EXTERNAL VERIFICATION REVIEW COMMENTS AND RESPONSES			
Commenter	**Comment Number**	**Comment**	**EPA Response**
Flanders	1	When running the calculator, the following message appears, “Peak DCCs require extra processing and may take up to several minutes to run.” This message does not disappear once the program completes running.	No action required.
Flanders	2	If you attempt to use the camera tool to download graphs as .png files, the following message appears, “Your file could not be accessed, and the individual will lose the data.”	This is a browser issue. The camera icon works for both Safari and Firefox, but not chrome. This type of error is a client side browser issue and nothing can be fixed on our end.
Flanders	3	For farmer receptor types, the media selected included combined soil and biota; however, the output table displayed soil only, and did not identify combined soil and biota as was selected. The output table was entitled, “Farmer Peak Dose DCCs for soil (complete chain decay).”	This cannot be modified as it would exceed a character limit and break the output. The farmer land use section in the user guide should be consulted to understand what is included in the combined soil and biota output.
Rood	General 1	The second paragraph of the DCC calculator welcome page states “This tool presents recommended DCCs calculated using suggested default input parameters and the latest dose conversion factors.” The dose conversion factors (more accurately termed dose coefficients) are NOT the latest for inhalation, ingestion, and external exposure and represent values over 20-years old. ORNL/TM-2013/00 (2014) is cited as the source for all dose coefficients. The latest dose coefficients are in DOE (2022) for internal dosimetry and EPA (2019) for external exposure.	EPA recognizes the "dose coefficient" nomenclature in the user's guide, however continues using "dose conversion factor" as DCF is embedded in all of the images in 4 of EPA's online calculators. EPA will be adopting the FGR 15 and 16 dose and risk coefficients when they both are released. The anticipated release will have EPA-derived internal and external dose coefficients for Superfund. *Changed language to “This tool presents recommended DCCs calculated using suggested default input parameters and the latest dose conversion factors adopted for Superfund use."*
Rood	General 2	The equations and parameter values listed in the output, and variable definitions need to be consistent. That is the only way a validation exercise can be conducted. For the external pathway for residential soil, I had to infer what the correct value was to use in the hand calculation.	EPA will check for consistency and update as appropriate.
Rood	General 3	There is no rationale provided for setting the default dose limit at 1 mrem/yr. According to the documentation, the EPA dose limit is 12 mrem, which is 12% of the federal and international dose limit of 100 mrem/yr. This value (i.e., 12 mrem/yr) should be the default value in the DCC.	EPA will add the reference for the default DL in Table 1 in section 5 of the User's Guide. "1 mrem/year is not a standard. A unit value was chosen for the default value so the DCCs can be multiplied by the ARAR determining the dose limit at that site."
Rood	General 4	The option to run all radionuclides at once should be disabled because the calculator bogs down and does not run to completion, especially when the Peak option is used.	The Select All option has been disabled for the peak output option.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 1	The variables, ACFext-sv, GSFi-total, and GSFo-ext-sv are not listed in the Soil Inputs sheet. Those variables (except GSFi-total) are defined in the detailed user manual, but a value is needed for verification. A value is provided for ACF, but not ACFext-sv. ACFext-sv is defined as the Area Correction Factor - soil volume in the user’s manual. The value for ACF is assigned a value of 100,000 m2. GSFi-total, is more than likely the indoor gamma shielding factor, which is listed as GSFi on the Soil Inputs sheet and the user’s manual, and has a default value of 0.4. GSFo-ext-sv is likely the outdoor gamma shielding factor which value is probably 1.0. Assuming the ACF is the ratio of the default site area of 100,000 m2 to the actual site area, then for the default values, ACFext-sv would be 1.0. ACFext-sv should be unitless based on the equation for the DCC for external exposure. When these assumptions are made (i.e., ACFext-sv =1.0, GSFi-total = 0.4, and GSFo-ext-sv = 1.0, the hand calculation matches the value reported in the output.	We have updated the columns headers in the output tables to be more descriptive of which GSF is provided. We also added clarifying text to the notes section on the site-specific inputs page.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 2	The EDres value listed in the Soil Inputs sheet is listed as 26 years. It should be 1 year.	The EDres value provided is used to calculate the AAF and should be retained for that purpose.

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Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 3	It is not clear the decay and ingrowth calculations are being done correctly. Take a simple example like Co-60 (half-life 5.27 years). The resident DCC is driven by external exposure. Produce ingestion makes a minor contribution. The Soil DCC sheet provides the undecayed DCC. The exposure duration is 1 year. The average activity (assuming unit concentration and 1-year exposure time) in the soil after 1 year assuming one decay member is: For Co-60, the average activity is 0.937. A form of this equation is shown at the bottom of the Supporting Equations page for DCC Equations on the web page. The decay corrected DCC is: where DCC = the undecayed DCC and DF is the decay factor given by the previous equation. Note that the total DCC is the inverse of the sum of the inverse of the individual pathway DCCs. The output from the DCC calculator assuming all default parameters and the hand calculation is shown in Table 1. All exposure pathways match (within rounding error) except produce ingestion shown on the “Peak DCC Soil Co60” worksheet. This accounts for the difference in the Total DCC. The undecayed DCC for produce is 1.68 pCi/g, which matches the worksheet labeled Produce Soil Co60. But in the “Peak DCC Soil Co60” worksheet, the produce DCC is 45 pCi/g (see Table 2). It is unclear why difference because decay is not provided in any of the produce equations in the documentation. The documentation needs to clearly state how decay is addressed for produce consumption because the values do not match up.	This discrepancy has been corrected.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 4	Hand calculations were used to verify non-decayed produce PRGs from all 26 fruits and vegetables. Hand calculated values were within rounding error of values reported in the Ra-226 output spreadsheet. However, this took some trial and error because there is no crosswalk between each fruit and vegetable and the soil-to-plant transfer factors for the various types of fruit and vegetable categories (i.e., woody tree, leaf, root, tubers etc.). This crosswalk should be added to the documentation.	The crosswalk in question is in the User's Guide section 2.5.1.2.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 5	The decay corrected produce PRGs for Ra-226 had the same problem identified for Co-60. That is, they did not agree with the hand calculations.	This discrepancy has been corrected.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 6	There is a fundamental conceptual problem with the entire produce ingestion pathway. The root uptake factor is radionuclide-specific and applied to all radionuclides in the decay chain regardless of half-life. For short-lived progeny, any uptake into the edible portion of the produce from the soil will have long since decayed away before consumption. The progeny activity in the edible portion of the plant is controlled by the presence of the parent in the edible portion of the plant, which in turn is controlled by the parent soil-to-plant transfer factor and not that of the progeny. A simple way to fix this problem is to employ a half-life cutoff (suggest 180 days) such that uptake of progeny from the soil from root uptake is based on the parent uptake and not that of the progeny.	A progeny cutoff factor may not be protective of people harvesting and consuming produce the same day; however, it may be considered for site-specific analysis.
Rood	Residential Soil, Default Parameters, Infinite Peak Time Period 7	All the age-adjusted intake amounts (e.g, IFCUres-adj (age-adjusted cucumber ingestion fraction) g) are stated to be fractions. They are not fractions but total intake amounts. This should be corrected in the output spreadsheet.	EPA will fix the label to be "Factor."

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Rood	Farmer Scenario – Combined Soil and Biota, Default Parameters, Infinite Peak Time Period 1	There were far too many values to check for the allotted time. Therefore, exposure pathways that were checked were those that were not included in the residential soil. Calculation checks were performed on shellfish ingestion and beef ingestion. There was a slight difference in the hand calculated value for the Ra-226 DCCfar-soil-shellfish-ing. The hand calculation was 9.41E-5 pCi/g whereas the value reported was 9.43E-5 pCi/g. Otherwise the shellfish ingestion DCC agree with the hand calculations. The beef ingestion pathway also agreed in addition to the decayed peak DCC using decay-ingrowth factors for 135 years. That is, the undecayed DCCfarsol-beef-ing when decay corrected (by dividing by the decay-ingrowth factor), matched the value reported on the Peak DCC Soil Ra226 sheet. Fish, milk, poultry, and eggs are similar in structure to the beef and shellfish, and thus it is expected that those pathways will also agree with hand calculations.	Noted.
Rood	Composite Worker, Default and Site-Specific Parameters, Infinite Peak Time Period 1	All undecayed values checked out using defaults and a site-specific run using an area of 500 m2 instead of the default value (10,000 m2).	Noted.
Rood	Composite Worker, Default and Site-Specific Parameters, Infinite Peak Time Period 2	The decay-corrected values also compared well for each pathway to the DCC at the time of peak dose.	Noted.
Rood	Composite Worker, Default and Site-Specific Parameters, Infinite Peak Time Period 3	An additional run was performed using Co-60 with default parameters. The decay corrected DCC at peak dose matched the hand calculations when the average decay-ingrowth factor (0.937) over the 0-1-year time period was used.	Noted.
Rood	Composite Worker, Default and Site-Specific Parameters, Infinite Peak Time Period 4	It would help if the area correction factor listed on the “Soil DCC Ra226” worksheet had the variable name in its title (ACFext-sv)	We have updated the columns headers in the output tables to be more descriptive of which GSF is provided.
Rood	Soil to Groundwater 1	The user manual equation for inhalation appears to be missing the Aeq term in the denominator. When this term is included in the denominator, the hand calculation for inhalation DCC for volatiles matches the values in the output spreadsheet.	A separate equation is presented that presents the application of the Aeq to the DCC.
Rood	Soil to Groundwater 2	The purpose of the soil to Groundwater DCC is to arrive at the soil concentration (in pCi/g) of a given radionuclide that will result in the dose constraint (1 mrem/yr default value) being met. This value is missing on the Peak DCC sheet in the output spreadsheet (see table 3). The Soil to Groundwater PRG calculator (based on carcinogenic risk) however does provide this value, listed as the soil screening level (SSL). Suggest adding the SSL to the Peak Dose DCC for the complete decay chain.	EPA will investigate the missing DCC in pCi/g.
Rood	Soil to Groundwater 3	The decay corrected peak DCC in water for water ingestion, produce ingestion, and immersion matched the values reported on the Peak DCC page. The inhalation and total did not. The inhalation value was calculated to be 3.8 pCi/L and total was 8.6E-2 pCi/L.	This discrepancy has been corrected.
Rood	Resident Soil with Site-Specific Values 1	For this verification, three radionuclides were selected (Co-60, Cs-137, and Ra-226) and site-specific produce types and contaminated fractions were used. Comparisons assumed that the undecayed dose from each pathway was correct (based on earlier results). The main purpose of this exercise was to check the decay-corrected dose and Peak DCC.	Noted.

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Rood	Resident Soil with Site-Specific Values 2	For each radionuclide the produce pathway had problems. Namely, the undecayed DCC for produce was always significantly less than peak DCC which is decay corrected. The undecayed produce DCC for Co-60, Cs-137, and Ra-226 was 266 pCi/g, 251 pCi/g, and 4.78 pCi/g respectively. The peak DCCs for each radionuclide are shown in the Tables 4, 5, and 6 below. All the peak DCCs are substantially greater than the undecayed DCCs. The decay-corrected DCCs are expected to be higher but the difference is not accounted for by the decay-ingrowth factors for each radionuclide in the decay chain. The Ra-226 peak DCCs by pathway was based on the decay factor at 70 years (the time of peak dose) and these values are not expected match the hand calculation because each pathway peaks at different times compared to the total.	EPA will investigate the produce calculation. It appears to be off by the ED just like the default option.