive manner. 3. Another overall comment is that the documentation and system is acronym rich. Many times I had to go searching for meanings of definitions and what they actually meant. A link to acronyms and definitions would be very useful – especially if this could be present on the desktop and accessible at all times – including when adding information (rather than jumping out of information entry and then back in). 4. I think that natural background levels need to be considered. In all cases, the DCC values are many orders of magnitude lower than natural background levels (for NORM radionuclides). 5. While doing this review, I took the perspective of a user – someone who has to use the software tool to implement management measures. 	<ol style="list-style-type: none"> 1. That is fine, we wanted some perspectives from radiation risk/dose modelling experts that are not familiar with the Superfund program. Although users of the tool at Superfund sites will generally be familiar with the EPA Superfund approach and other guidance/calculators, including reviews by those who work with other programs may provide insight into other scientific information and improving the usability of the calculator. 2. EPA has been giving 8-hour overview trainings at EPA regional offices and at conferences. We plan on giving the same class online and archiving that session. We anticipate developing a more advanced class for online. 3. To explain what each acronym and term means would become too lengthy to replicate the discussions that occur in other Superfund guidance documents. The Home page of the DCC calculator does refer readers to the guidance document “Radiation Risk Assessment at CERCLA sites: Q&A” for information on the role of dose assessments in the Superfund program. There are also links to for more information to FAQ, User Guide, and one page fact sheets on the DCC calculator for EPA staff and the general public. 4. The guidance document “Radiation Risk Assessment at CERCLA sites: Q&A” does state in the answer to Q.40 that the approach for how to incorporate background is dictated by the requirement that is an ARAR

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Hondros	NA	Additional Comments	<p>Online Tool – Overall</p> <ol style="list-style-type: none"> 1. Output graph is nicely interactive – this is a good feature 2. One of the graph tabs links to an external proprietary graphing program (Plotly) and this could be seen to be endorsing this product. 3. The export function works well to both pdf and spreadsheets. It may be worthwhile adding a header within the document that gives a date and name of program that the output. This would make it more useful for users. 	<ol style="list-style-type: none"> 1. Noted. 2. This mention of the program used for developing graphs of Peak Dose Rates was included for reasons of transparency, to provide the user with information on how the graphs were developed. 3. When saving the DCC calculator runs, there is a time stamp to the XLS and PDF output. The name of the tool is in the filename.
Hondros	NA	Additional Comments	<p>Online Tool – Radionuclide Decay Chain Calculator</p> <ol style="list-style-type: none"> 1. The mode columns should be as α, β rather than A, B. Capital letters are not the usual way to represent the types of radioactive emissions. 2. Throughout there is reference to “daughters”. The more correct term is "decay product". 3. A number of tables do not have units, and this is confusing as to what is being presented in the tables. 	<ol style="list-style-type: none"> 1. This change will be made 2. We used “daughters” in the DCC calculator for consistency with other EPA tools. 3. Units will be added to mass and branching fraction columns.
Hondros	NA	Additional Comments	<p>Online Tool – DDC Calculator</p> <ol style="list-style-type: none"> 1. I am not quite sure how the results would be used in practice and the documentation is not clear. For example, for airborne levels of Ra226, I use the default limit of 1mR with default variables and the result is a DCC of 1×10^{-4} Bq/m³. In practice, does this mean that the monitoring has to show that the airborne concentrations of Ra226 need to be continuously less than this value? If yes, then that is problematic because that value is barely measurable and therefore demonstrating compliance with the value is difficult. 2. All variable names should be consistent (otherwise it creates confusion for the users). 3. I note that the more recent ICRP 137 dose factors and recent ICRP radon factors have not been incorporated. 	<ol style="list-style-type: none"> 1. The 1 mrem/yr is just a starting point. There are a variety of dose limits in US standards, and EPA does not have a recommended dose level for Superfund cleanups, so 1 mrem/yr was selected. 2. We think the variable names are consistent within the tool and with other EPA Superfund calculators. 3. It is expected that these will be incorporated in the future.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Hondros	NA	Additional Comments	<p>Online Tool Issues/Difficulties/Annoyances</p> <ol style="list-style-type: none"> 1. General reference through the tool and the support material to "lambda". The correct or regularly used name is "decay constant". 2. In the tool, one of the data entry options is "Source and Decay Output Options - assumes secular equilibrium". The explanation then says that this means that the source is being "constantly replenished". This is not the correct meaning of "secular equilibrium". The correct definition is that the decay products are in equilibrium with the source. Secular equilibrium would be maintained, even if the source activity reduced and the decay products remained in equilibrium. Maybe the definition should say "decay products constantly replenished". 3. The output tables that appear in the tool (for example: Outdoor Worker 2-D External Inputs) extends off screen. Initially I thought that I had to print the outputs to xlsx or pdf to see the whole table. I latter found that there is a slider bar under the table. Maybe make this slider bar a little bigger. 4. I understand the difficulty and am not sure of an answer, however, the x-axis (time in years) on the output graphs seems odd – it reports as, for example, 1.295e-08 years. Is it possible to have this as days or seconds? 5. A footnote to the graphs says that the activities have been calculated for 1e16 years. This may be technically correct but might be seen as comical given that the age of universe is 1.4e10 years 6. When doing data entry and moving the cursor across the screen, the information pop up boxes appear immediately which is annoying. It means that you have to guide the cursor around the highlighted areas otherwise the pop up boxes appear. 7. When entering a value, you need to then move the cursor to the next data entry box. If you press "enter", then the whole screen moves forward rather than allowing you to enter the next value. 8. When entering "media concentrations" (for example) when putting in user inputs under the PRG screen, the entry screen does not fit on the screen. Slider bar helps, but maybe smaller text. 	<ol style="list-style-type: none"> 1. The term "lambda" is regularly used in other EPA tools. 2. The User Guide section "2.2.2 DCC Output Option #2: Assumes Secular Equilibrium Throughout the Chain (no decay - parent and progeny in constant equilibrium)" explains how this option should be used. 3. Currently we have not found a suitable solution to shrinking the width of the html table while being readable for those using smaller screens. Previously we did receive permission to remove EPA boilerplate website text from the left-hand side of the screen. We will continue to evaluate options to improve readability. 4. At this point it is not practicable to make this change with how the graphs are developed. 5. These are future years. The long time is necessary for the tools Bateman peak solver to function. 6. The tool tips in the DCC calculator were revised to resolve this issue. 7. The user should use the tab key. 8. EPA has adjusted the text size and screen width over the years to maximize readability over various screen sizes.

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Hondros	NA	Additional Comments	<p>Manual/User Notes</p> <ol style="list-style-type: none"> 1. The manual is a pdf of the online material – which is fine, however, a glossary would be useful. Again – far too many acronyms. 2. Please check the links. In a number of cases, there were no websites (although this might be because I tried to access from out of the US). Additionally, some of links go to general sites rather than the specific area of the website being referenced in the text. 3. Section 2.2.1.1 refers to a “Bateman solver... out to a trillion years”. A trillion years may be conservative and technically appropriate, however, it is a slightly comical. 4. Similar comment for 2.2.1.2, which references a peak in year 3,981,072. These times are so far in the future as to be meaningless. Suggest wording that says something like “beyond 10,000 or 100,000 years”. 5. A similar comment applies generally for the graphs which show units of nano year through to mega year. As noted, this might be correct, however, can this be presented better? (ie; “nyears” is a very odd unit). 6. Table in Section 2.2.5 – half-life of U238 is incorrect. I did not check the online tool. 7. Diagram in 3.1 is excellent and gives a very clear overview. 8. There may need to be more explanation of background radiation and its impacts. I noted when doing some example assessments, the output target values were well below background levels. (Section 3.2) 9. The point in section 3.3 is important and supports the idea that training should accompany the system. As noted earlier, I think a training package (maybe on line lecture or video could be useful). 10. The examples and scenarios in section 4 are very clear and well explained. Providing the equations is good. There is quite a bit of repetition, but this is appropriate. 11. Section 5 – Table 1: Tissue Transfer Factors and Animal Intake Rates of Fodder, Water, and Soil – reference cannot be “personal communication”. 12. Section 5 – Table 1: Mechanical Particulate Emission Factor Variables from Other Construction Activities – the first three symbols and definitions are meaningless. 	<ol style="list-style-type: none"> 1. See earlier answer regarding glossary. Also, note that all acronyms should be spelled out in the text on first use. 2. Will evaluate several approaches for periodically checking the links to websites. The issue of broken links does seem to be increasing. Generally, we have tried to make the links as specific as readily possible. 3. It was intended that when developing the Bateman solver it might have uses other than site risk/dose assessments, so we did not artificially limit the time period. 4. See previous response. Also, a FAQ on this issue will be added. 5. The graphs have a sliding scale depending on the half-life. 6. Will correct. 7. Noted. 8. The guidance document “Radiation Risk Assessment at CERCLA sites: Q&A” does state in the answer to Q.40 that the approach for how to incorporate background is dictated by the requirement that is an ARAR. 9. See earlier answer to training comment. 10. Noted. 11. The documentation that was the source of the data in the personal communication will be referenced instead. 12. These are default values.
Hondros	NA	Additional Comments	<p>DCC Models and Equations</p> <p>I went through each of the equations for each of the scenarios and they are comprehensive and appear to be in order. I did not see any errors in equations or approach.</p>	Noted.

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Hondros	NA	Additional Comments	<p>Radon Decay Products</p> <p>The approach to radon decay products is not comprehensive. It is unclear how exposure and dose factors for radon decay products are being incorporated and the various factors that contribute to the dose factor, such as attached and unattached fraction and particle size. If radon (both Rn-222, Rn-220 and Rn-219) concentrations are being used as the basis for assessment, then other factors such as equilibrium factor need to be considered. I think further work is required on radon.</p>	<p>Aeq is used to quantify the equilibrium level of radon daughter products in the air from household use of water based on air exchange rates. This work was derived from the approach used in the Radon Vapor Intrusion Level (RVISL) calculator and will be further refined in the future if that portion of the RVISL calculator is revised. We have additional information from an intern research paper and webinar in August 2022.</p>

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Koliabina	1	Is there anything you would recommend to improve the website? In particular:	Check all links, and check how it works when user is opening links in new tabs.	Links are periodically checked as we are aware that they change often.
Koliabina	1a	Is the website clearly organized, described, easy to navigate, and generally "user friendly"? If not, what do you recommend?	It is user friendly. Maybe it could be good to place link to calculator as button somewhere above/below the picture to make it more visible. Download as well as Download Area links (Home page) redirects to the page with info - "Unavailable until further notice". Maybe somewhere should be presented conversion from mrem/yr to mSv/yr in FAQ. Also, maybe it is good to specify Child in table in FAQ (1 y.o, 10 y.o etc).	The navigation box is standard across all our tools. The download tables will be available soon. Conversions to other units are easily found on the internet.
Koliabina	1b	Do the online DCC calculator tools match the information provided in the User's Guide and vice versa? If not, what do you recommend?	It is perfect that there is redirection to DCC FAQ in User's guide. They match each other.	Noted.
Koliabina	1c	Do you have any other recommendations to improve the usability of the website?	Maybe open each new link in new tab, to work at the same time with Guide and Calculator as example. During work with user Guide in Edge browser when I was trying to open some links in new tab, all the time site was redirecting me to the Disclaimer (not to the linked topic).	Chrome is the recommended browser for use on all our Calculators. If the problem persists, we will fix.
Koliabina	2	Is there anything you would recommend to improve the User's Guide? In particular:	In PDF version there is no navigation in the document.	Noted. The PDF is generated from HTML and not a Word file so there is no navigation.
Koliabina	2a	Are the tool and website clearly explained?	Yes, it is understandable. "DCC Download area" is not available for now.	Download tables will be available soon.
Koliabina	2b	Are the assumptions clear and reasonable? If not, what do you recommend?	Yes, they are.	Noted.
Koliabina	2c	Is the guide well written and clearly organized? If not, what do you recommend?	It is, but navigation in PDF version is not comfortable (no navigation links).	Noted. The PDF is generated from HTML and not a Word file so there is no navigation.
Koliabina	2d	Is the technical support documentation complete, organized and easy to follow? If not, what do you recommend?	Yes, documentation is clear and easy to follow. Maybe it is good to add some short description of the contamination of foods (only transfer from soil to plant, or some leaves uptake, is contamination due resuspension from the soil taken into account...is the translocation taken into account for mobile elements etc.). Maybe I couldn't find this information in the documentation.	This information is available in the User's Guide.
Koliabina	3	Are the DCC models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?	They are.	Noted.
Koliabina	3a	Resident	No comments	Noted.
Koliabina	3b	Indoor Worker	No comments	Noted.
Koliabina	3c	Outdoor Worker	No comments	Noted.
Koliabina	3d	Composite Worker	No comments	Noted.
Koliabina	3e	Construction Worker (Site-specific only)	No comments	Noted.
Koliabina	3f	Recreator (Site-specific only)	No comments	Noted.
Koliabina	3g	Farmer	No comments	Noted.

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Koliabina	3h	Soil to Groundwater	"The Kd of the parent was used for all the short-lived progeny in the soil-to-water partitioning DCCs to calculate downgradient water concentrations" why Kd of progeny, is not used for it?	That section was pointing out the flaw in the old +D models.
Koliabina	4	Is the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend? Are the standard recommended default factors adequately explained, sourced, and reasonable?	Yes, it is. Age-adjusted cereal ingestion fraction is not clear and couldn't be found in user's guid easily (some more clean description should be presented). In the Radionuclide decay chain tab, halflife is shown in different format for different RNs and may confuse user. The same with Time (yrs) in the table -"Activities for RN and daughters". Data format is different for different time-points.	The User's Guide presents a condensed version of the biota Technical Memorandum document cited in the text. The varying time scale is necessary to clearly show the decay and ingrowth.
Koliabina	5	Are the results of the calculator clearly explained and presented for the given scenarios? If not, what do you recommend?	Yes, mostly they are. "Soil Ingestion of Beef ' as example is not very understandable. Maybe it is good to add the same tips as are presented for input data.	We could not find this in the User's Guide or calculator output.
Koliabina	5a	In particular, we are interested in your review of the calculator results when selecting the DCC Output Option "Peak DCC".	It manages radioactive decay, but can not be postprocessed directly.	Noted.
Koliabina	6	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, just some clarifications may be added.	Noted.
Koliabina	7	Do the results provide a defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?	Results look understandable and could be then analyzed by the user.	Noted.
Koliabina	8	Is there anything else you would recommend to improve the utility, accuracy, completeness, or supportability of the calculator?	It would be more user friendly to add possibility to use some filter or search window during radionuclides selection. In the tip in Calculator where Chapters from guide are listed they may be presented as hyperlinks to the chapters. There is no option to use scientific format (1E5 etc) when inputting media concentrations. Age-adjusted cereal grain ingestion fraction is not clear and couldn't be found in user's guide easily (some more clean description should be presented).	To find a radionuclide, click in the list and start typing; the cursor will jump to the letters you type. Making each section in the user's guide it's own HTML page is not practical. Entering non-numeric characters is disabled in all our tools. The cereal grain description will be clarified.

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LaBone	1	Is there anything you would recommend to improve the website? In particular:	1) FAQ; Farmer Direct Consumption of Agricultural Products CDIs: equation for consumption of sheep milk is missing. 2) Supporting equations: first three equations do not load. 3) Radionuclide Decay chain; fourth paragraph of description: "Primary Remediation Goals" misspells "preliminary". 4) Radionuclide Decay chain; paragraph after figure 1: space between "are specified" and "."	1) CDI equation is present now. 2) PEF equations are present now. 3) spelling will be fixed. 4) will be fixed.
LaBone	1a	Is the website clearly organized, described, easy to navigate, and generally "user friendly"? If not, what do you recommend?	The results for the calculator could be improved. 1) Adding a progress bar for calculations that will take several minutes would help. The notification that calculations could take several minutes shows up below the list of radionuclides when there are a large number of them (e.g., selected all) and it isn't immediately obvious why the links are dead. 2) Making the download options more noticeable and with a consistent layout would be more user friendly. Currently, some downloads are buttons, some are at the top, and others are scattered among the output tables and figures. 3) Adding a "return to the top" option after each FAQ entry would improve user friendliness.	1) Progress indicators have been tried and don't work. The best thing to do is monitor the browser page loading indicator. 2) Download option positions are dictated by the coding of the various PRG output options. The user can increase the font. EPA also added download buttons. 3) Most mice and trackballs have a back button. Also two key strokes can get you to the top of any page.
LaBone	1b	Do the online DCC calculator tools match the information provided in the User's Guide and vice versa? If not, what do you recommend?	Yes, it matches the user guide.	Noted.
LaBone	1c	Do you have any other recommendations to improve the usability of the website?		
LaBone	2	Is there anything you would recommend to improve the User's Guide? In particular:	1) Some of the figures do not load (section 2.1, 2.5.1.2, 4.10) on Edge, Chrome, or Firefox. Checking back after intial review, the figures that load are inconsistent. 2) section 2.1 paragraph 5: "resident" is not capitalized in "resident air". 3) section 2.5.1.1: second paragraph, make include past tense, i.e. "...particularly for food exposures not include[d] in the Exposure Factors..." 4) 4.5.1 5cm equation is the same as the 1cm equation.	1) Images have been be restored. 2) Corrected. 3) Corrected. 4) Corrected.
LaBone	2a	Are the tool and website clearly explained?	Yes	Noted.
LaBone	2b	Are the assumptions clear and reasonable? If not, what do you recommend?	Yes	Noted.
LaBone	2c	Is the guide well written and clearly organized? If not, what do you recommend?	The guide could use some proofreading (see main part of question 2).	Noted.
LaBone	2d	Is the technical support documentation complete, organized and easy to follow? If not, what do you recommend?	Yes	Noted.
LaBone	3	Are the DCC models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?	I do not have the expertise to answer this question.	Noted.

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LaBone	3a	Resident		
LaBone	3b	Indoor Worker		
LaBone	3c	Outdoor Worker		
LaBone	3d	Composite Worker		
LaBone	3e	Construction Worker (Site-specific only)		
LaBone	3f	Recreator (Site-specific only)		
LaBone	3g	Farmer		
LaBone	3h	Soil to Groundwater		
LaBone	4	Is the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend? Are the standard recommended default factors adequately explained, sourced, and reasonable?	I do not have the expertise to answer this question.	Noted.
LaBone	5	Are the results of the calculator clearly explained and presented for the given scenarios? If not, what do you recommend?	The calculator results are somewhat jumbled looking, especially in runs with a large number of radionuclides. Having the results for each radionuclide be collapsable would help with presentation and readability. Having explanation at the start of results and not requiring the user to scroll through all the tables and figures to find the explanations would improve the user experience.	There are already tabs at the top of the page that separate media. Also at the top of the page are links to each radionuclide's result section. EPA did add download buttons on the results page. EPA did add download buttons on the results page.
LaBone	5a	In particular, we are interested in your review of the calculator results when selecting the DCC Output Option "Peak DCC".	This mode in particular would benefit from having collapsable sections for each radionuclide and the downloads being more obvious (e.g., buttons).	There are already tabs at the top of the page that separate media. Also at the top of the page are links to each radionuclide's result section. EPA did add download buttons on the results page.
LaBone	6	Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?	I do not have the expertise to answer this question.	Noted.
LaBone	7	Do the results provide a defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?	The model equations and methods are given sufficient description so that the model is not a "black box".	Noted.
LaBone	8	Is there anything else you would recommend to improve the utility, accuracy, completeness, or supportability of the calculator?	The user cannot enter scientific notation in the user provided entries of the PRG calculator. Adding that functionality would increase the user experience and accuracy when adding values that are recorded as scientific notation and could be mistyped and thus off by an order of magnitude.	Entering non-numeric characters is disabled in all our tools.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	1	Is there anything you would recommend to improve the website? In particular:		
Siard	1a	Is the website clearly organized, described, easy to navigate, and generally "user friendly"? If not, what do you recommend?	I find the web site to be generally easy to navigate and user friendly. A substantial comment is that the calculator does not consistently provide accurate results when the back arrow is used. Initially, it appeared to me that hitting the back arrow worked fine-- and I believe it sometimes did. Regardless, it became clear to me that something was amiss with some of my test DCC runs. Once I began to close out after each run, these "problems" disappeared when I re-did my runs. Also, I was not able to use the online User's Guide trying a couple different browsers (Edge and Chrome)--I had to use the pdf version. This was workable, except that the links on the pdf version are not live. SUGGESTIONS: 1) Either fix the Calculator so that using the back arrow provides accurate results for a subsequent run, or disable the back arrow so that one cannot use it to go from results to input. 2. Make sure that the User's Guide can open online and/or make sure that the pdf version links are live.	1) back button issues will be investigated 2) The links in the PDF document of the User's Guide are from our development area; they will be generated from the live version in the future.
Siard	1b	Do the online DCC calculator tools match the information provided in the User's Guide and vice versa? If not, what do you recommend?	In general, the DCC Calculator and the User's Guide match up reasonably well. However, a couple items are noted here for suggested changes. 1) As mentioned in other responses, I think the treatment of the 2-D External Exposure is a bit confusing. 2-D External Exposure is listed as a "medium," but it is not mentioned/footnoted in the CSM on page 32 (Section 3.1.1) of the pdf. SUGGESTION: If the 2-D External Exposure is left as a medium, then I suggest that it be identified in the CSM. (However, I would prefer having the ability to select the contamination layer thickness under the soil medium and eliminate 2-D from the list of media.) 2) Another item is that the Peak Dose DCC output lists an ED of 26 years for the resident, but with respect to dose, this is inconsistent with Page 4 Section 2.1.2.2 which states: "For instance, if the time period of 100 years is selected for default resident soil for U-238 (ED of 1 year), year 100 will be selected by default, because U-238 peak 0 dose isn't until year 3,981,072." Please also see response No. 5a (and elsewhere) regarding the SUGGESTION to eliminate "ED" from the output.	1) The CSM can be edited to include mention of the 2-D media with a footnote. In the calculator, the addition of a drop-down selection option for the contamination depths will be considered. 2) The ED is actually used to develop a pro-rated RME receptor over the peak year of dose and all those variables need to be given to the user. It can be clarified in the User's Guide that annual dose is the intended duration.
Siard	1c	Do you have any other recommendations to improve the usability of the website?	Nothing in addition to the suggestions provided in 1a and 1b, but I will emphasize with respect to 1b that I recommend that 2-D be eliminated as a medium and depth options be used for soil. (The ACF options for area are already included.)	Will change the name to "Soil 2-D External Exposure Only".
Siard	2	Is there anything you would recommend to improve the User's Guide? In particular:	I recommend changing the title of Section 2.8 to "Sensitivity/Uncertainties Analysis" and to restructure the first couple sentences to introduce the fact that multiple uncertainties exist. Before the discussion of changing a value, it should be made clear that the existence of uncertainties is the typical reason why one would consider changing a value. I note that the current Section 2.8 text opens without any discussion of uncertainties: "A sensitivity/uncertainty analysis is the quantitative assessment of how changing a single value impacts the DCC calculation. Sensitivity analyses are generally conducted to determine what changed variable in a DCC has the greatest impact." Also, I suggest paginating the pdf of the User's Guide for easier reference-- especially useful if a page or section is printed.	Changing the section of 2.8 to "Sensitivity/Uncertainties Analysis" is agreeable. Introductory sentences will be evaluated. The PDF will be paginated if possible.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	2a	Are the tool and website clearly explained?	The User's Guide lists a default dose limit of 1 mrem/year but does not provide adequate discussion as to why this value might be a reasonable value or a reasonable starting place. SUGGESTION: Additional discussion should be added to Section 2.6 regarding the selection of dose limit values.	A particular dose limit would have to be determined to be an ARAR before the DCC would be used. There are many different dose limits in the US so 1 mrem/yr is just a placeholder.
Siard	2b	Are the assumptions clear and reasonable? If not, what do you recommend?	I found the discussion of external exposure to ionizing radiation for e.g., Resident Soil and Resident Soil 2-D External Exposure to be a bit confusing. The second short paragraph of Section 4.1.2 (p. 36) states: "This analysis is designed to look at external exposure from contamination of different area sizes. Areas considered are 1 to 1,000,000 square meters. Isotope-specific area correction factors (ACF) were developed for this analysis." Although this is correct, it is also true that for "Residential Soil" on p. 34, the same isotope-specific values were also used based on infinite soil volume (ACFext-sv). Note that the last equation on p. 34 and the first equation on p. 37 (direct exposure at infinite depth) are exactly the same and use the same isotope-specific, area (i.e., m2)-specific ACF values. SUGGESTION: Include "isotope-specific" also on page 34 (Section 4.1.1) and emphasize in Section 4.1.2 that the difference between the external exposure in Sections 4.1.1 and 4.1.2 is the multiple depths in Section 4.1.2 and that Section 4.1.1 defaults to the "soil volume" (i.e., infinite) depth selection.	Agreed that the second paragraph in these land use sections should be about contamination depth and not area exclusively.
Siard	2c	Is the guide well written and clearly organized? If not, what do you recommend?	As suggested above, the pdf should be paginated for easier reference. Additionally, based on my comments in response 2b, I suggest clarifying that Section 4.1.1 likewise includes external exposure, but that it assumes an infinite depth.	The PDF will be paginated if possible. IT is created from HTML so it isn't something that happens automatically. 4.1.1, 4.2.1, etc will add explanation about "infinite soil volume."
Siard	2d	Is the technical support documentation complete, organized and easy to follow? If not, what do you recommend?	In general, the technical support documentation appears to be appropriately complete and organized. However, I note that the values listed for each of the receptors on page 106 of the pdf listed for all of the Dose and Decay Constant Variables are not found in the references listed except for the construction worker (t-cw = 1). The values for the other receptors (except for the site-specific recreator) are likewise t=1, which is correct for a mrem/yr dose rate, but the references listed provide exposure duration values (e.g., resident = 30 years; worker = 25 years; both are from EPA [1991], which was revised by the 2014 EPA revised default exposure values). SUGGESTION: Correct the source of these values, perhaps stating something like: "Because the dose rate is based on mrem/yr, t=1yr is used as a default for this receptor," for the workers, resident, and farmer scenarios. Refer to Attachment A.	Will revise.
Siard	3	Are the DCC models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?		

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	3a	Resident	<p>I found a few issues with the calculations and/or model for the resident. 1) If Soil and 2-D are selected as media, the resultant dose rate associated with external exposure under "soil" is 26 times lower than the resultant dose rate associated with external exposure (soil volume) under 2-D (See Attachments B, C, and D that accompany this review); the resultant DCCs associated with external exposure under soil are accordingly 26 times higher than under 2-D (soil volume). From pages 34 and 37 in the User's Guide, the equation and parameter values are the same for these two scenarios. The factor of 26 is also equal to the ED for the resident (combined child and adult). If the dose limit is based on mrem/yr and ED is not a parameter value in the equation on pages 34 and 37 for external exposure, it does not seem that this factor should be related to exposure duration. SUGGESTION: Correct this apparent error. 2) The 26-yr exposure duration appears in the DCC graphs for the resident and is reflected in the DCC results summary. Dose values associated with ARARs are in units of mrem/yr. Therefore, it is unclear to me why the DCC calculator includes a 26-year period for "peak dose" as would be done for risk calculations See also response 5a. SUGGESTION: Eliminate the 26-year ED from the calculation. The child/adult ratios associated with exposure via certain pathways (not including external exposure) are factored in the AAF-res(c) and AAF res(a) shown on page 39 of the pdf. 3) Because the dose (i.e., mrem/yr) is based on t=1yr, as shown on page 108 of the pdf, an individual would be either an adult or a child--not both--during the year of highest dose. SUGGESTION: Consider revising the model to run the adult and child residents separately and base the DCC on the lower of the two. Note that this would eliminate use of the child/adult resident receptor and the associated AAF values referenced in the previous suggestion. 4) Additionally, please see discussion for the indoor worker (3b) regarding the 0.4 dilution factor for indoor dust inhalation included in EPA (2000) Soil Screening Guidance for Radionuclides which is supported by the current EPA (2018) Exposure Factors Handbook. SUGGESTION: Include the 0.4 factor for the indoor dust pathway in the resident scenario, consistent with EPA guidance.</p>	<p>1) The 26 factor will be investigated. 2) the blue area of the graph will be investigated to see if it should be one year and not twenty-six. 3) Evaluation of separating the adult and child will be done. 4) The indoor air dilution factor would not be consistent with chemical models.</p>
Siard	3b	Indoor Worker	<p>This model appears to be set up correctly in general, and t=1 yr is used correctly in the output. However, I notice that the calculation does not include the "dilution factor" for indoor dust inhalation of 0.4 that is found on page 2-20 of the EPA (2000) Soil Screening Guidance for Radionuclide: User's Guide (EPA/540-R-00-007). This dilution factor acknowledges that indoor dust occurs at a concentration that is ~40% that found in associated ambient outdoor air. Note that Chapter 19 (2018) of the current EPA Exposure Factors Handbook (EFH) states, " In the absence of indoor sources, indoor concentrations of particulate matter are significantly lower than outdoor levels," citing a paper by Wallace (1996). The Wallace (1996) paper includes an equation that includes an indoor dust concentration factor of 0.385 (compared to particulates in ambient outdoor air) which is the same values used in the EPA (2000) SSG for rad document (and RESRAD). Ignoring the 2000 guidance and the statement included in the current EFH results in a ~2.5X overestimate of dose associated with dust-borne exposure. RECOMMENDATION: Add the 0.4 indoor dust inhalation factor for the indoor worker. This comment regarding the outdoor-to-indoor factor also applies to the resident, composite worker (if recommendation of 3d is implemented) and farmer.</p>	<p>The indoor air dilution factor would not be consistent with chemical models.</p>

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	3c	Outdoor Worker	The model appears to be set up correctly and operating properly. The t=1yr is correctly reflected in the results.	Noted.
Siard	3d	Composite Worker	<p>The composite worker is defined in the User's Guide as, "This long-term receptor is a full time employee working on-site who spends most of the workday conducting maintenance activities outdoors." This definition is EXACTLY THE SAME as the definition given for the outdoor worker. Social Security Ruling 82-61 states "Composite jobs have significant elements of two or more occupations ...". For purposes of exposure assessment of a given exposure unit, I have always seen a "composite worker" treated as representing individuals who are engaged in tasks where they spend significant time both indoors and outdoors. Using the outdoor worker scenario for a composite worker who may spend 50 percent or more of his/her time indoors will typically overestimate exposure, especially with respect to the external exposure pathway. Because of the DCC not truly including a composite worker, the DCC user is forced to run both the indoor and outdoor worker scenarios, and then multiply each result by a relative indoor/outdoor exposure factor (e.g., for a 2 hour outdoor/6 hour indoor, the factors would be 0.25 and 0.75, respectively). RECOMMENDATION: Mathematically rework the composite worker exposure scenario to include both indoor and outdoor exposure. If a screening-only DCC value is desired for an indoor/outdoor composite worker, the default settings of 0.9 for outdoor and 0.1 for indoor factors might be considered. This is because the more-exposed outdoor worker is assumed to be exposed for 225 days/yr (90% of 250 days/yr) and the remaining 25 days (10% of 250 days/yr) could be assumed as indoor exposure. Alternatively, the outdoor worker DCC values should typically be adequately conservative for a composite worker because more than 10% of time would likely be spent indoors. Also, please see note under 3b regarding the use of outdoor-to-indoor dust factor of 0.4 for the indoor portion of the composite worker that is recommended in the previous sentences.</p>	<p>1) The worker activity descriptions will be made unique. 2) The addition of indoor exposure time will be considered for the composite worker for the external exposure route.</p>
Siard	3e	Construction Worker (Site-specific only)	The model appears to be set up correctly and operating properly. The default t=1yr is correctly reflected in the results.	Noted.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	3f	Recreator (Site-specific only)	<p>The model appears to be set up correctly and generally working properly. However, comments on the resident receptor with respect to inclusion of the in the calculation of the DCC also applies to this receptor also apply to this receptor. I used a 10-year exposure duration, with 2 years as a child and 8 years as an adult (i.e., child AAF=0.3; adult AAF=0.8) using the Peakrisk option. The external exposure dose under the "soil" option was exactly 10X less than the external exposure dose using the 2-D (soil volume), and the DCC values were inversely related, where the DCC based on the soil option was exactly 10 higher than the DCC based on 2-D (soil volume). (See Attachments E, F, and G.) SUGGESTION: Correct this apparent error. 2) The selected "site-specific" 10-yr exposure duration appears in the DCC graphs for the resident and is reflected in the DCC results summary. Dose values associated with ARARs are in units of mrem/yr. Therefore, it is unclear to me why the DCC calculator includes a 10-year period for "peak dose" as would be done for risk calculations. SUGGESTION: Eliminate the ED from the calculation under the 2D selection. The child/adult ratios associated with exposure via certain pathways (not including external exposure) are factored in the AAF-rec(c) and AAF-rec(a) shown on page 62 of the User's Guide pdf. 3) Because the dose (i.e., mrem/yr) is based on t=1yr, as shown on page 108 of the pdf, an individual would be either an adult or a child--not both--during the year of highest dose. SUGGESTION: Consider revising the model to run the adult and child recreators separately and base the DCC on the lower of the two. Note that this would eliminate use of the child/adult recreator and the associated AAF values referenced in the previous suggestion.</p>	<p>1) The ED factor will be investigated. 2) The blue area of the graph being larger than one year will be investigated. 3) evaluating the separation of the adult and child will be done.</p>

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	3g	Farmer	<p>I found a few issues with the calculations and/or model for the farmer. Comments on the resident receptor and indoor worker also apply to this receptor. Additionally, I found one output that provides an unexpected result but after further review appears to be akin to "rounding error," and I question the use of the soil-to-fish pathway. These issues are as follows:</p> <p>1) The 40-yr exposure duration appears in the DCC graphs for the farmer and is reflected in the DCC output summary (Appendix H). Dose values associated with ARARs are in units of mrem/yr. Therefore, it is unclear to me why the DCC calculator includes a 40-year period for "peak dose" as would be done for risk calculations. SUGGESTION: Eliminate the 40-yr ED from the results. The child/adult ratios during exposure via certain pathways (not including external exposure) are factored in the AAF-far(c) and AAF far(a) shown on page 77 of the pdf.</p> <p>2) Because the dose (i.e., mrem/yr) is based on t=1yr, as shown on page 108 of the pdf, an individual would be either an adult or a child--not both--during the year of highest dose. SUGGESTION: Consider revising the model to run the adult farmer and child farmer separately and base the DCC on the lower of the two. Note that this would eliminate use of the child/adult farmer receptor and the associated AAF values referenced in the previous suggestion.</p> <p>3) Additionally, please see discussion for the indoor worker (3b) regarding the 0.4 dilution factor for indoor dust inhalation included in EPA (2000) Soil Screening Guidance for Radionuclides which is supported by the current EPA (2018) Exposure Factors Handbook. SUGGESTION: Include the 0.4 factor for the indoor dust pathway in the resident scenario, consistent with EPA guidance.</p> <p>4) The farmer scenario was run for U-234 for combined soil and biota at 1 pCi/g U-234 in soil, using Peakrisk and a maximum of 1,000 years. For each farmer pathway except swine ingestion, the maximum dose rate was between 960 and 1,000 years. For swine ingestion, the maximum dose rate was between years 0-40 (actually year 0-1) and for all other pathways, the maximum dose rate was at between years 960-1,000 (actually year 999-1,000). The magnitude of differences between swine ingestion dose at years 0-1 and 999-1,000 are negligible, but it would seem that the dose at year 999-1,000 should be higher than at year 0-1. (See Attachment H). SUGGESTION: Revisit the swine ingestion calculation to verify that this is not a mathematical error.</p> <p>5) I question the practice shown on page 83 of the User's Guide pdf that includes the calculation of fish and shellfish concentrations based on soil concentrations. SUGGESTION: Provide an explanation and reference for this practice.</p>	<p>1) The ED factor is fixed. 2) The blue area of the graph being larger than one year is fixed. 3) Separation of the adult and child is not consistent with EPA risk tools and will not be done. The user can use the calculator to generate adult and child only DCCs. 3) The indoor air dilution factor use is not consistent with chemical calculators. 4) This is the result of progeny having few or no known transfer factors for each animal. More element specific transfer factors are needed for swine including Pb, Ra, and Th among others. 5). Fish and shellfish based on soil concentration uses default Kds from EPA. If site-specific Kds are available, they should be used.</p>
Siard	3h	Soil to Groundwater	My review found the model to be set up correctly and operating reasonably.	Noted.
Siard	4	Is the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend? Are the standard recommended default factors adequately explained, sourced, and reasonable?	The choice of radionuclides and decay chains appear to be addressed appropriately. In general, default factors appear to be adequately defined. Please note exception in my response for 2d regarding the t=1 values.	Noted.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	5	Are the results of the calculator clearly explained and presented for the given scenarios? If not, what do you recommend?	The results are adequately explained in general. I have made a suggestion in 5a regarding the use of "ED." I have also commented on what I think to be heading errors in the DCC output.	Noted.
Siard	5a	In particular, we are interested in your review of the calculator results when selecting the DCC Output Option "Peak DCC".	Please see 3a concerning the apparent error with respect to the 26-year ED shown in the final column of the Peak results summary. It is suggested that "ED" be deleted as this value typically relates to a receptor scenario at a given site (e.g., 26 years for residents, 25 years for workers), as these values are provided only to derive the age adjustment factors (AAF) for the resident, recreator and farmer (shown on e.g., pages 34, 62, and 71 of the pdf User's Guide, respectively) for certain pathways. Because dose relates to mrem/yr, the focus should be on the maximum dose year over the time period selected. Therefore, the final column of the dose summary should not include "ED" as this is confusing. Instead, a heading such as "Maximum Dose Year" is suggested. Also see response 7 and Attachment I.	See response to comment 3a.
Siard	6	Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?	Please see my response to Question 7 with respect to DCC output. Also, response 2a is intended to clarify the existence/importance of uncertainties.	See responses to 7 and 2a.
Siard	7	Do the results provide a defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?	I do not think they suffer from "black box" syndrome with respect to the program. As stated by comments above, I think the use of a 26-year (resident) or 40-year farmer for calculating a dose of the entire exposure duration is not applicable to verifying compliance with ARARs that are based on mrem/yr. Also, some of the headings on the DCC output (for all receptors) appear to be incorrect, described as follows (and shown in Attachment I): 1) The 3rd column of the output is labeled "Maximum dose during peak interval (unitless)." The calculation is 26X the maximum dose rate; thus, the units would seemingly be "mrem" over the entire exposure duration. Because ARARs are based on mrem/year, the third column should either be eliminated or an explanation should be provided as to how it is used to calculate a DCC that is based on the 1-yr period of maximum dose rate (mrem/yr). 2) The 4th column is headed "Maximum dose rate during peak interval" (risk/yr). The units should be "mrem/yr". 3) In the 5th column, "Maximum dose interval" should be replaced with a heading such as, "Maximum Dose Year." Mention of ED should be eliminated, or an explanation should be provided as to how it is used to calculate a DCC that is based on the 1-yr period of maximum dose rate (mrem/yr). Note that the ED is (errantly) applied only to the resident, recreator and farmer receptors, whereas the t=1 values is correctly applied to the worker scenarios such that the length of the maximum dose interval is correctly shown as 1 year. Again, p. 108 of the pdf User's Guide also uses a t=1 for the resident and farmer receptors as well as for the worker scenarios; t=1 is reflected in the 5th column of the DCC output summaries for the worker scenarios rather than a multi-year ED value.	The peak Dose output table has been updated appropriately.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Siard	8	Is there anything else you would recommend to improve the utility, accuracy, completeness, or supportability of the calculator?	<p>The Calculator does not calculate the total dose of multiple radionuclides. Conservatively, one may simple add the Peak dose values for each radionuclide. However, it is possible that four radionuclides present in site media may have greatly different maximum dose rates and dose curves. An estimate of the maximum dose may be inferred by comparing the maximum total dose of each radionuclide. However, this approach relies on presentation of the curves and a description of the method used. It is recommended that the Calculator is revisited to calculate a total dose of multiple radionuclides to which a receptor may be exposed.</p>	This will be considered as a future project.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	1	Is there anything you would recommend to improve the website? In particular:	Apart from the comments in my Notes I think the website is mostly fine. I would suggest asking who the intended audience for the tool might be. As I talk about in other questions and in my Notes, I am somewhat of an outsider to many EPA concepts and I had to educate myself on some of them. One way to ease that issue is to be more consistent when defining initializations or acronyms. I encountered several instances where I found an acronym/initialization that I was unfamiliar with and the definition was not easy to find. That required me to do document searching and was not always trivial to do. I have pointed to many instances of this kind of problem in my Notes but it is not exhaustive. Generally I would say the entire website and User's Guide need a thorough editorial review to clean these issue up and make the web page and User's Guide internally consistent.	Thank you for a thorough review. Addition of prominent links to key guidance documents and revisiting acronym definitions should help.
Wentworth	1a	Is the website clearly organized, described, easy to navigate, and generally "user friendly"? If not, what do you recommend?	The website is well organized generally and user friendly overall. I accessed the website through 3 different computers all using a Windows OS and Chrome browser during my evaluation. I had some performance issues occasionally. Because of the large number of operations contained in the web page, I would assume that users will have mixed results which can be somewhat frustrating. Expanding the entire User's Guide with "Open All Sections" was occasionally problematic.	Noted.
Wentworth	1b	Do the online DCC calculator tools match the information provided in the User's Guide and vice versa? If not, what do you recommend?	The calculator tools generally match the user's guide. As I note in several entries of my Notes, I do not have a background in CERCLA and I needed to educate myself on some of the EPA ideas and concepts. One item that I'm still unsure about occurs in User's Guide Section 4.10.6 "TR".	The "TR" was an artifact and has been removed.
Wentworth	1c	Do you have any other recommendations to improve the usability of the website?	I have no other general recommendations to improve usability other than internal consistency issues noted my other comments.	Noted.
Wentworth	2	Is there anything you would recommend to improve the User's Guide? In particular:		
Wentworth	2a	Are the tool and website clearly explained?	The tool and website are clearly explained. I would emphasize again editorial consideration be given to the audience and internal consistency.	Agreed.
Wentworth	2b	Are the assumptions clear and reasonable? If not, what do you recommend?	Most assumptions seem to be clear and reasonable. One major exception is the default breathing rate for all occupational settings (60 m ³ /day). This seems like an overly high breathing rate. Using my prior experience with NRC regulations I am familiar with the average rate used to establish Derived Air Concentrations (DACs) which uses 20 l/min (29 m ³ /day) defined as light work. I'm not convinced that a worker could spend an entire shift at a breathing rate of 60 m ³ /day (42 l/min).	The breathing rate is based on our guidance documents.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	2c	Is the guide well written and clearly organized? If not, what do you recommend?	The guide is well written generally apart from the specific examples I cited elsewhere or in my "Notes".	Noted.
Wentworth	2d	Is the technical support documentation complete, organized and easy to follow? If not, what do you recommend?	The technical support documentation is very good. However, due to the large number of references I found many dead links to supporting material. These are identified in my attached Notes.	The links will be addressed. Thank you for the thorough review.
Wentworth	3	Are the DCC models for the following scenarios comprehensive and accurate, and do they represent the current state of knowledge? Are they supported appropriately by citations? If not, what do you recommend?	I believe the models are appropriate and comprehensive. Citations are appropriate and actually very expansive. To me, the number of citations and references are the most compelling feature of the DCC project. EPA should consider curating the bibliography used as a standalone resource for unique modelling situations. I have provided specific comments on the various scenarios in my "Notes". One issue that bothered me during the review was the confusing variable naming schemes. In particular there are cases where the variable name might be an ingestion or inhalation variable (see my "Notes"). I feel like the variable naming scheme should be analyzed and normalized overall; the variable name should be somewhat intuitive to a user.	The variable names are used across several tools. The ingestion/inhalation confusion seems to have been a misunderstanding.
Wentworth	3a	Resident	See Notes document.	Noted.
Wentworth	3b	Indoor Worker	See Notes document.	Noted.
Wentworth	3c	Outdoor Worker	See Notes document.	Noted.
Wentworth	3d	Composite Worker	See Notes document.	Noted.
Wentworth	3e	Construction Worker (Site-specific only)	See Notes document.	Noted.
Wentworth	3f	Recreator (Site-specific only)	See Notes document.	Noted.
Wentworth	3g	Farmer	See Notes document.	Noted.
Wentworth	3h	Soil to Groundwater	See Notes document.	Noted.
Wentworth	4	Is the choice of radionuclides and how decay chains are addressed appropriate and based on supportable reasoning? If not, what do you recommend? Are the standard recommended default factors adequately explained, sourced, and reasonable?	I believe these are stated appropriately and factors explained well.	Noted.
Wentworth	5	Are the results of the calculator clearly explained and presented for the given scenarios? If not, what do you recommend?	One issue with the outputs that is confusing is the use of time intervals. What is the utility of nanoyears, picoyears, etc? Also, use of nano, micro, or pico for year is confusing; scientific notation is preferable instead. The tables and graphs should not be cluttered with these timeframes. I do not understand why any time less than a day should be considered for the cases relevant to the tool.	The time periods are embedded with the software used to generate the graphs. The great number of decimal places required to accommodate very small and large half-lives necessitated the need for units like nano years. We will investigate the possibility of using "powers".
Wentworth	5a	In particular, we are interested in your review of the calculator results when selecting the DCC Output Option "Peak DCC".	I have no specific comment on the Peak DCC compared to the other 3 output frames.	Noted.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	6	Are the results appropriately described and qualified (to the extent that they may be relied upon and defended)? If not, what do you recommend?	I think the backing reference material are more than adequate to defend decisions made from the calculator. That is the strength of the tool as I see it. If anything, I would suggest more explicit narratives linking the calculator's outputs to the documents referenced. Rather than linking to a particular study, links should either go to specific tables or locations in the reference reports or sections of the reference could be quoted directly in the website. Because of the extreme technical nature of the references, more helpful citations/quotations could be helpful to the user when justifying results.	Noted.
Wentworth	7	Do the results provide a defensible explanation of how they were derived, or are they the result of a "black box"? Do you recommend anything different?	The results provide defensible explanations. As I stated in question 6, more direct or explanatory material could be helpful for justifying/explaining the results.	More descriptive text for land uses and exposure routes were made based on your thorough comments.
Wentworth	8	Is there anything else you would recommend to improve the utility, accuracy, completeness, or supportability of the calculator?	No additional comments. As I've stated in other questions and in my Notes, the quality and quantity of reference reports that support this tool are very impressive. I think enhancing and curating the web page for these references would be a great resource in general.	Noted.
Wentworth	NA	Additional Comments	<p>Overall</p> <ol style="list-style-type: none"> 1. The following are notes made while reviewing the DCC website and users guide. The notes were spontaneously while and my not be perfectly formatted. For ease of review I will attempt to make it clear as follows: <ol style="list-style-type: none"> a. Where I suggest specific wording changes I've quoted the website in a text box and used track changes to show what I would change. b. The user's guide comments are denoted by section number and location using bulleted hierarchy scheme. 	Noted.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Home Page</p> <ol style="list-style-type: none"> 1. Tap water pathway – from the homepage it isn't clear what this entails. Crops raised on site in the resident and farmer scenarios may not use "tap water". What is the difference between groundwater and tap water? Does the program distinguish between tap and ground water if both are available? 2. PRG should be defined on the home page. 3. OSWER is not defined anywhere on the homepage. 4. CERCLA is not defined anywhere on the homepage. 5. The "Introduction" section contains a dead link: The website was initially made available for use in a transmittal memo entitled "Distribution of OSWER Radionuclide ARAR Dose Compliance Concentrations (DCCs) for Superfund Electronic Calculator", January 28, 2004. 6. WTC, SDCC, SPRG, BDCC, BPRG are not defined in the "Related CERCLA Calculators and Guidance" paragraph. 7. DCC calculator download link and Download Area links in the "Welcome" section are not active. 8. Should the top graphic be presented lower on the home page or omitted altogether? 9. The "Welcome" paragraph should distinguish between the PRG and DCC "fact sheet". This could be as simple as appending DCC or PRG to fact sheet and the corresponding hyperlink. 	<ol style="list-style-type: none"> 1. Soil to groundwater is a scenario looking at leaching to groundwater to either regulatory concentrations or dose based calculated concentrations, while tap water scenario is the use of contaminated water that could be either from surface or ground water. No. 2. To explain what each acronym and term means would become too lengthy to replicate the discussions that occur in other Superfund guidance documents. The Home page of the DCC calculator does refer readers to the guidance document "Radiation Risk Assessment at CERCLA sites: Q&A" for information on the role of dose assessments in the Superfund program. There are also links to for more information to FAQ, User Guide, and one page fact sheets on the DCC calculator for EPA staff and the general public. 3. See comment above. 4. See comment above. 5. The link was working when we tested it. 6. See comment above on defining terms. Also, if you click on the link the Home page for each tool there is an explanation of it's function. 7. The link was working when we tested it. 8. All of our Superfund calculator tools have a similar graphic. But it has been shrunken for better aesthetics. 9. When the user clicks on the links, PRG is explained.
Wentworth	NA	Text correction	<p>Home Page</p> <p>Change: (i.e., ingestion or inhalation) or external exposure of that radionuclide</p> <p>To: (i.e., ingestion or inhalation) or external exposure from emissions of that radionuclide</p>	Sentence has been fixed.
Wentworth	NA	Text correction	<p>Home Page</p> <p>Change: The OSWER Directive, Superfund Radiation Risk Assessment: A Community Toolkit was also</p> <p>To: The OSWER Directive and Superfund Radiation Risk Assessment: A Community Toolkit were also</p>	Sentence has been fixed.
Wentworth	NA	Text correction	<p>Home Page</p> <p>Change: The DCC calculator was largely developed based on the PRG calculator and benefited from its peer reviews, which may be seen here.</p> <p>To: The DCC calculator was largely developed based on the PRG calculator and benefited from its peer reviews.</p>	Will modify the text.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Text correction	Home Page Change: which also benefits from the external verification review of the PRG calculator To: which also benefited from the external verification review of the PRG calculator	Will modify the text.
Wentworth	NA	Additional Comments	Home Page 1. Link to the pdf of user's guide appears to be a pdf print of the web page from July 2022 and includes an ORNL server system outage message. The pdf of the guide should be a standalone document, not a print of the web page. 2. Administrative Record is used inconsistently in the document. It is sometimes capitalized as if it is a regulatory requirement but not always. If this is a CERCLA concept it should be emphasized and/or explained.	1. New PDF of user's guide will be made after review comments are addressed. Disagree. If this was an actual document, it would be much more difficult to update which would result in it being out of date for extended periods of time. 2. Will capitalize consistently.
Wentworth	NA	Additional Comments	Users Guide ~ Disclaimer Section • Acronym definitions missing: CERCLA, WTC, SDCC, BDCC, PRG, BPRG, SPRG • Link to Regional Screening Levels (RSLs) is a dead link. • Referenced citations should match the reference section of the User's Guide citation format. The last paragraph of the reference section cites "EPA 2000a" for site-specific DCCs however the reference section of the User's Guide uses U.S. EPA (2000a) as the reference. • The last paragraph of the Disclaimer section is extremely confusing it provides links to Soil Screening Guidance for Radionuclides: Technical Background Document twice but abbreviates it on the second occurrence while linking to the same document. It uses the phrase "this report" twice creating confusion about what "this report" is. This paragraph and the inconsistent referencing creates a lot of confusion.	See earlier comment on defining terms. Will fix link. The reference will be modified. The reference will be modified.

PEER REVIEW CHARGE RESPONSES: DCC Calculator UPDATE

Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ Introduction Section</p> <ol style="list-style-type: none"> 1. Reference to EPA/540/1-89/002 should be changed to match the format in the Reference section 2. Fourth paragraph change suggestion: 3. One set of radiation standards consists of a combination of whole body and critical organ dose annual limits, generally either (1) 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ besides the thyroid or (2) 25 mrem/year to the whole body and 75 mrem/year to any critical organ (including the thyroid). Another set of annual standards consists of a single limit (e.g., 10 mrem/year). The type of dose limit used in the a particular standard would be the use the same type-of dose methodology used as used for dose assessments to demonstrate ARAR compliance. 4. Paragraph 5 cites "(ICRP,1959)". This document is not included in the reference section and does not use the apparent preferred format, i.e. [Organization (Year)]. 5. Paragraph 6: wrong formatting again for ICRP (1977) and reference not in Reference section. 6. Subsequent paragraphs have additional versions of reference citations. The reference section must be updated to include all references. 7. The paragraph introducing ICRP 60 states that effective dose is similar to effective dose equivalent but without details. The differences should be spelled out. Also the reference is flawed in many ways. 8. ICRP publications are a special case and reference to them is chaotic throughout this whole section. 9. Use of the phrase(s) "this document", "this report", "this database", etc. are poorly used. They often create confusion about the point of view or reference. 10. Third to last paragraph "Likely Federal Radiation Applicable or Relevant and Appropriate (ARARs)", should not be quoted or capitalized as a title. References should be more consistent. 11. DCC concentration should never be used, should be DCCs. It occurs in the penultimate paragraph. 	<ol style="list-style-type: none"> 1. The reference will be modified. 2. This text has been revised. 3. This text has been revised. 4. Citation added but in format consistent with other citations. 5. Citation added but in format consistent with other citations. 6. Agreed. 7. Noted. 8. Although ICRP has a recommended way of citing their documents, we would rather keep the formatting consistent for all citations. 9. We will evaluate after some additional revisions having all 7 Superfund radiation calculator tools undergo another technical editor review. 10. Disagree. This is referring to a key recommended guidance document for EPA staff implementing the Superfund program. 11. Agreed.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ Understanding the DCC Website Section: 2.1 General Considerations:</p> <ul style="list-style-type: none"> • DCFs are defined as Dose Coefficients. “Dose Conversion Factor” should be stated and DCF should be consistently used once defined rather than switching randomly between DCF and Dose Coefficients. Changing back and forth creates confusion. [EPA response – Will more consistently use “dose coefficient”, but link the use of “Dose Conversion Factor (DCF) since this acronym is used in the programming and equation images.] • The link to the bookmark for Ingestion of Fish is a dead link. [EPA response – Will fix.] • RME needs more explicit definition. [EPA response – Will define RME.] • This (last of the section) paragraph needs a lot work to explain the initializations and what they mean: <p>“The DCCs are generated with standard exposure route equations using EPA DCFs and exposure parameters. A DCC calculator receptor represents a high end (RME) exposed individual, as does BDCC receptor (for person exposed to contamination indoors). Since the DCC RME is often outside and the BDCC RME is always indoors, an individual receiving both indoor and outdoor exposures at a site should be protected. For the calculation of oral dose coefficients, area correction factors, and gamma shielding factors, a standard soil density of 1.6 g/cm³ has been used”. [EPA response – The BDCC references will be revised.]</p>	

Wentworth	NA	Additional Comments	<p>Users Guide ~ Understanding the DCC Website Section: 2.2 DCC Output Options:</p> <ol style="list-style-type: none"> 1. 2.2.1 “The DCC provided in the output is the inverse sum of the reciprocal DCCs of the parent and all the progeny present at the period of peak dose.” This is difficult to understand. 2. 2.2.1.1 The Bateman and ORNL Technical Memorandum are dead links. 3. 2.2.1.2 The user may also select a defined time period to search for the period of peak dose. This option operates just like the infinite time option but stops searching for the period of peak dose at a user-defined time in the future. Predefined time points of 10,000, 1,000, and 100 years are offered as well as the option for the user to enter a specific time period between 70 and one trillion years. These options are only offered for use in certain situations where a regulatory agency is concerned with dose at certain time points in the future. If a peak hasn’t been resolved in the entered time period, as is the case when progeny are still ingrowing, the dose interval will be calculated for the last exposure duration span. For instance, if the time period of 100 years is selected for default resident soil for U-238 (ED of 1 year), year 100 will be selected by default, because U-238 peak 0 dose isn’t until year 3,981,072. This paragraph is very confusing, especially the last two sentences. I think I understand the intent but I am not certain. This should be reworded. 4. 2.2.1.2 Tutorial graphs comments: Don’t use esoteric time units on the x-axis of the graph, nanoyears and microyears are of little value for the graphs. Perhaps years in powers of 10 years? 5. 2.2.2 I would recommend not using FC to indicate fractional contribution in the narrative. Although FC is used as a variable in the equations, it does not need to be abbreviated in the descriptive text. It saves no time and creates a new initialization without value. 6. 2.2.5: Don’t use esoteric time units on the x-axis of the graph, nanoyears and microyears are of little value for the graphs. Perhaps years in powers of 10? 7. 2.2.5: In the section describing the 6 categories of common superfund radionuclides – don’t abbreviate “exposure duration” as ED. It’s confusing and unnecessary. In health physics contexts ED is frequently used to abbreviate Effective Dose. 8. 2.2.5: The footnote at the bottom of the table comparing the 6 superfund radionuclides stating “DL=1.0” causes confusion and requires the reader figure out what “DL” means. Also, the explanatory category introducing the table states a risk coefficient of 1E-06 which I assume corresponds to the default calculation parameter of DL=1.0 making the footnote unnecessary. 	<ol style="list-style-type: none"> 1. Further explanation is provided later in the User’s Guide. 2. Will fix. 3. For those uses in need of this option, we think the explanation is sufficient. But there will be different instances for when these options may be appropriate. 4. The smaller values are sometimes useful and will be retained. 5. Disagree since FC is used in the equations and in the calculator output. It is better to create the initialization in the User Guide before users attempt the calculator. 6. The time units are being retained and are useful for some circumstances. 7. ED, in Superfund risk assessment, is used far more often exposure duration than effective dose. Also, ED is defined. 8. Will spell out dose limit and eliminate the reference to risk coefficient.
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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	Users Guide ~ Understanding the DCC Website Section: 2.3 Dose Conversion Factors (DCFs): 2.3.2 ICRP 60 The link to European Council Directive 96/29 in paragraph 3 is a dead link.	Will fix.
Wentworth	NA	Additional Comments	Users Guide ~ Understanding the DCC Website Section: 2.4 Radionuclide-Specific Parameters: 1. 2.4.1 Sources The link to the spreadsheet downloads from IAEA TRS 472 and the UK Environment Agency are dead links. 2.4.2 Hierarchy by Parameter Use of day and d (pCi/day versus pCi/d) should be normalized throughout this section, there are multiple instances in this section. I would recommend use of "day" in all instances.	1. Will fix. 2. Will fix.
Wentworth	NA	Additional Comments	Users Guide ~ Understanding the DCC Website Section: 2.5 Biota Modeling: 1. •2.5.1 Produce Modeling Exposure Factors Handbook (EFH) – A link to this document/web page would be helpful. 2. •2.5.1.1 Intake Rates (g/day) In the second paragraph, the link Guidance for Conducting Fish and Wildlife Consumption Surveys is dead. 3. •2.5.1.2 Soil-to-Plant Transfer Factors (B _{wet}) There seems to be a missing image in the Climate Zones paragraph associated with the link to the USA Koeppen-Geiger county map. There seems to be a missing flow chart image and link preceding the last paragraph of this section. 4. •2.5.2.1 Intake Rates (g/day) The link Guidance for Conducting Fish and Wildlife Consumption Surveys is a dead link. 5. •2.5.2.2 Animal Transfer Factors (TF) Clicking on the flow chart does not provide a larger image. 6. •2.5.3 Mass Loading Factor The reference column in table Table 2.4.3-A does not provide a link to the reference for the dry weight plants.	1. Will fix. 2. Will fix. 3. Will fix. 4. Will fix. 5. Will fix. 6. Will fix.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	Users Guide ~ 2.9 Advanced Calculator Uses (Postprocessing and Replicating Discontinued DCC Options) 2.9.1 Postprocessing Calculator Results to Incorporate Site-Specific MCNP Factors <ol style="list-style-type: none"> 1. The first paragraph introduces ACF without defining what it means. 2. What is “resident GSFo” in the second bullet of considerations (third paragraph)? 3. 3. GSF is used extensively in this section. It appears to be defined for the first time in “4.10.5 Gamma Shielding Factor”. 	This has been addressed.
Wentworth	NA	Additional Comments	Users Guide ~ 3. Using the DCC Table 3.1 Developing a Conceptual Site Model <ol style="list-style-type: none"> 1. Download area is unavailable 2. The link location in the last sentence in paragraph 1 is in an odd location. “A separate CSM for ecological receptors can be useful. Part 2 and Attachment A of the Soil Screening Guidance for Radionuclides: Users Guide (EPA 2000a) contain the steps for developing a CSM. A site-specific CSM may not include all of the land uses presented in this calculator.” The link emphasizes Part 2 and Attachment A in the sentence while the link itself directs the user to the entire document and summary description. 3. Are the DCC table and Table 1 (mentioned in the opening paragraph of section 4) the same thing? I can’t find out since the download area is not available. 4. This section may be more appropriately renamed as something related to developing a CSM since that is the entirety of subject matter. 	<ol style="list-style-type: none"> 1. The download area is under production and will be available soon. 2. “Part 2” has been corrected to say “Chapter 2”. 3. Table 1 is different from the Download tables. 4. Section title has been revised.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.1.1 Resident Soil</p> <ol style="list-style-type: none"> 1. The sentence in paragraph 1 should be changed: Adults and children exhibit different ingestion rates for soil and produce. For example, the child resident is assumed to ingest 200 mg of soil per day while the adult ingests 100 mg per day. 2. BDCC in the second to last sentence is a dead link. <p>DCC Equations</p> <ol style="list-style-type: none"> 3. It is not helpful that the discussion of 6 years and 26 years used in the soil ingestion and inhalation is presented at the end of this section, many lines (about a page?) below the equations. Presenting it earlier would allow the user to understand the terms in the equations. 4. It is confusing to have some variables in the equations shown with parenthetical values without declaring that these are the intended values for those variables. A note on presentation would be helpful. 5. DCF subscripts need to be better defined in definition/units column of Table 1. For example, the user has to infer that DCFext-sv is for external soil volume searching for other instances of sv in the table. Does the sv subscript denote an infinite underlying volume given the other options are 1 cm, 5 cm, 15 cm? 6. The link Exposure Factors Handbook in the “consumption of fruits and vegetables” equation description is a dead link. 7. The link to Table 1 at the end of this section goes to a bookmark on the web page which opens the entire users guide and requires the user to scroll to the end of the guide in order to view the table. You should create a standalone web page with just Table 1 for ease of access. 8. The stated assumptions (first sentence: “This receptor spends most, if not all, of the day at home except for the hours spent at work.”) for the receptor include being at home all the time except for going to work. The time away from home for work is not stated. What are the time assumptions for work in the ingestion and inhalation pathways? For a full time worker, one might assume a minimum of 4000 hours away from the residence (not including commute time or other factors) or 167 days per year. 9. The equations use 350 days per year. Are 15 days taken for vacation? These assumptions should be stated. Is the child at the residence full time? 	<ol style="list-style-type: none"> 1. Will fix. 2. Will fix. 3. The last 3 paragraphs will be moved up. 4. Will fix. 5. Will fix. 6. Will fix. 7. The link worked when we tested it. 8. The ingestion rate has no time assumption, while the inhalation assumption is 24 hours. For external the time home is divided indoors and out. The remaining time for external is away from the site. 9. Yes, vacation, however, 350 is the RME EF from EFH and where the residents are and what they are doing is irrelevant. The external exposure route doesn’t evaluate adult and child separately as is unnecessary. In general, a combination of the upper 90th to 95th and 50th values are used for the RME scenario. This is done by route and not by land use, which is considered protective.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.1.2 Resident Soil 2-D External Exposure - DCC Equations</p> <p>General comment</p> <ol style="list-style-type: none"> 1. This applies to the equations in all parts of this user guide and especially to the table: Exposure Times (ETs) are given in 4 or more digits based on 50th percentile averages of US citizen behaviors (i.e. 1.752 hours outdoors and 16.416 hours indoors at home per day); yet hours in a day are still specified in two digit numbers (i.e. 24 in a day). Why not round these 50th percentile values? Please tighten or otherwise use a standard number of digits as excess digits are wasted space and clutter the concepts. <p>General comment</p> <ol style="list-style-type: none"> 2. This applies to this and all parts of this user guide: I am personally not familiar with the use of Chronic Daily Intake (CDI). I do not understand the utility of presenting a series of equations for DCCs followed by CDIs. The relationship between CDI and DCC are obvious. I would recommend eliminating the CDI portions of the user guide to save space/memory and potential editing errors. <p>General comment</p> <ol style="list-style-type: none"> 3. This applies to this and all parts of this user guide: Use of IF* is extremely confusing. IFA (with various subscripts) refers to inhalation fraction in cubic meters per year but all other occurrences of IF* refer to ingestion fractions. Please establish a distinction between inhalation fractions and ingestion fractions. 	<ol style="list-style-type: none"> 1. Whenever we have rounded in the past, it makes comparison to the source value impossible, and it makes numerical QA off a little that raises user concerns. Therefore, we find it best not to round. 2. Our equations are generated by code making errors easily repaired. Users performing dose calculation assessments are required to present the equation images used, so by offering the images, it is intended to result in saving the user's time and effort. 3. The various subscripts do that. Also, A is for air and S is for soil.
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.1.4 Resident Tap Water - DCC Equations</p> <ol style="list-style-type: none"> 1. For the inhalation equation, a discussion of the Andelman Volatilization Factor would be helpful. 2. Regarding the immersion equation, Table 1 has ETevent-res-c occurs twice. One of these should be labelled ETevent-res-a. It would also be helpful to know what is being modelled here, is this a bath/shower/swimming event and why is the child duration assumed to be 0.54 hr compared to the adult 0.71 hr. 3. DFares-adj from the immersion equation does not occur in the table. 4. The link to Exposure Factors Handbook in the consumption of fruits and vegetables equation is dead. 	<ol style="list-style-type: none"> 1. Agree. 2. Agree to correct Table 1. Immersion is a bath/shower event. Children and adults take baths of different lengths according to EPA's Exposure Factors Handbook (EFH). 3. Will add. 4. Will fix.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.3.1 Outdoor Worker Soil – DCC Equations</p> <ol style="list-style-type: none"> 1. What is the explanation for EF to go from 250 days/yr in the composite worker condition to 225 days/yr for the outdoor worker? This would be helpful to know. <p>General comment</p> <ol style="list-style-type: none"> 2. This applies to the equations in all parts of this user guide. In the inhalation pathways, each of these equation sets includes an inhalation fraction of “particulates emitted from soil”. The language should be modified since particulates are not “emitted” from the soil (or water source). The particulates are in the air as a result of some kind of kinetic suspension (resuspension) process not from being emitted. 	<ol style="list-style-type: none"> 1. Will add a note that the 225 is used because weather may limit days of work. 2. Will change to "inhalation of particulates resuspended from soil."
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.4.1 Indoor Worker Soil – DCC Equations</p> <p>General comment</p> <ol style="list-style-type: none"> 1. This applies to the equations in all parts of this user guide. The use of a breathing rate of 60 m3 per day for all occupational settings seems extremely high. The Resident and Farmer scenarios use 20 m3. This converts to 42 l/min and 14 l/min respectively. NRC regulations in 10 CFR 20 DAC calculations use a breathing rate of 20 l/min for “light work”, which equates to 29 m3 per day. Why is such a high breathing rate for the entire duration of in all occupational scenarios? This seems like an excessively conservative rate. 	<ol style="list-style-type: none"> 1. We continue to use the same breathing rate as other EPA tools. There often differences in the default values used by EPA for Superfund and NRC in its regulatory programs. EPA Superfund program is using for its receptor a combination an upper bound (95th or 90th) and 50th inputs to represent a Reasonable Maximum Exposure (RME) scenario while NRC is protecting a receptor using a central tendency (50th rate) for the average member of critical group.

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Commenter	Charge Question No.	Charge Question	Response	EPA Response
Wentworth	NA	Additional Comments	<p>Users Guide ~ 4. Land Use Descriptions, Equations, and Technical Documentation</p> <p>4.10 Supporting Equations and Parameter Discussion</p> <p>General comment</p> <ol style="list-style-type: none"> 1. This applies to the User Guide generally: when clicking on a redirect link that goes to another part of the User Guide or DCC website, the back page button should go back to the html location where we started. Currently, using the back button (for most) links returns the user to the DCC homepage requiring the user to find the location they were previously looking at. <p>4.10.5 Gamma Shielding Factor</p> <ol style="list-style-type: none"> 2. It is not completely clear that a structure built on a contaminated slab will have the same soil cover depth as a receptor walking on top of an undisturbed part of the zone. It's not clear whether this concept has been included in the various models. <p>4.10.6 Using the Combined Biota, Soil, and Water Interactive Graph</p> <ol style="list-style-type: none"> 3. 1. What is TR in this paragraph (occurs just before the graph): "The x-intercept (coordinate x,0) shows where the water DCC = TR and soil concentration must equal 0. The y-intercept (coordinate 0,y) shows where the soil DCC = TR and the water concentration must equal 0. Any point between (x,0) and (0,y) shows a separate DCC for water and soil that will meet the TR. Hovering the mouse over the graph will display moving lines that follow the mouse based on the x-coordinate (water DCC). Click anywhere on the graph to stop the lines from moving and to display the soil and water DCCs associated with that specific x-coordinate." 	<ol style="list-style-type: none"> 1. This is the downside to having expandable sections. We currently do not have fix for this issue. 2. That scenario is not addressed in the DCC calculator. The slab scenario is addressed in the SDCC calculator. 3. This should be DL for dose limit. It will be corrected.
Wentworth	NA	Additional Comments	<p>Radionuclide Decay Chain</p> <p>https://epa-prgs.ornl.gov/cgi-bin/radionuclides/chain.pl</p> <p>The description narrative paragraphs are terrible. These are barely passable as basic public health level science and are linked from the DCC framework which requires a high level of scientific understanding in multiple disciplines (i.e. bateman equations, matrices for solving a system of linear differential equations). The EPA should edit this page and the source pages regardless of the DCC project.</p>	<p>The text will be replaced with a short description and reference to a technical document on the Bateman equation use for peak DCCs.</p>