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October 6, 2021 21-NWP-174

Brian A. Harkins, Deputy Assistant Manager
Tank Farms Division
Office of River Protection
United States Department of Energy
PO Box 450, MSIN: H6-60
Richland, Washington 99352

Re: *Risk Assessment of Contaminated Soils and Vadose Zone Sediments at Waste Management Area C at the Hanford Site, Southeast Washington*, RPP-RPT-58329, Revision 3

References: Page 3

Dear Brian A. Harkins:

The Department of Ecology (Ecology) submitted our comments on *Baseline Risk Assessment for Waste Management Area C*, RPP-RPT-58329, Revision 2, on July 14, 2017 (Reference 1). At that time, we also submitted comments for two other Waste Management Area C (WMA C) Appendix I Performance Assessment (IPA) documents.

The United States Department of Energy (USDOE) submitted proposed comment dispositions for RPP-RPT-58329, Revision 2, by email to Ecology on October 24, 2017 (Reference 2). The comment resolution process began soon after. Several meetings and draft revisions were necessary for comment resolution. We submitted our last set of comments on a revised portion of this document by email to USDOE on May 13, 2020 (Reference 3).

Since then, RPP-RPT-58329 was renamed *Risk Assessment of Contaminated Soils and Vadose Zone Sediments at Waste Management Area C at the Hanford Site, Southeast Washington*, Revision 3, dated February 10, 2021, and was placed in the Hanford Administrative Record on March 18, 2021.

Ecology obtained RPP-RPT-58329, Revision 3, from the Hanford Administrative Record and evaluated it against the most recent version of the Review Comment Record (RCR) to determine if USDOE had incorporated our comments as we had previously discussed.

On June 9, 2021, Ecology communicated the results of our evaluation of Revision 3 to USDOE by email (Reference 4). USDOE requested a series of meetings to discuss the comments that Ecology identified as still being open or unresolved. These meetings took place from June 30 to August 5, 2021. As a result of these meetings, USDOE produced a new Appendix K for RPP-RPT-58329, with a revised RCR that includes possible future revisions for this document.

As we have explained previously, Ecology has been following the primary document review process for the WMA C IPA (under Section 9.2 of the Hanford Federal Facility Agreement and Consent Order Action Plan) because the IPA "represent[s] the final documentation of key data" that is necessary to support regulatory decisions on how to proceed with closure of WMA C. Accordingly, Ecology intends to incorporate the WMA C IPA by reference into the Single-Shell Tank portion of the Hanford Site-wide Permit, with appropriate caveats about regulatory jurisdiction included, to support the required closure actions and schedules that will be set forth in the Tier 2 and Tier 3 closure plans for WMA C.

The purpose of this letter is to submit Ecology's notes (enclosed) from the comment resolution process for RPP-RPT-58329 to the Hanford Administrative Record. The enclosure is the version of the RCR form that Ecology maintained throughout the comment resolution process. Our final responses are set forth in the Status Details (Ecology's response to disposition) column of the RCR form. We have identified some of our comments as still open or unresolved, as explained on the RCR form and summarized below.

1. Ecology's response to USDOE's proposed dispositions for our general comment BRAG-1, regarding the large unplanned releases, indicates our concern that the revisions USDOE previously agreed to make in this document have not been made and may not actually be made in the future.

   This concern is based on text from the new Appendix K that states, "The changes to Revision 3 of this document identified in several responses to Ecology comments will be considered for incorporation into the next revision of this document if it is updated in the future." We feel that this document should undergo regular maintenance along with the remainder of the WMA C IPA, with the identified revisions incorporated as previously agreed.

2. Ecology is encouraged that USDOE is looking into performing hexavalent chromium analyses for vadose zone samples. Ecology requested hexavalent chromium analyses for tank farm soils and residuals frequently in the past. In the absence of chromium speciation data, Ecology conservatively assumes that the species of chromium in WMA C soil and groundwater is hexavalent chromium.

   Ecology also notes that the document retains some chromium performance standards and background values that are not reported correctly. Further details about this issue are provided in our RCR for comments BRA3-40, and BRA3-65.

3. Ecology reiterates that we do not support the use of a scientific management decision point (SMDP) for ecological evaluations at the tank farms. Our records indicate that Ecology and USDOE agreed during the resolution process for comments BRAES-1 and BRA4-3 not to use an SMDP approach for this document, while USDOE's proposed disposition for comment BRA3-87 defends use of the SMDP approach. Text about this approach also remains in the document, although the new Appendix K indicates that the text will be deleted if the document is revised in the future.

   The SMDP approach is not consistent with Washington Administration Code (WAC) 173-340-7490 through -7493. In order to support permitting decisions, Ecology will use approaches that are consistent with and as protective as those set forth in WAC 173-340-7490 through -7494. (The *Waste Management Area C Phase 2 Corrective Measures Study Report*, RPP-RPT-59379, Revision 0, an approved primary document, erroneously included this approach without Ecology consensus.)

4. Comments related to radiological results near method detection limits were not resolved in our discussions. Ecology may comment on this issue in future documents. We will continue to rely on the expertise of scientists from the Washington State Department of Health for this issue.
5. Many comments remain open pending text revisions. Since the body of this document has not been modified to include the proposed revisions in Appendix K, these comments will remain open unless and until the document itself is updated.

If you have questions or concerns, please contact me at jeff.lyon@ecy.wa.gov or (509) 372-7914, or Beth Rochette, Chemist, at beth.rochette@ecy.wa.gov or (509) 372-7922.

Sincerely,

Menard, Nina (ECY)

Digitally signed by Menard, Nina (ECY)
Date: 2021.10.06 15:40:51 -07'00'

Jeffery J. Lyon
Tank Systems Operation & Closure Project Manager
Nuclear Waste Program

rb/aa
Enclosure

References:

1. Letter 17-NWP-085, dated July 14, 2017, "Department of Ecology's (Ecology) Review and Comments of Appendix 1 Performance Assessment for Waste Management Area C (WMA C) Documents"
2. Email with attachment, dated October 24, 2017, from M. Bergeron, USDOE-RL, to B. Rochette, ECY, Subject: Responses to Ecology Comments on RPP-RPT-58329, Revision 2

   Attachment: Master Ecology Comment Response WMA C PA BRA 10312017 mtg R0
3. Email with attachment, dated May 13, 2020, from B. Rochette, ECY, to M. Bergeron, USDOE-RL, Subject: RE: Update Chapters 4 and 5 of RPP-RPT-58328 and Latest Dispositions for Your Review and Comment

   Attachment: ECYComments WMACPA BRA w Dispositions ECYresp Many 2020
4. Email dated June 9, 2021, from J. Lyon, ECY, to B. Harkins, USDOE-ORP, Subject: [External]A Letter in Peer Review

cc: See page 4

cc electronic w/enc:
David Einan, EPA
Rod Lobos, USDOE
Brian Vance, USDOE
Jon Perry, HMIS
Marcel Bergeron, WRPS
Paul Rutland, WRPS
Mason Murphy, CTUIR
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Nina Menard, Ecology
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Beth Rochette, Ecology
Kyle Rucker, Ecology
Maria Skorska, Ecology
Jerry Yokel, Ecology
Environmental Portal
Hanford Administrative Record
Hanford Facility Operating Record
HMIS Correspondence Control
EPA Region 10 Hanford Field Office, Correspondence Control
USDOE Correspondence Control
WRPS Correspondence Control

Document number	Comment number	Section	page	lines, Figure or Table #	Primary Comment initiator	Secondary commen-ters	Comment date	Comment	Basis	Recommendation	Comment Category	Comment Responder	Comment disposition date	Disposition	Revised Dispositions	Status Details (Ecology response to disposition)	Open or Closed
RPP-RPT-58329, Rev. 2	BRAG-1	General	General	General	BR	JL	9/28/2017	Ecology completed our review of the WMA C BRA and submitted our comments to USDOE on July 14, 2017. The document was a component of the Appendix I Performance Assessment for WMA C. However, there was a significant omission from this document that became evident during our review of the Waste Management Area C Phase 2 Corrective Measures Study Report (RPP-RPT-59379, Rev. 0), which we would like corrected. Risk and hazard values were not reported in the WMA C BRA, as given in the WMA C CMS, for three significant unplanned releases and the 216-C-8 French drain. While Ecology focused our review on the Phase 2 sample locations discussed in the WMA C BRA document, we emphasize that two of these three UPRs (UPR-200-E-82 and UPR-200-E-86), and releases to the 216-C-8 French drain (estimated to be lower risk than URAs 200-E-81, -82, and -86) were entirely omitted from the WMA C BRA.	UPR-200-E-81 (Area P) – a pipeline release of Plutonium Uranium Extraction (PUREX) cladding waste from 1961, near 241-CR-151, from a PUREX plant pipe that connected to tank C-102 is thought to account for roughly 49% of the chemical inventory released at WMA C (RPP-RPT-59379, Rev. 0). The WMA C CMS report currently estimates baseline radiological cancer risk associated with this release at 1, (i.e. exposure of an industrial worker to this release, using the CMS scenario, would have a 100 % probability of developing cancer). UPR-200-E-82 – a high-Cs-137 pipeline leak of PUREX high-level waste supernatant that was covered by shotcrete years after the release. The WMA C CMS report currently estimates the baseline radiological cancer risk associated with this release at 200; exposure of an industrial worker to soil beneath the shotcrete, using the CMS scenario, would have a cancer probability of well above 100 %. UPR-200-E-86 – a large-volume pipeline leak of PUREX sludge supernatant that was eventually covered by shotcrete. The WMA C CMS report currently estimates the baseline radiological cancer risk associated with this release at 80; exposure of an industrial worker to soil beneath the shotcrete from this release, using the CMS scenario, would also have a cancer probability of well above 100%.	Considering the extremely large radiological cancer risks estimated for these releases under baseline conditions, Ecology expects the risk information about these releases, such as that contained in Appendix B of the WMA C CMS report (RPP-RPT-59379, Rev. 0), to be included in the WMA C BRA. Please include summary statements in the Executive Summary and body of the document, giving the estimated risk associated with these releases. We also ask that the radiological risks be reported as doses as well as cancer risk in the WMA C BRA.				**1/22/18** Regarding some releases from WMA C not being evaluated and included in the WMA C BRA (i.e., UPR-200-E-81, UPR-200-E-82, UPR-200-E-86, and 216-C-8 French drain), the information included in Appendix B of the WMA C CMS will be added to the WMA C BRA as an appendix or by reference for informational purposes. These evaluations will be identified as being performed as part of the CMS process for corrective measures evaluations. The following is some additional information regarding this issue. Section 1.7.4 of the WMA C CMS identified that "The BRA was performed based on sampling and analysis results from the Phase 2 RFI effort". This was also identified in the WMA C RFI, the WMA C BRA, and discussed with Ecology during a number of working sessions (Exposure Scenarios Session– Sept. 28-30, 2010; PA Modeling Kickoff Session, Nov. 19-20, 2013; PA Modeling Mid-Year Status Session, June 23-24, 2014) associated with the WMA C PA. Section 1.7.4 of the WMA C CMS also identified that "Those historical field characterization data for contaminated soils in WMA C were not collected using the same methods (i.e., geophysical logging versus laboratory analysis of soil samples) or under the same level of quality control." These evaluations were performed as part of the corrective measures evaluation process. It should be noted that 200-E-UPR-81 was evaluated during Phase 2 of the WMA C RFI process (Site P) and this data was included in the WMA C BRA. There was originally a site that was to evaluate the 216-C-8 French drain (Site S). However, Site S was deleted as agreed upon in the 9/22/2011 work plan meeting minutes and RPP-PLAN-39114 Revision 2. Soil contamination from UPR-200-E-82 and UPR-200-E-86 releases do have the potential, under assumed unrestricted direct contact exposure, to yield extremely large radiological risks; however, these historical pipeline leak event locations have gunite caps placed on the surface and these situations do not reflect the no action or unrestricted exposure conditions that are normally evaluated in a baseline risk assessment. The current existence of gunite caps at UPR-200-E-82 and UPR-200-E-86 provide an effective interim solution to the threats posed by contaminant releases for these leak events by minimizing infiltration, contaminant migration to groundwater, and preclude direct contact contaminant exposure to present-day workers. Additionally, the Phase 2 WMA C work plan planned for a direct push in the center of UPR-200-E-82; however, in consultation with Ecology, the planned sampling direct push at UPR-200-E-82 was deleted to reduce risk of	personnel exposure to high levels of 137Cs at this location (RPP-PLAN-39114 Revision 2). It was agreed that data collected from surface geophysical exploration and previous soil samples from this site were deemed to be adequate to document the nature and extent of this specific release.It should also be noted that the Analysis of Past Leaks (RPP-RPT-59197) provides the comprehensive evaluation of impacts of all tank leaks and unplanned releases, including unplanned releases (UPR-200-E-81, UPR-200-E-82, UPR-200-E-86 and the 216-C-8 French drain). This analysis supports an improved understanding of the current nature and extent of contamination at WMA C, as well as an evaluation of potential future impacts from contaminants originating from WMA C. This evaluation also complements the WMA C BRA and is a component of the overall WMA C Appendix I Performance Assessment. To address the dose calculation request, the uncertainty evaluation section will be amended to include an evaluation of dose vs risk for the industrial worker scenario. This discussion is included in Attachment BRAG-1. 2/10/21 Section 3.3 of RPP-RPT-58329, Rev.2 summarized three supplemental risk assessments - (1) Supplemental Human Health Risk Assessment for Exposure Areas; (2) Supplemental Human Health Risk Assessment for Unplanned Releases; and (3) Supplemental Human Health Risk Assessment for Past Leaks, Surface Releases and French Drain. Those assessments were performed to support the CMS alternatives evaluation and documented in Waste Management Area C Phase 2 Corrective Measures Study Report (RPP-RPT-59379). Due to presence of high levels of radiological contamination and safety concerns, no samples were collected, and risk assessments were not performed at these locations as part of the RFI. The supplemental risk assessments presented the results of risks and hazards under current and assumed post-remediation conditions and concluded that both risks and hazards under assumed postremediation condition are within acceptable levels for risk and hazard. It should be noted that Ecology reviewed and approved those supplemental risk assessments as well as the preferred alternative selected within the document, RPP-RPT-59379. Executive Summary of RPP-RPT-58329, Rev. 2 did not include any information regarding those three supplemental risk assessments. Risk assessment information for the supplemental risk assessments have been included in the Executive Summary.	Ecology Response on 2/5/18: Please add information from Appendix B of the WMA C CMS for UPR-200-E-81, UPR-200-E-82, UPR-200-E-86, and 216-C-8 French drain to this BRA. It was not clear in the planning process for the Appendix I performance assessment that baseline risk information for these important UPRs would not be included in the IPA BRA. Adding the information only by reference is not sufficient, since these releases are a major source of risk to workers and have been ommitted from this BRA. Estimates, even though they are not based on concentrations directly measured in samples, will suffice in the absence of direct measurements. Also, please provide Attachment BRAG-1 referenced in the disposition. 4/2/20 The disposition has not changed since 1/22/18. Note that the Past Leaks document did not give the direct contact risks associated with UPR-200-E-81, UPR-200-E-82, UPR-200-E-86, or 216-C-8 French drain as it is stated in the disposition. Section 1.1 now states "Three types of assessments were performed as a part of WMA C RA. 1. Human Health Risk Assessment (HHRA) to assess human health direct contact risks for soils within WMA C under various land use scenarios,…" This statement does not represent this document if the biggest sources of direct contact risk (the three large UPRs) are not brought forward. These three large UPRs will require some remedial action, and the Executive Summary needs to be revised to highlight this source of risk. Please revise the Executive Summary to include the direct contact risks associated with UPR-200-E-81, UPR-200-E-82, UPR-200-E-86, or 216-C-8 French drain. Also, this disposition should reference Table 3-19. 3/31/21 The supplemental risk assessment information in Section 3.3 addresses the large UPRs. Yet the large UPRs were only briefly mentioned in the revised Executive Summary, even though their large cancer risk levels (values greater than 1) dwarf all other direct contact risks in WMA C. Overall, throughout the document, a great deal of text and analysis is dedicated to the Phase 2 sample locations, while the Phase 1 locations, which included the UPR-200-E-81, UPR-200-E-82, UPR-200-E-86, are given very little attention in spite of their much larger risk contributions. This is misleading to readers who might consult this document for risk information about WMA C. 7/7/21 USDOE response on 6/6/21 proposed no changes. Meeting with USDOE on 6/30/21 concluded that USDOE will consider adding more text to the Executive Summary about this. **8/23/21 Open. The text changes USDOE proposes are accepted. However, DOE's revised text (Appendix K, p. K-1) states "Thus, no additional changes were made to the main body and the associated appendices provided in Revision 3 of this document. The changes to Revision 3 of this document identified in several responses to Ecology comments will be considered for incorporation into the next revision of this document if it is updated in the future." It was Ecology's understanding that there would changes in future revisions, which will be required as part of performance assessment maintenance. Please change the text to: The changes to Revision 3 of this document identified in several responses to Ecology comments will be considered for incorporation into the next revision of this document when it is updated in the future as part of performance assessment maintenance. Also, Ecology's notes from 7/14/21 indicate that there would be a reference to this new appendix added to the Executive Summary. We cannot find that.**	Open
	BRG-1, continued													8/19/21 Comment Noted: The primary purpose and focus of RPP-RPT-58329, Rev. 3 is to present the results of risk assessments for contaminated soils and vadose zone sediments at WMA C based on soil sample results collected as part of the Phase 2 RCRA RFI Site Characterization Effort. Supplemental risk assessments were also performed for WMA C Exposure Areas with unacceptable risks, three unplanned releases (UPRs), past leaks, surface contamination and 216-C-8 French Drain as a part of the Corrective Measure Study (CMS), and the results of those supplemental risk assessments are presented in RPP RPT-59379. Detailed information related to those supplemental risk assessments was included in Section 3.3 and Section 4.6 of RPP-RPT-58329, Rev. 3 at the request of Ecology for informational purposes only. Summarized information for those supplemental risk assessments was presented in the Executive Summary and Chapter 5 of RPP-RPT-58329, Rev. 3. In the next revision of this document, the Executive Summary will be updated to address Ecology's request to include additional information related to the large risk levels associated with the UPRs.The next revision of this document will revise the Executive Summary to add additional information related to the unacceptable risk at three UPRs and 216-C-8 French Drain, as follows. A new second paragraph will be added with the following text: "Two approaches of RAs were conducted for contaminants present in the soil and vadose sediment within WMA C. During the first approach, the RA calculated source-term concentrations using a statistical approach based on the approved work plan. However, due to the presence of extensive amounts of interferences caused by buried infrastructure and topographic constraints, a judgmental sampling approach was applied. Statistical analysis may not be the right approach to calculate the source-term concentrations for biased samples. Therefore, in accordance with the Interagency Management Integration Team (IAMIT) Determination 2019-006, an additional RA was performed for five risk scenarios using a sample-by-sample evaluation."	continued. The existing third paragraph will be deleted. A new third paragraph will be added with the following text: "Radiological contamination is present at three unplanned release (UPR) locations - 200-E-81 (UPR-81), 200-E-82 (UPR-82), and 200-E-86 (UPR-86), at past leaks locations originating from six single-shell tanks (241-C-101, 241-C-104, 241-C-105, 241-C-108, 241-C-110, and 241-C-112), at 216-C-8 French drain due to past discharge and at radiological surface contamination locations associated with non-specific contaminant migration due to releases and activities within WMA C. No soil samples were collected from those locations due to safety concerns, and risk assessments were not performed at these locations as part of the RA. Therefore, three supplemental RAs were conducted to support the CMS alternatives evaluation process as documented in RPP-RPT-59379, Waste Management Area C Phase 2 Corrective Measures Study Report. The summaries of those supplemental RAs are included in this RA at the request of the Washington State Department of Ecology." The new fourth paragraph will be the existing second paragraph. The last line will be revised as follows: "These COPCs were evaluated in both the human health risk assessment (HHRA), and the screening level ecological risk assessment (SLERA) and the protection of groundwater assessment." The second line of the fifth paragraph will be revised as follows: "Under this approach, HHRA addresses potential exposures to Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) industrial worker, CERCLA construction worker, CERCLA maintenance/surveillance worker, CERCLA trespasser, CERCLA hypothetical onsite residential receptors and two Native American residential receptors. In addition, nonradiological HHRA was also performed for Washington Administrative Code (WAC) industrial worker and WAC residential receptor." The new twelfth paragraph presents the results of supplemental risk assessment. The following text revision was made within that paragraph. Lines 2 and 3 of the second bullet (number) will be revised as follows:"The results showed that the carcinogenic risks for all three UPRs with no cover (1 × 100, 2 × 102 and 8 × 101, respectively) are well above the than EPA's target risk range of 10-4 to 10-6 and the threshold risk of 10-4. Cesium-137 was identified as a major risk contributor (>99% of total risk) for all three UPRs.	continued. The carcinogenic risks for all UPRs with a 3-ft concrete cover (9 × 10-9, 2 × 10-6, and 6 × 10-7, respectively) are within or less than EPA's acceptable target risk range of 10-4 to 10-6." Text of the third bullet (number) will be revised as follows: "(3) Supplemental human health radiological dose and risk assessments were performed for a CERCLA construction worker scenario for the radionuclide soil contamination associated with past leaks originating from six single-shell tanks with no cover. The past leaks were estimated to have occurred at least 20 ft below ground surface. There are no complete direct exposure pathways for both radiological and nonradiological contaminants associated with the past tank leaks. Therefore, special risk and dose evaluations were performed by assuming that the CERCLA construction worker will be exposed to those subsurface contamination that may be brought to the surface from excavation activities. The results showed that the maximum carcinogenic risk for all six past tank leaks is greater than EPA's acceptable target risk range and the maximum doses for all six past tank leaks are greater than 500 mrem/yr. Supplemental HHRAs were performed for the soil contamination associated with surface releases within WMA C based on the CERCLA industrial worker exposure scenario, assuming no soil cover. The radiological ELCR for surface releases is less than EPA's acceptable target risk range of 10 4 to 10-6target risk threshold of 10-4. No nonradiological risk and hazard contributors were identified for the surface releases. Supplemental HHRA were performed based on the CERCLA industrial worker scenario for the soil contamination associated with past discharges to the 216-C-8 French drain by assuming no cover condition and a 0.1 m (4 inch) of concrete cover condition. Under no cover condition, the radiological ELCR (3 × 10-4) for the 216-C-8 French drain is greater than EPA's acceptable target risk range of 10-4 to 10-6 and the target risk threshold of 10-4. Cesium-137 was identified as a major risk contributor (>99% of total risk) for the French drain. Under a 0.1-m of concrete cover condition, the radiological ELCR (4 × 10-5) is within EPA's acceptable target risk range of 10-4 to 10-6. No nonradiological risk and hazard contributors were identified."	
RPP-RPT-58329, Rev. 2	BRAG-2	General	General	General	BR	JL	9/28/2017	The WMA C BRA was not updated for consistency with the updated values in RPP-ENV-58813, Exposure Scenarios for Risk and Performance Assessments in Tank Farms at the Hanford Site, Washington. However, the WMA C BRA, Rev. 02 was released in October, 2016, while RPP-ENV-58813 had been released in February, 2016.		To address this issue, Ecology requests a meeting to discuss the nature of the exposure scenario changes, revision of the WMA C BRA to incorporate appropriate changes, and addition of RPP-ENV-58813 to the Hanford Administrative Record.				1/22/18 Regarding this comment, we would be glad to have a discussion with Ecology on this matter. To address Ecology's request for additional information, we propose that a table be added to the WMA C BRA that would provide a list of all updated exposure factors in RPP-ENV-58813 that would be relevant to the current version of the BRA. A copy of RPP-ENV-58813 can also be added to the Administrative Record. The current version of WMA C BRA was prepared to address Ecology's comments made on WMA C BRA, Rev. 0 report that was released in November of 2014. The exposure and receptor scenarios representing both unrestricted and reasonably anticipated future land uses for WMA C were outlined in RPP-RPT-47479, Exposure Scenarios for the Waste Management Area C Performance Assessment (January 2011) and were considered for the WMA C BRA. It is noted that following issuance of the BRA, the assigned exposure parameters were updated to be consistent with the most recent EPA guidance. This guidance was issued in 2014 after the BRA Rev. 0 was reviewed by Ecology. The current version of the BRA addressed Ecology's concerns on Rev. 0 but did not try to change other exposure factors to minimize confusion. Exposure factors are updated often by U. S. EPA. In this case, the industrial exposure scenario was replaced in the most recent guidance with three worker exposure scenarios (indoor worker, outdoor worker, and composite worker). The revision 0 version of the RPP-ENV-58813 was released in February, 2016 in preparation for the WMA C PA by the DOE Low-Level Facility Review Group (LFRG). However, the current version of RPP-ENV-58813 (Rev. 1) was updated in response to comments provided the LFRG during their review of the WMA C PA in 2016. This revision of RPP-ENV-58813 was not released until October of 2016. 3/26/20 RPP-ENV-58813 has been added to the Administrative Record. The current version of WMA C BRA was prepared to address Ecology's comments made on WMA C BRA, Rev. 0 report that was released in November of 2014. The exposure and receptor scenarios representing both unrestricted and reasonably anticipated future land uses for WMA C were outlined in RPP-RPT-47479, Exposure Scenarios for the Waste Management Area C Performance Assessment (January 2011) and were considered for the WMA C BRA. It is noted that following issuance of the BRA, The current version of the BRA addressed Ecology's concerns on Rev. 0 but did not try to change other exposure factors to minimize confusion. Exposure factors are updated often the assigned exposure parameters were updated to be consistent with the most recent EPA guidance. This guidance was issued in 2014 after the BRA Rev. 0 was reviewed by Ecology. by U. S. EPA. In this case, the industrial exposure scenario was replaced in the most recent guidance with three worker exposure scenarios (indoor worker, outdoor worker, and composite worker). The revision 0 version of the RPP-ENV-58813 was released in February, 2016 in preparation for the WMA C PA by the DOE Low-Level Facility Review Group (LFRG).	However, the current version of RPP-ENV-58813 (Rev. 1) was updated in response to comments provided the LFRG during their review of the WMA C PA in 2016. This revision of RPP-ENV-58813 was not released until October of 2016. do intend to use the updated versions of RPP-ENV-58813 in future risk assessments of contaminated soils and vadose zone sediments in other tank farms. 2/10/21 The current version of WMA C BRA was prepared to address Ecology's comments made on WMA C BRA, Rev. 0 report that was released in November of 2014. The exposure scenarios representing both unrestricted and reasonably anticipated future land uses for WMA C were outlined in RPP-RPT-47479, Exposure Scenarios for the Waste Management Area C Performance Assessment (January 2011) and were considered for the WMA C BRA. The exposure assumptions related to WAC receptor scenarios within WMA C BRA are consistent with WAC 173-303. It should be noted that the current version of RPP-ENV-58813 (Rev. 1) was updated and added to the Administrative Recordduring 2019. Therefore, WMA C BRA have not been updated using the exposure assumptions included within RPP-ENV-58813 (Rev. 1). DOE is providing a table to show the exposure assumptions for each receptor scenario, along with a summary of the updated values and their potential impacts on risk calculations and conclusions. DOE presented this table to Ecology during July 14, 2020 and discussed those exposure assumptions and their potential impacts on risk calculations as part of our discussion series. **8/19/21** Comment Noted. The risk assessment results presented in RPP-RPT-58329, Rev. 3 were based on exposure assumptions outlined in RPP-RPT-47479, Rev. 0 (January 2011). The exposure assumptions related to WAC receptor scenarios are consistent with WAC 173-303. New risk assessments were not performed based on the exposure assumptions included in RPP-ENV-58813, Rev.1 (2019). As noted in the disposition, a table comparing exposure assumptions between RPP-RPT-47479 (Rev. 0) and RPP-ENV-58813 (Rev. 1) was presented to Ecology in the July 14, 2020 meeting. The comparison highlighted that the exposure assumptions included in RPP-RPT-47479 are more conservative than those in RPP-ENV-58813. Since the dermal exposure for the construction worker was reported in RPP-RPT-47479, the exposure route was considered during the calculation of risk and hazard in RPP-RPT-58329, Rev 3. The summary table will be included as Attachment 1 of this Appendix.	Ecology Response on 2/5/18: Ecology requests the following as part of the comment resolution process for this BRA: (1) The table mentioned in the disposition; (2) a meeting with a discussion about the table; (3) document revisions as needed based on the discussions with Ecology; (4) RPP-ENV-58813 added to the Administrative Record. This IPA BRA does not include all of the exposure scenarios that had been agreed upon in RPP-RPT-47479, Exposure Scenarios for the Waste Management Area C Performance Assessment of 2011. 4/2/20 Ecology needs to use information consistent with WAC 173-303 and the referenced WAC 173-340 sections regarding exposure scenarios. Except for (4), our response from 2/5/18 has not been addressed. 5/10/21 There does not appear to be text that addresses the differences in exposure parameters between the original WMA C exposure scenarios (RPP-RPT-47479) and the latest version (RPP-RPT-58813). [For example, according to the presentation given to Ecology, the original version differs from the current one in that the construction worker no longer is assumed to have any dermal contact with the waste (as was considered for the construction worker in RPP-RPT-47479). However, futher confusing this, is that this document, on p. 3-15, does list dermal exposure for the construction worker]. Ultimately, Ecology has to use exposure scenarios and parameters that are at least as protective as those in WAC 173-340 sections 700-760 for hazardous chemicals. 7/7/21 A presentation was given to Ecology in July, 2020, and included the requested table. The table indicates that the Exposure Scenarios document (RPP-ENV-58813) that was used in the latest WMA C DOE 435.1 PA (RPP-ENV-58782) and RCRA Closure document (RPP-ENV-58806) is less conservative for the construction worker than RPP-RPT-47479, which is the one used in this risk assessment document, with regard to worker body weights, particulate emission factors, and dermal exposure. Where WAC 173-340 section 700-760 methods result in more protective concentrations for receptors than RPP-ENV-58813 gives, Ecology will use the more protective values of WAC 173-340 sections 700-760 in decision making. 7/13/21 A table comparing the parameters in RPP-RPT-47479 and RPP-RPT-58813 with clarifying text, and even a comparison calculation that shows the outcomes from each approach, is needed in this document. Ecology will use WAC 173-340-700 - 760 methods unless those provided in this risk assessment give more protective values. 7/14/21 DOE is considering providing a table. **8/23/21 Table has been included in new Appendix K, as Attachment 1 at the end of the appendix.**	Closed 8/23/21
RPP-RPT-58329, Rev. 2	BRAES-1	ES	ii	27-46	BR		7/6/2017	The SMDP process is from CERCLA guidance but the primary regulator for this unit (Ecology) was not involved in the SMDP process. Therefore, Ecology does not acknowledge this process for satisfying WAC 173-303 requirements.	WAC 173-303-610(b)(i) requires cleanup levels based on WAC 173-340-700-760, excluding -745. These sections of the regulation do not include an SMDP process for screening contaminants or sites.	Maintain contaminants and locations in the risk assessment and into remedial investigations and corrective measure studies when contaminants have exceeded the requirements in WAC 173-340-700 - 760, excluding -745.	3	MR	10/24/2017	There is extensive precedent in Hanford risk assessments for applying SMDP (e.g., River Corridor OU BRAs, 300-RI/RS, 100-D/H, and 100-N). During Tier 1 and Tier 2 SLERA, HQs for several nonradiological COPECs were greater than 1. To evaluate the potential for population-level risks to wildlife and community-level risks to plants and invertebrates, soil sample results across WMA C were utilized to calculate the site-wide EPCs for those COPECs. The site-wide EPCs for those EPCs were compared to corresponding SSLs to calculate HQs. As the results of the HQs<1, no COPECs were retained. REVISED on 1/8/18 to; Even though there is extensive precedent in Hanford risk assessments for applying SMDP (e.g., River Corridor OU BRAs, 300 Area, 100-D/H, and 100-N), no SMDP will be implemented for WMA C BRA. Therefore, based on results of Tier I and Tier 2 SLERA, several radiological (Cs-137, H-3 and Sr-90) and nonradiological COPECs (Boron, molybdenum, selenium, thallium, sulfate and 6. Bis (2-ethylhexyl) phthalate) will be retained as COPEC for various EAs within WMA C. Texts within the report will be updated to reflect such changes.	**Revised 1/8/2018** Even though there is extensive precedent in Hanford risk assessments for applying SMDP (e.g., River Corridor OU BRAs, 300 Area, 100-D/H, and 100-N), no SMDP will be implemented for WMA C BRA. Therefore, based on results of Tier I and Tier 2 SLERA, several radiological (Cs-137, H-3 and Sr-90) and nonradiological COPECs (Boron, molybdenum, selenium, thallium, sulfate and 6. Bis (2-ethylhexyl) phthalate) will be retained as COPEC for various EAs within WMA C. Texts within the report will be updated to reflect such changes.	The units listed in the disposition are not TSDs; the tank farms are TSDs. No TSD units use the SMDP process, especially an SMDP process that had no Ecology involvement. WAC 173-303 and its referenced sections do not include this process. Ecology does not accept this process for TSD units. Furthermore, as described in OSWER 9285.7-25, p. I-11, "SMDPs are significant communication points which should be passed with the consensus of all involved parties." This did not take place for this unit; Ecology is an involved party and did not approve of the decisions made for this unit. Please do not use the SMDP process. REVISED on 1/10/18 to: The comment will be closed once the revisions are made in the document. 5/11/20 Text added for comment BRA4-3.	5/11/20 Closed
RPP-RPT-58329, Rev. 2	**BRAES-2**	ES	iii	12-16	DD		7/6/2017	Because the soil EPC for Cd (1 mg/kg) exceeds both the Hanford 90th percentile soil background (0.56 mg/kg) and the MTCA three phase model soil CUL (0.69 mg/kg), Cd should be retained as a soil COPC.	Soil Cd exceeds both Hanford background (90th percentile) and the soil CUL for groundwater protection (MTCA 3 phase model).	Retain Cd as a soil COPC.	2	MR	10/24/2017	REVISED on 11/27/17 to: The three phase model soil CUL (0.69 mg/kg) for cadmium was based on Kd value of 6.7 (mL/g) (CLARC 2013). Baes and Sharp (1983) developed this Kd value based on agriculture soil (Loamy and clayey Type). However, predominant soil type at WMA C is Sand. Sheppard and Thaibault (1990) developed kd values for difference elements based on four different soil types - Sand, Loam, Clay and Organic. For sand, the Kd value for Cd is 80 mL/g. Hence, the three phase soil CUL for cadmium will be 8.02 mg/kg. The highest concentration for cadmium at WMA C is 3.47 mg/kg. Therefore, it can be concluded that soil concentration for cadmium within WMA C will not impact the groundwater.	**Revised 11/27/2017** The three phase model soil CUL (0.69 mg/kg) for cadmium was based on Kd value of 6.7 (mL/g) (CLARC 2013). Baes and Sharp (1983) developed this Kd value based on agriculture soil (Loamy and clayey Type). However, predominant soil type at WMA C is Sand. Sheppard and Thaibault (1990) developed kd values for difference elements based on four different soil types - Sand, Loam, Clay and Organic. For sand, the Kd value for Cd is 80 mL/g. Hence, the three phase soil CUL for cadmium will be 8.02 mg/kg. The highest concentration for cadmium at WMA C is 3.47 mg/kg. Therefore, it can be concluded that soil concentration for cadmium within WMA C will not impact the groundwater. **Revised 1/22/2018** This comment will be resolved following the comment resolution process of "RCRA Closure Analysis" or "Past Leak Analysis". **3/30/20** Site-specific STOMP model results have been removed from the BRA. Resolved through IAMIT decision 2019-007. Cadmium will be retained.	Ecology has not agreed to contaminant fate and transport modeling methods used at WMA-C. If available, please provide a Hanford-specific Kd for Cd. 12/27/17 Please see Ecology's response for BRA3-36. ADDITIONAL INFORMATION ADDED ON 1/10/18: Regarding cadmium Kd, Ecology refers to Paripurnanda et al., 2012, Cadmium sorption and desorption in soils: A Review, *Critical Reviews in Environ. Sci. and Technol.* 42:489-533. Soil texture is not the only soil characterisitic that is important (ex. pH is important). We consider the CLARC value of 6.7 L/kg preferable to the 80 L/kg value, which is not a Hanford-specific value. Regarding modeling, Ecology will address modeling issues in association with comment resolution for the Past Leaks document (RPP-RPT-59197) and the RCRA Closure document (RPP-ENV-58806). We also request that an evaluation be performed that addresses how the fate and transport modeling for WMA C meets each element of WAC 173-340-747(8); the evaluation should be placed in the Past Leaks and RCRA closure documents. This comment will remain open until modeling issues are resolved for the IPA. 4/3/20-Have not yet seen IAMIT 2019-007. 5/10/21 It appears that the CLARC Kd value for cadmium was used for calculating the 3-phase model results (example Table 3-14). Also, the STOMP modeling has been discontinued for this document.	5/10/21 Closed

RPP-RPT-58329, Rev. 2	BRAES-3	ES	iii	23-26	DD		7/6/2017	Clarify if the compliance is required for 1000 or 10000 years.	Compliance times should be specified.	Clarify if the compliance is required for 1000 or 10000 years.	1	MR	10/24/2017	There is no EPA guidance related to period of compliance for radiological risk assessment. However, EPA's PRG Calculator and Dose Compliance Calculator utilize a period of 1,000 years.	Accepted: 11/8/2017		Closed
RPP-RPT-58329, Rev. 2	BRAES-4	ES	iii	33	DD		7/6/2017	Se-79, Sn-126, U-238, and total U are listed here, but the follow-up text does not address these contaminants. Please address.	All detected contaminants should be addressed.	Describe STOMP groundwater results for Se-79, Sn-126, U-238, and total U, relative to DWS levels.	1	MR	10/24/2017	The following text will be added: "The peak concentrations for Se-79, Sn-126, U-238 and total uranium are well below related to their corresponding drinking water standards." The comparison results for those analytes will be summarized in Section 3.5.11.2.	Accepted: 11/8/2017 **3/30/20** Resolved through IAMIT decision 2019-007	The comment will be closed once the footnote is added to the text. 4/3/20-Have not yet seen IAMIT 2019-007. 5/10/21 The STOMP evaluation was removed from the document.	5/10/21 Closed
RPP-RPT-58329, Rev. 2	**BRAES-5**	ES	iv	23-36	DD		7/6/2017	The text, cited in Ecology Letter 16-NWP-130, may apply to the 200-SW-2 Radioactive Landfills Group OU, but it does not apply universally.	In an email (10/26/2016) with Dr. Anita Singh (Lockheed Martin Environmental Services, lead statistician for ProUCL development), she indicated that the UCL is the best statistic to estimate EPC and should be used irrespective of its value (> or < maximum). In another email (10/28/2015) on this subject, Dr. Scott Ferson (formerly with Applied Biomathematics who currently holds the Chair of Uncertainty at the Inst. for Risk and Uncertainty, School of Engineering, Univ. of Liverpool) commented on an EPA publication (1992, Pub. 9285.7-081) which allowed use of the sample max when the UCL exceeds the max (note that EPA [1992] was subsequently updated by EPA [2002, OSWER 9285.6-10]). Dr. Ferson states the following, "EPA [1992] guidance says one can use the sample max as the EPC when it is smaller than the 95% UCL. From a statistical perspective, this seems like a completely unwarranted idea to me, and I've never understood any justification for it other than as a naked concession to PRPs. As a matter of policy, it also seems to me to be a bad idea because it can disincentivize PRPs from making more measurements. I think we should be encouraging more sampling when uncertainties are large."	Alternatively and more statistically sound, the highest 95% UCL, "suggested" by ProUCL output, should be used as the EPC. In cases where a 95% UCL cannot be calculated or is not suggested by ProUCL, EPC may default to the sample maximum. The maximum should not be used, simply because a 95% UCL exceeds the maximum. EPA has previously stated, "It is important to note, however, that defaulting to the maximum observed concentration may not be protective when sample sizes are very small because the observed maximum may be smaller than the population mean" (OSWER 9285.6-10). Whenever possible, Ecology prefers collection and evaluation of larger data sets (n>10 samples). Finally, in terms of confidence level, 95% UCLs are recommended in order to avoid unreasonably low EPCs (e.g., 90% UCL) or high EPCs (e.g., 99% UCL).	3	MR	10/24/2017	This issue has been discussed extensively with Ecology. The approach used by this BRA has been approved by Ecology when the BRAs for the 100-DH source and groundwater units were approved by Ecology. The language cited in the (Ecology-approved) 200-SW-2 RI/FS Work Plan has been developed in collabotration with Ecology staff and with EPA concurrence. Ecology needs to provide the rationale for accepting the approach included in 200-SW-2 and 200-DV-1, but not for WMA C. What are the differences that distinguish WMA C soil for risk characterization purposes from other source units within the Hanford Site Central Plateau?	**3/30/20** Resolved through IAMIT decision 2019-006. 8/19/21 Comment Noted. The reference text citing Ecology Letter 16 NWP 130 was deleted; hence, it was not included within the Executive Summary of RPP-RPT-58329, Rev 3.	With random sampling and adequate sample numbers, the statistic for estimating EPC should not typically vary by waste site at Hanford. The most technically sound method described in the comment basis and recommendation is supported by subject matter experts (Dr. Anita Singh, lead developer of EPA's ProUCL and Dr. Scott Ferson, industry and academic statistician). In the ProUCL version 5.1 User Guide, EPA states, "When a 95% UCL does exceed the maximum observed value, ProUCL suggests the use of an alternative UCL computation method based upon the Chebyshev inequality" (i.e., use UCL, independent of relationship to max). To estimate EPC (which represents the population of exposure concentrations) when UCL>max, notice that EPA recommends using a UCL (albeit an alternate Chebyshev UCL) which of course incorporates sample variability (as all UCLs do). EPA does not recommend the sample max, a single observation, which does not incorporate sample variability (and may in fact be smaller than the population mean). Comments by Dr. Singh and Dr. Ferson recognize and reflect this. In contrast, USDOE's position on this issue (i.e., use max when UCL>max) is neither logical nor defensible. Regarding the work plan for DV-1, Ecology did make a related comment on this issue, and Ecology did not agree to using maxima in lieu of 95% UCLs in cases where ProUCL could do the 95% UCL calculation. Ecology stated in the comment resolution meeting on 3/31/16 that this issue was in dispute. Please delete DV-1 from the disposition. Furthermore, the units listed in the disposition are strictly CERCLA units and are not TSDs; the tank farms are TSDs. Ecology has primacy as the lead regulatory agency, and WAC 173-303 and its cited sections of WAC 173-340 are not just ARARs that can be waived, but rather promulgated laws for which we are directly responsible. WMA C will require a permit, unlike the CERCLA units. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment BRA2-2. FURTHER ECOLOGY RESPONSE ON 2/5/18: For additional references on direct comparisons for judgmental (focused) samples, see Ecology Publication 94-49, section A.2. Also see the data analysis approaches used in the Cleanup (and Remaining Sites) Verification Packages for the 100 Areas cleanups under the Interim Action Records of Decision. 4/3/20-IAMIT 2019-006 supports the use of direct comparison of each sample result with a cleanup level for judgmental (nonrandom) sampling. This comment applies to the inappropriate reference to Ecology Letter 16-NWP-130 which relates to statistical (random) sampling at 200-SW-2. That is, the Ecology letter is not relevant to WMA-C soils, where samples were collected judgmentally. Therefore, text referring to Ecology Letter 16-NWP-130 should be deleted. 5/10/21 This reference is still cited on p. 3-19 in Section 3.1.2.6. 7/7/21 USDOE plans no changes. **8/24/21** **Accept, pending text revision.**	8/24/21 Pending text revision
RPP-RPT-58329, Rev. 2	BRA1-1	1.2	1-3	39	SVV		7/6/2017	Text states the BRA is based on complete exposure pathways. While this is true, the groundwater pathway does not include current contamination, so only a subset of the total sources of contamination are considered.		Clarify that even though all pathways are considered, the groundwater pathway does not include current contamination.	2	MR	10/24/2017	The following text changes will made: "The exposure assessment considers both current and potential future site uses under a range of potential exposure scenarios and is based on complete exposure pathways for soil contamination to either actual or hypothetical receptors." REVISED on 11/27/17 to: Line 26 to 28 of Section 1.1 will be replaced as follows: "No risk evaluation based on existing groundwater contamination was performed in this WMA C BRA as it is currently being evaluated as a part of the 200-BP-5 groundwater Operable Unit Remedial Investigation report. However, potential threats to groundwater from existing soil contamination are evaluated as part of the WMA C BRA. " The following text changes will made for Line 39, Section 1-2 and Page 1-3: "The exposure assessment considers both current and potential future site uses under a range of potential exposure scenarios and is based on complete exposure pathways for soil contamination to either actual or hypothetical receptors." **Revised 11/27/2017** Line 26 to 28 of Section 1.1 will be replaced as follows: "No risk evaluation based on existing groundwater contamination was performed in this WMA C BRA as it is currently being evaluated as a part of the 200-BP-5 groundwater Operable Unit Remedial Investigation report. However, potential threats to groundwater from existing soil contamination are evaluated as part of the WMA C BRA. " The following text changes will made for Line 39, Section 1-2 and Page 1-3: "The exposure assessment considers both current and potential future site uses under a range of potential exposure scenarios and is based on complete exposure pathways for soil contamination to either actual or hypothetical receptors." **Revised 1/8/2018** The first paragraph of Section 1.2 will be replaced by the following text: "This report documents the assumptions and methodologies used to calculate the potential human health and ecological risks associated with exposure to both nonradiological and radiological contaminants present in the soil at WMA C. Three types of assessments were performed as a part of WMA C BRA. 1. Human Health Risk Assessment (HHRA) to assess human health direct contact risk for soils within WMA C under various land use scenarios: 2. Screening Level Ecological Risk Assessment (SLERA) to assess risk ecological receptors; and 3. Assessment for Protection of Groundwater Pathway to evaluate the potential impacts to groundwater from migration of nonradiological and radiological contaminants in contaminated soil through the vadose zone to the aquifer. It should be noted that there is existing groundwater contamination within this report as it is currently being evaluated as a part of the 200-BP-5 groundwater remedial investigation report."	**Revised 1/22/2018** The first paragraph of Section 1.2 will be replaced by the following text: "This report documents the assumptions and methodologies used to calculate the potential human health and ecological risks associated with exposure to both nonradiological and radiological contaminants present in the soil at WMA C. Three types of assessments were performed as a part of WMA C BRA. 1. Human Health Risk Assessment (HHRA) to assess human health direct contact risk for soils within WMA C under various land use scenarios: 2. Screening Level Ecological Risk Assessment (SLERA) to assess risk ecological receptors; and 3. Assessment for Protection of Groundwater Pathway to evaluate the potential impacts to groundwater from migration of nonradiological and radiological contaminants in contaminated soil through the vadose zone to the aquifer. It should be noted that there is existing groundwater contamination within this report as it is currently being evaluated as a part of the 200-BP-5 groundwater remedial investigation report. Further, DOE will complete a "Cumulative Impacts Evaluation" to integrate existing groundwater contamination an additional contamination that is currently arriving to the unconfined groundwater aquifer or will arrive in the future. This evaluation is currently described in the RI/FS Work Plans for source area OUs including, 200-DV-1, 200-WA-1, and 200-SW-2. Finally, the report title will be changed to: "Baseline Risk Assessment for Soil and the Vadose Zone under Waste Management area C". **Revised 1/29/2018** The first paragraph of Section 1.2 will be replaced by the following text: "This report documents the assumptions and methodologies used to calculate the potential human health and ecological risks associated with exposure to both nonradiological and radiological contaminants present in the soil at WMA C. Three types of assessments were performed as a part of WMA C BRA. 1. Human Health Risk Assessment (HHRA) to assess human health direct contact risks for soils within WMA C under various land use scenarios: 2. Screening Level Ecological Risk Assessment (SLERA) to assess risk ecological receptors; and 3. Assessment for Protection of Groundwater Pathway to evaluate the potential impacts to groundwater from migration of nonradiological and radiological contaminants in contaminated soil through the vadose zone to the aquifer. It should be noted that there is	The suggested disposition does not address Ecology's recommendation. It should be made very clear and specific that this assessment does not consider current groundwater contamination. ECY REVISED and sent 12/14/17 the text paragraph from the BRA3-10 disposition: ["The scope of this document…RPP-RPT-59197, "Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington."] AND OUR REVISED TEXT WE WOULD LIKE ADDED TO DISPOSITION: 'Because no groundwater evaluation was performed for the WMA C, and long-term risks posed by groundwater are not adequately evaluated in the 200-BP-5 groundwater remedial investigation report, additional groundwater information must be obtained to support a decision for WMA-C Closure. To provide sufficient information to meet the TPA Appendix I requirements and the Ecology regulatory responsibility for SST Closure the Hanford Site Cumulative Impacts Evaluation will be updated to include information on the impacts from WMA-C and the SST soil contamination." The Tri-parties will develop a milestone for the Hanford Site Cumulative Impacts Evaluation for future GW integration and regulatory decisions.' ECY REVISED our Status Details on 12/14/17, contingent on revision of the disposition: Ecology has reviewed the response and edited it to clarify the USDOE deficiency. To meet the requirements of WAC 173-303-610(2), USDOE must evaluate all media including groundwater to provide enough information to determine if the residual contamination does or does not pose a risk to human health and the environment. Ecology supports the joint development of site-wide cumulative model such as the Hanford Site Cumulative Impacts Evaluation. This model must be developed and maintained cooperatively with the TPA agencies and regularly updated as new waste site information is collected. Until the Cumulative Impacts Evaluation is developed, updated and the Agencies agree, Ecology will utilize the TC & WM EIS modeling impacts analysis and results to evaluate the risk posed to human health and the environment from the groundwater pathways. This information will be used to provide information to meet the regulatory requirements for a RCRA Facility Investigation, a Corrective Measures Study and to determine closure actions until the TPA cumulative modeling is developed and Ecology accepts the analysis. FURTHER INPUT on 1/11/18: Consider revising the title of the document to "Risk Assessment for WMA C Soil and Vadose Zone". 1/23/18 NOTE : The disposition still includes the word "Baseline". Please remove this. Also, Ecology has not accepted the revised disposiston, though ECY management is considering the revised disposition. FURTHER ECOLOGY RESPONSE on 2/5/18: In addition to the example of a Washington site where risk and hazard were calculated by summing the risk and hazard of all pathways including groundwater ingestion, submitted by D. Delistraty on 2/2/18, we also point to the Hanford Site Risk Assessment Methodology (DOE/RL-91-45, Rev. 3), Chapter 3 and appendices. Also, see RPP-RPT-47479, Rev. 0, Exposure Scenarios for the Waste Management Area C Performance Assessment, Subsistence Farmer Receptor, which includes summation of all pathways including groundwater. 04/15/20 SVV: The last paragraph of Section 1.1 satisfies my original comment. 3/26/20: The terms of the IAMIT decision are not available for this comment; it will remain open. 4/7/21Closed based on IAMIT determination 2019-007 and revised text in section 4.3.	4/7/21 Closed
RPP-RPT-58329, Rev. 2	BRA2-1	2.1	2-1	general comment	SVV		7/6/2017	What constitutes the set of soil characterization data is not clear.		Indicate in the text that at each of the sampling locations, there are several samples from a variety of depths, and indicate the range of the number of samples and depths at the locations. For example, you could say something like "Each sample location has between n1 and n2 samples, that range in depth from d1 to d2", and you would put in the correct values for n1, n2, d1, and d2.	2	MR	10/24/2017	The following text will be added: "Section 4 and Table 4-3 of RPP-RPT-58339, Phase 2 RCRA Facility Investigation Report for Waste Management Area C provided detailed information regarding the set of characterization data. Those results are presented in Appendix H. Those characterization data was utilized during this baseline risk assessment." REVISED 11/27/17 to: The following text will be added: "Section 4 and Table 4-3 of RPP-RPT-58339, Phase 2 RCRA Facility Investigation Report for Waste Management Area C provided detailed information regarding the set of characterization data. A new table will be included to show characterization sample results, including depth information, for each EA. REVISED 1/8/18 to: Table 2-2 will be added at the end of Section 2 to provide a summary of the characterization data. It should be noted that several samples were collected at various depths from each sampling location with each EA. Therefore, Table 2-2 includes information related to EA, Sampling location, Sample IDs and Depths. Sampling results will not be included in the table.	**Revised 11/27/2017** The following text will be added: "Section 4 and Table 4-3 of RPP-RPT-58339, Phase 2 RCRA Facility Investigation Report for Waste Management Area C provided detailed information regarding the set of characterization data. A new table will be included to show characterization sample results, including depth information, for each EA. **Revised 1/8/2018** Table 2-2 will be added at the end of Section 2 to provide a summary of the characterization data. It should be noted that several samples were collected at various depths from each sampling location with each EA. Therefore, Table 2-2 includes information related to EA, Sampling location, Sample IDs and Depths. Sampling results will not be included in the table.	The suggested disposition does not address Ecology's recommendation. We realize that the information we want can be obtained from another document, but even then, it would take some effort to get a summary of the characterization data as we wish. We are suggesting a simple summary sentence be added to this document that would help the reader gain context regarding the characterization data (see our suggested sentence). REVISED 1/11/18 to: Accept. The comment will be closed once the text is added to the document. 04/15/20 SVV: I searched the document and could not find the text specified in the revised 11/27/2017 disposition, but I don't think that matters, as Table 2-2, as discussed in revised 1/8/2018 disposition, satisfies my original comment. I accept the disposition. 4/2/20 Text added.	4/2/20 Closed
RPP-RPT-58329, Rev. 2	BRA2-2	2.1	2-1	14-15	DD, SVV, BR		7/6/2017	Sampling at judgement sampling locations consitutes biased sampling, and the results no longer are random samples that represent the true population of samples. This has implications for the legitimacy of making inferences to the wider population (representativeness) with inferential statistics (e.g., use of a 95% UCL to estimate a population mean). The use of these data in statistical analysis, such as calculating averages or upper confidence limits, is suspect and discouraged. Ecology will rely most on individual sample results.	For example, sample locations are chosen subjectively, such that all locations in the population do not have an equal and independent chance of being selected, as contrasted with simple random sampling (or probability sampling). Therefore, inferences to the wider population cannot be made with judgment sampling, and conclusions are limited to the sample data.	Describe the basis, pros, and cons of the sampling design. Compare individual sample results against the pertinent thresholds. Highlight exceedences and carry the contaminants and their locations forward into the planning of remedial actions.	2	MR	10/24/2017	A random sampling approach could not be applied in WMA C because of the extensive amount of interferences caused by buried infrastructure and topographic constraints. Therefore, soil samples were collected from judgmental locations based on the following Ecology's approved work plan and sampling and analysis plans - RPP-RPT-38152, RPP-PLAN-39114 and RPP-PLAN-38777. In addition, the statistical analysis for the sample results were performed based on the Ecology's approved work plan, RPP-PLAN-39114, Rev 2, Phase 2 RCRA Facility Investigation/ Corrective Measures Study Work Plan for Waste Management Area C. Therefore, even though we concur with issues related to random samples, no changes will be made. It should be noted that it is a surprising comment. The data evaluated in this BRA is collected per an Ecology-approved Work Plan. Further, during the previous review of this BRA, Ecology did not provide any comment related to this issue. **3/26/20** Resolved through IAMIT decision 2019-006		While the sampling design had been agreed upon in recognition of the constraints, the data analysis approach was not described in detail in RPP-PLAN-39114, Rev. 2, beyond, Section 5.4.2, "f. If sufficient data are available, perform statistical analyses. This step has many facets, including determining the distribution of the data and selecting the appropriate statistical tests. If available data are not sufficient for statistical analysis, maximum concentrations will be used in the data evaluation process. The combined chemical and geophysical data will be used for refining the initial conceptual contaminant-distribution models and as inputs to the risk assessment." In order to benefit from the use of statistical analysis of data, the data need to be collected in a manner that does not violate the assumptions of the statistics. Regardless of what was approved, from purely a technical standpoint, the legitimacy of using judgemental sampling to make inferences to the wider population with inferential statistics (e.g., use of a 95% UCL to estimate a population mean) is suspect, and perhaps this should be pointed out in the document. Also, the previous version of this document was a secondary reference document submitted with the RFI along with numerous other reference documents. We had very little time to review it during our review of the RFI. We have done a more thorough review of it now that it is a primary document. Please describe the basis, pros, and cons of the sampling design. Compare individual sample results against the pertinent thresholds. Highlight exceedences and carry the contaminants and their locations forward into the planning of remedial actions. 3/26/20 Ecology will expect to see the revisions agreed to in the IAMIT decison. Text should refer to Section 3.2 to demonstrate consistency with IAMIT 2019-006. Also,…. Also,…. 4/14/21 IAMIT determination 2019-006 states "the U.S. Department of Energy (DOE), … (EPA), and… (Ecology) agreed that DOE will provide the following information in the revised WMA C BRA: • A sample-by-sample evaluation for five of the 11 risk scenarios, including the…(CERCLA) residential and industrial scenarios, the Model ToxicsControl Act (MTCA) Methods B and C scenarios, and the groundwater protection evaluation using the MTCA fixedparameter three-phase model.• An appendix with a comparison of the sample-by-sample evaluation results to the WMA C BRA, Rev. 2 statistical analysis results for the scenarios listed above. • A summary of the sample-by-sample and statistical results comparison in the main body of the BRA.• For the remaining six risk scenarios, no sample-by-sample evaluation will be performed; however, the statistical evaluation as documented in Section 3.5 of the WMA C BRA, Rev. 2 will be retained. WMA C BRA summary and conclusions in the approved RFI/CMS will not change. DOE and Ecology will coordinate upfront to reach agreement on the appropriate analysis methodology to be used in future site characterization efforts supporting risk assessments for other tank farm WMAs. The WMA C BRA will not define future actions or a reements for other WMAs.	11/25/19 IAMIT closed

RPP-RPT-58329, Rev. 2	BRA2-3	2.2	2-1	41 - 42	SVV		7/6/2017	Text states that all sample results flagged with a 'U' are considered non-detected, but the text does not explain what this means in terms of how the data are used or not used in the analysis. Furthermore, a 'U' qualifier is somewhat meaningless in the absense of a detection limit.		Briefly explain here how non-detect data are used, and briefly describe the basis for detection limits (for example, are they based on some human health criterion?) and provide a reference where the contaminant specific detection limits can be found.	2	MR	10/24/2017	The information related to the use of non-detected sample results is presented in Section 3.2.2. Detailed information related to detection limits are presented in RPP-PLAN-38777. A summarized information was also presented in section 3.1.2 of this BRA. REVISED 1/8/18 to: Section 3.2.2 of the BRA provided a brief summary how ProUCL software utilizes both detect and non-detect sample results during the calculation of 95%UCL. More detailed explanation related to the handling of non-detect results during the UCL calculation is provided in Chapter 4 of ProUCL version 5.0.00 User's Guide. For WMA C BRA, the non-detect sample results for nonradiological contaminants were used directly within the ProUCL software as non-detected values at the specified detection limit. For radiological contaminants, reporting results for both non-detect and detected sample results were used by the ProUCL software during the calculation of 95%UCL. No substitution was used for radiological sample results. In addition to sample results, the analyte-specific detected and non-detect sample results were also designated as 1 and 0, respectively to represent the detection status for each sample result within the ProUCL input files. Information related to the non-detect and detected sample results for nonradiological and radiological contaminants will be included in Section 3.2.2.	**Revised 1/8/2018** Section 3.2.2 of the BRA provided a brief summary how ProUCL software utilizes both detect and non-detect sample results during the calculation of 95%UCL. More detailed explanation related to the handling of non-detect results during the UCL calculation is provided in Chapter 4 of ProUCL version 5.0.00 User's Guide. For WMA C BRA, the non-detect sample results for nonradiological contaminants were used directly within the ProUCL software as non-detected values at the specified detection limit. For radiological contaminants, reporting results for both non-detect and detected sample results were used by the ProUCL software during the calculation of 95%UCL. No substitution was used for radiological sample results. In addition to sample results, the analyte-specific detected and non-detect sample results were also designated as 1 and 0, respectively to represent the detection status for each sample result within the ProUCL input files. Information related to the non-detect and detected sample results for nonradiological and radiological contaminants will be included in Section 3.2.2. **3/26/20** Section 3.1.2.6 of the BRA provided a brief summary how ProUCL software utilizes both detect and non-detect sample results during the calculation of 95%UCL. More detailed explanation related to the handling of non-detect results during the UCL calculation is provided in Chapter 4 of ProUCL version 5.0.00 User's Guide. For WMA C BRA, the non-detect sample results for nonradiological contaminants were used directly within the ProUCL software as non-detected values at the specified detection limit. For radiological contaminants, reporting results for both non-detect and detected sample results were used by the ProUCL software during the calculation of 95%UCL. No substitution was used for radiological sample results. In addition to sample results, the analyte-specific detected and non-detect sample results were also designated as 1 and 0, respectively to represent the detection status for each sample result within the ProUCL input files. Information related to the non-detect and detected sample results for nonradiological and radiological contaminants will be included in Section 3.1.2.6.	The disposition for comment BRA3-21 responds to this comment. We suggest using language in that disposition as text to clarify how non-detects are handled (assuming the requested clarificaton for that disposition is addressed). REVISED 1/11/18 to: Accept. The comment will be closed once the text is added to the document. 04/15/20 SVV: Disposition accepted. Text has been added to Section 3.1.2.6, and Section 2.2 references the text in Section 3.1.2.6.	4/28/20 Closed
RPP-RPT-58329, Rev. 2	BRA2-4	2.3.2	2-4	21 - 26	SVV		7/6/2017	The handling of non-detect data in the evaluation of field duplicate results is potentially problematic.		Even though a result may be considered not-detected, the result typically has a reported numeric value, and that value is the best estimate of the actual concentration, and that value should be used in any analyses or data reduction. For example, in the case where there is at least one detection and one or more nondetected results, it could be that one of the nondetected results is greater than the maximum detected value. This is common for cases where concentrations are very low and near a generic detection limit, as the sample specific detection limit can widely vary. This reviewer would recommend simply using reported values, independent of the detection status (at least if actual values are reported). All the criteria could simply be reduced to stating that the maximum reported concentration is used.	2	MR	10/24/2017	Non-detect sample means the chemical may be present at a concentration just below the reported quantitation limit, or it may not be present in the sample at all. The EPA software proUCL takes the detection limit (DL) while calculating the 95% UCL value. The DL is used in the calculation using a range of rigorous methds that recognize that the actual value might equal or be less than the DL. More importantly, practocal quantitation limits were evaluated during the development of the Sampling and Analysis Plan (SAP) to ensure that the PQL is lower or significantly lower than applicable cleanup levels. That is, the detection limits are not generic. REVISED 1/8/10 to: See response to the comment no BRA2-3. 'Revised 1/8/2018 'See response to the comment no BRA2-3. '8/19/21 Comment Noted. "Data Evaluation for Samples with Field Duplicate Results" did not provide an approach for handling non-detect results, especially for radioactive isotopes. Further, no guidance was provided from U.S. EPA on this subject and no requirements were found in the applicable Federal and State regulations. In this BRA, Section 3.1.2.6 presents the approach that was followed for handling the non-detect sample results. This approach was thought to be conservative and representative. For the analytical data set evaluated in this risk assessment, among sample-duplicate sample pairs at the same location, there are only two cases where the reporting results for non-detect results are greater than the detected sample results. For both cases, reported results are less than 2 sigma counting errors. Using reported values for non-detects may not provide adequate sensitivity, hence introducing uncertainty into the sample results. By accepting reported result, a high-quality measurement (detected result) could be replaced with a low-quality reporting result. Therefore, the detected sample results were used for WMA C RA. However, as the comment notes, using the recorded value	8/19/21 continued, value contains information that should not be discarded. A footnote will be added to the text in Section 3.1.2.6 to state:"Another approach can be used to handle non-detected results for radioisotopes, where the reported value is always used, regardless of whether the sample is identified as detect (above the Minimum Detectable Activity, MDA) or non-detect (below the MDA). This approach could be more representative because the reported value can include better information about the underlying population than the MDA, which is not sample specific. However, no guidance or requirements from U.S. EPA ~~and Washington State Department of Ecology~~ exists about dealing with duplicates for radioisotopes. Future risk assessments can explore this subject if sufficient data are available to evaluate the two approaches for radioisotopes. Future risk assessments can explore this subject if sufficient data are available to evaluate the two approaches."	The disposition for comment BRA3-21 responds to this comment. We suggest using language in that disposition as text to clarify how non-detects are handled (assuming the requested clarificaton for that disposition is addressed). REVISED 1/11/18 to: Accept. The comment will be closed once the text is added to the document. 4/28/20 Regarding radionuclides, SVV: My original comment is not addressed. I was specifically addressing the issue discussed in Section 2.3.2 concerning evaluation of samples with duplicate field results, and am not talking about issues with ProUCL to calculate a UCL. The disposition for comment BRA3-21 actually does not address this comment, and there is no text in Section 2.3.2 that addresses my comment. 4/12/21 A new paragraph has been added on p. 2-5, at the end of Section 2.3.2. This new paragraph does not address this comment and further indicates that negative results for radionuclides were not used (the new text states "Nondetected samples were analyzed for but not detected above limiting criteria. Limiting criteria may be any of the following: value reported < 0;"). As the comment originally stated, 'For example, in the case where there is at least one detection and one or more nondetected results, it could be that one of the nondetected results is greater than the maximum detected value. This is common for cases where concentrations are very low and near a generic detection limit, as the sample specific detection limit can widely vary. For radionuclides, this reviewer would recommend simply using reported values, independent of the detection status (at least if actual values are reported). All the criteria could simply be reduced to stating that the maximum reported concentration is used.' 7/13/21 USDOE disagrees with this approach. **8/24/21 ECY: The footnote is accepted with the indicated revision. The Washington State Department of Health would be the state agency with expertise in radiological sample analysis. Ecology will continue to comment on this issue in the future. It is likely that sufficient data are available to do a comparison, since the data are collected for every analysis.**	Open
RPP-RPT-58329, Rev. 2	BRA2-5	2.4	2-4	31-32	DD		7/6/2017	Explain why the "13 judgment sampling locations within WMA C are grouped into 10 primary exposure areas (EAs)." From Appendix N in the RFI [RPP-RPT-58339, Rev 0], it appears that either one or two geographic locations was sampled (over multiple depths) at each EA. This implies that risk metrics (cancer risk, noncancer HQ, rad SOF) were calculated from only one or two locations per EA which is marginal at best for acceptable risk characterization. Clarify if this is the case.	Location and size of EAs, number of samples at depth per EA, and sampling design (within and across EAs) should be fully described and have a clear basis.	Describe the soil sampling design for WMA C overall, as well as within each EA. For example, specify the number of geographic sample locations in each EA, as well as the number of samples collected at depth in each EA (i.e., shallow and deep), and explain how sample depths were selected within each EA (e.g., random, biased) in this BRA. Also, provide rationale for the grouping of 10 EAs and how this may impact calculation of risk.	3	MR	10/24/2017	DOE and Ecology were jointly involved during the selection of 13 judgmental sampling locations for WMA C. This agreement was documented in the WMA C RFI Work Plan, which listed the specific locations selected for sampling. Following the approval of the Work Plans (RPP-RPT-58152, RPP-PLAN-39114 and RPP-PLAN-38777), soil samples were collected from the approved locations. Section 4 of RPP-RPT-58339 and Section 2.0 of RPP-RPT-57218 provided detailed information regarding the sampling locations for the different exposure areas (EAs). The locations of surface soil samples and boreholes were based on • Available information regarding locations and sources for known and suspected releases in and around WMA C, • Elevated survey results of surface radiation and surface geophysical exploration Several of these investigation areas (soil boring locations) are in very close proximity to each other and are associated with the same waste release event. Several of the soil borings were grouped into a single area based on common Phase 2 characterization objectives. Therefore, for the purposes of the BRA, Phase 2 site characterization data collected from 13 sampling locations are partitioned into 10 primary EAs. It should be noted that it is a completely new comment. During the previous review of this report, Ecology did not raise any concerns related to this issue.	**3/26/20** Resolved through IAMIT decision 2019-006 The following text will also be added to Section 2.1: "RPP-RPT-39114 provided information on sample collection requirements: • An average of eight samples collected per sample location. • Surface samples collected from ~0 to 1 ft bgs. • Three samples collected at depths less than 15 ft bgs: o 5 ft bgs o 10 ft bgs o 14 ft bgs For depths greater than 15 ft bgs (i.e., deep), sample intervals were determined by reviewing the gamma and moisture logs of the first direct push and any of the following available information: - Pertinent leak loss inventory information - Geologic information - Operational history - Historical characterization data These sampling horizons were selected in meetings WRPS, DOE, Ecology, EPA, and other site contractors, as available. Documentation of sample selections is provided in RPP-RPT-58339." Section 2.5 and Table 2-1 provides the rationale for grouping of 10 EAs within WMA C. DOE and Ecology were jointly involved during the selection of 13 judgmental sample locations for 10 EAs. Risk metrics (cancer risk, noncancer HQ, rad SOF) based on EA-specific EPCs were calculated from only one or two borehole locations per EA. Table 2-2 will be added to provide a summary of the site characterization sample results. The table will include information related to each EA, sample location, sample IDs, and sample depth.	A table should be included in this BRA with a description of sample locations and depths at each EA to clarify/simplify reviewing sampling information presented in previous documents. Please indicate the number of samples used to calculate risk metrics per EA (cancer risk, noncancer HQ, rad SOF) and how this impacts interpretation of results. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and Ecology response for BRA2-2. 4/3/20-OK, but text should refer to Section 3.2 to demonstrate consistency with IAMIT 2019-006. 4/12/21 Adding Table 2-2 (shallow zone sample characterization), citing IAMIT 2019-006 (judgmental sample analysis) in Sections 2.1, 3.0, 3.2, and adding the new Section 3.2 (sample by sample approach) satisfies this comment, so it can now be closed.	4/12/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-1	3.1.1; 4.2	3-3; 4-5	32 - 37; 27-30	SVV		7/6/2017	Eliminating a radionuclide based only on its half life being less than 3 years is not necessarily valid. Even though after 30 years its concentration will be reduced by a factor of one thousand, if the original concentration was very high, in principle there still may be significant concentration remaining. In addition, if there are a large number of such radionculides, even small individual concentrations may leed to a total risk contribution from the sum of all such radionuclides that may be significant. What really matters is the summ of all radionuclides' current contribution to risk.		For the 27 radionuclides with half lives less than 3 years that were eliminated as COPCs, provide some context as to their total contribution to risk.	2	MR	10/24/2017	There is extensive precedent in Hanford risk assessments for eliminating radionuclides based on their half life being less than 3 years (e.g., 100-DH RI/FS, 300 Area RI/FS, 200-PO-1 RI). For WMA C BRA, only 10 of 27 short-lived radionuclides were detected in the WMA C and their concentrations are so low that all of those short-lived radionuclides will produce negligible contribution to total risk. No changes will be made. REVISED on 1/8/10 to: The last line for Criterion 3 (Sections 3.11 and 4.2.1) will be replaced as follows: "For WMA C, only 10 of 27 short-lived radionuclides were detected and their concentrations are so low that all of those short-lived radionuclides will produce negligible contribution to total risk. Hence, those short-live radionuclides were eliminated from further consideration for identification of COPCs."	'**Revised 1/8/2018** The last line for Criterion 3 (Sections 3.11 and 4.2.1) will be replaced as follows: "For WMA C, only 10 of 27 short-lived radionuclides were detected and their concentrations are so low that all of those short-lived radionuclides will produce negligible contribution to total risk. Hence, those short-live radionuclides were eliminated from further consideration for identification of COPCs." **3/26/20** The first paragraph of Section 1.2 will be modified to reflect that this risk assessment focuses on contaminated soil in the vadose zone. Resolved through IAMIT decision 2019-007	We are simply suggesting a sentence similar to what you wrote in the disposition. The half life alone does not determine whether there is risk, regardless of precedent in other documents. Instead of just stating that those with half lives less than 3 years are eliminated, please include the sentence in your disposition. REVISED ON 1/11/18 to: Accept. The comment will be closed once the text is added to the document. **3/26/20** This comment was not one of the IAMIT issues.... 04/15/20 SVV: Disposition accepted, the specified text is added to Sections 3.1.1 and 4.2.1.	4/28/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-2	3.1.1	3-3	39-43	DD		7/6/2017	Text describes one COPC exclusion criteria as, "Analytes without Known Toxicity Information." A recent editorial in Toxicol Sci notes, "Surprisingly, the current model deems that if we have no reliable toxicity data for a given chemical then it must be assumed to be safe. Although we may be blissfully ignorant of the toxicity this could indeed be very dangerous for the health of the human race and for the planet" (Miller, 2015--A link to this reference is in the next column).	http://toxsci.oxfordjournals.org/content/early/2015/02/25/toxsci.kfu310.full.pdf	Describe the potentially nonconservative uncertainty associated with this exclusion.	2	MR	10/24/2017	Ecology accepted DOE's response for this comment during the first review. Based on the comment, the following text was added: "Human health risk assessment was performed for radionuclides, metals, VOC, SVOCs/PAHs and pesticides/herbicides. Toxicity information was not available for 2 radiological indicator parameters (gross alpha and gross beta), 17 metals, 2 VOCs, 11 SVOCs and 4 pesticides/herbicides. All excluded metals are radiological in nature. Only risk coefficients are available for their radiological isotopes, and were used when they were detected during radiological risk assessment. Among 2 VOCs, one has not been detected and the other, (m+p)-Xylene was detected in one sample out of 47 samples with a very low concentration (less than 1% of the screening values for the surrogate compounds). None of the SVOCs and pesticides were detected. Because of the lack of detection, those analytes will not contribute to the total risks. "	Accepted **3/26/20** Ecology accepted DOE's response for this comment during the first review. Based on the comment, the following text was added: "Human health risk assessment was performed for radionuclides, metals, VOC, SVOCs/PAHs and pesticides/herbicides. Toxicity information was not available for 2 radiological indicator parameters (gross alpha and gross beta), 17 metals, 2 VOCs, 11 SVOCs and 4 pesticides/herbicides. All excluded metals are radiological in nature. Only risk coefficients are available for their radiological isotopes, and were used when they were detected during radiological risk assessment. Among 2 VOCs, one has not been detected and the other, (m+p)-Xylene was detected in one sample out of 47 samples with a very low concentration (less than 1% of the screening values for the surrogate compounds). None of the SVOCs and pesticides were detected. Because of the lack of detection, those analytes will not contribute to the total risks. "	Comment will be closed when the text is added to the document. 4/3/20-OK	4/6/20 Closed

RPP-RPT-58329, Rev. 2	BRA3-3	3.1.2	3-4	13-15	DD, SVV		7/6/2017	Text states, "Sampling results for 37 primary and secondary contaminants were reported as not detected at MDLs exceeding required detection limits listed in RPP-PLAN-38777." This statement is not clear. Does it imply that there are cases where the sample specific MDL was greater than the required detection limit? If this is the case, then there is a problem in that the analysis did not meet the detection limit. When MDLs are greater than "required detection limits," this creates an uncertainty, assuming required detection limits correspond to some regulatory criteria. In this case, MDLs are not sufficiently sensitive to evaluate regulatory criteria.	MDLs need to be below required detection limits (exhibit sufficient sensitivity) to adequately evaluate regulatory criteria.	Discuss the uncertainty generated when MDLs exceed regulatory criteria.	2	MR	10/24/2017	This statement was included in the document based on Ecology's suggestion. However, the following text changes will be made: "Sampling results for 37 primary and secondary contaminants were reported as not detected at MDLs listed in RPP-PLAN-38777."	**Revised 1/22/2018** The following text will be added after that sentence (Line 15). The paragraph will be included in the uncertainty analysis (Section 3.6.1). "Out of 37 primary and secondary COPCs were reported as not detected at MDLs exceeding target detection limits. The required and target detection limits were, in most instances, risk-based or statistically derived. Some exceedances were attributable to result calculation based on aliquot size used for preparation and analysis. Other exceedances were attributable to sample dilutions needed to alleviate interference from other analytes in the sample (high concentrations, overlapping peaks, etc.) or the sample matrix. A number of exceedances were attributable to the variability in MDLs across laboratories. These exceedances resulted in an uncertainty to the risk calculation." **3/26/20** The following text will be added after that sentence (Line 15). The paragraph will be included in the uncertainty analysis (Section 3.4.1). "Sampling results for 37 primary and secondary COPCs were reported as not detected at MDLs exceeding target detection limits. The required and target detection limits were, in most instances, risk-based or statistically derived. Some exceedances were attributable to result calculation based on aliquot size used for preparation and analysis. Other exceedances were attributable to sample dilutions needed to alleviate interference from other analytes in the sample (high concentrations, overlapping peaks, etc.) or the sample matrix. A number of exceedances were attributable to the variability in MDLs across laboratories. These exceedances resulted in an uncertainty to the risk calculation."	Re the text change, please clarify why the modifying phrase for MDLs, "exceeding required detection limits," was removed from the statement. This was the crux of the comment. REVISED 1/23/2018 to: Ecology now concurs with the revised (1/22/2018) USDOE disposition, although the grammar in the first sentence of new text for the revised disposition is a bit goofy (should change "Out of" to Sampling results for"). The main point (now captured in the revised disposition) is that MDLs exceeding required detection limits are a source of uncertainty in the risk assessment. The comment can be closed when the new text is added to the document. 04/15/20 SVV: Disposition accepted, the text in 3/26/20 disposition has been added to Sections 3.1.2 and 3.4.1. 4/6/20-OK	4/6/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-4	3.1.2	3-4	17-20	DD		7/6/2017	Text states that 110 analytes were not detected (after removing excluded analytes), but the subsequent chemical group listing of non-detects (in the following sentence) sums to 109 analytes.	Internal consistency is needed.	Please reconcile the number of non-detects in the text.	1	MR	10/24/2017	Concur. The text is correct. One anion is missing in that list. The following text will be revised as follows: "Non-detected analytes in WMA C soil data included 1 anion, 1 metal, 5 polychlorinated biphenyl aroclors, 15 pesticides, 6 radionuclides, 32 SVOCs, and 50 VOCs."	Accepted: 11/8/2017 **3/26/20** Concur. The text is correct. One anion is missing in that list. The following text will be revised as follows: "Non-detected analytes in WMA C soil data included 1 anion, 1 metal, 5 polychlorinated biphenyl aroclors, 15 pesticides, 6 radionuclides, 32 SVOCs, and 50 VOCs."	Comment will be closed when the text is added to the document. 4/6/20-OK	4/6/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-5	3.1.2	3-4 - 3-6	Table 3-1	BR		7/6/2017	Some contaminants (though concentrations may be low) are missing from the table: Area A+B: Ni-63, Tc-99, tritium, U-236; Area F+G:Tc-99; Area J: Am-241, Sn-126; Area L1+L2: Tc-99; Area P: C-14, Eu-154, Eu-155; Area R: thallium (HQ > 1 and exceeds ecological threshold Of 0.5 mg/kg for invertebrates from DOE/RL-2010-96, Rev. 0); Area U: Tc-99.	The data set: WMA C_SoilData_for_BRA_02June14_wGroupingsPu241, which was provided to Ecology separately from these documents, shows that these contaminants were detected at the locations given in the comment.	Please add these to Table 3-1 and include them in the risk calculations.	1	MR	10/24/2017	Those samples were collected at a depth greater than 15 ft below ground surface. Hence, those were not included in Table 3-1. REVISED on 11/27/17 to: Those samples were collected at a depth greater than 15 ft below ground surface. Hence, those were not included in Table 3-1. The following text will be added for Line 15 within Page 3-1. "It should be noted that risks related to existing groundwater contamination are not evaluated in this BRA as they are evaluated in the 200-BP-5 groundwater Operable Unit Remedial Investigation. However, potential threats to groundwater are evaluated as part of the WMA C BRA." The texts within lines 20 and 21 will be replaced as follows: "Table 3-1 identifies the list of both radiological and nonradiological COPCs for human health direct contact within each EA." Table 3-1 title will be replaced as "Identification of Contaminants of Potential Concerns for Direct Contact within Each Exposure Area".	**Revised 1/8/2018** The following text will be added at the beginning of Section 3.1. "Shallow zone (0 to 15 ft. bgs) soil samples data collected from 14 sampling locations within WMA C were utilized during the human health risk assessment (Section 3) and screening level ecological risk assessment (Section 4) to meet the requirements of direct contact exposure pathway as stated in WAC 173-340-740. It should be noted that soil samples were also collected from deep vadose zone (>15 ft. bags). Soil samples collected from both shallow and deep vadose zones were utilized for performing an assessment referred to as the "protection of groundwater pathway" to understand the potential impacts to groundwater from migration of nonradiological contaminants in contaminated soil through the vadose zone to the aquifer (Subsection 3.5.11). " The Title of Table 3-1 will be updated as "Identification of Contaminants of Potential Concerns Based on Direct Contact Pathway for Each Exposure Area" . The table identified COPCs based on shallow zone soil sample data collected from 14 sampling locations. The Tile for Table 3-2 will be updated as "Exposure Point Concentrations for Nonradiological and Radiological Contaminants of Potential Concern Based on Direct Contact Exposure Pathway at Each Exposure Area".	From the disposition of Comment BRA3-10, the following is considered scope for this document: "The scope of this document [is] limited to the evaluation of existing soil contamination within WMA C and its potential impact to groundwater up to 100 m downgradient from migration in contaminated soil through the vadose zone to the aquifer." Therefore, samples may be below 15 feet but should still be considered for this BRA and included in Table 3-1. (Thallium was, however, found at depths above 15 ft bgs though has a C flag). REVISED 1/10/18 to: Comment will be closed when the text is added to the document. 4/2/20 Text added.	4/2/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-6	3.2.1	3-8	Figure 3-1	DD		7/6/2017	Figure 3-1 should be labelled, "Human Conceptual site Model for WMA C." A footnote should be provided which explains how complete pathways that are not evaluated (represented with vertical bars, e.g., fish consumption for the WAC and CERCLA resident) are addressed (e.g., with rationale added in new text or reference to specific existing text).	Rationale needs to be provided for exposure pathways that are complete but not evaluated.	Please modify the title of Figure 3-1 (add "human" descriptor), and add explanation to support those pathways that are complete but not evaluated.	1	MR	10/24/2017	The title for Figure 3-1 will be labeled as: "Human Conceptual site Model for Soil Contamination within WMA C". In Figure 3-1, a number of pathways are completed but not evaluated for various reasons. Those are summarized in details within Section 3.2.1. Hence, no footnote will be added.	Accepted: 11/8/2017	Comment will be closed when the text is added to the document. 4/8/20-OK on figure title, but could not find new text in Section 3.2.1, summarizing complete pathways that were not evaluated (as shown in Figure 3-1). 4/15/21 IAMIT determination 2019-008 signed 5/12/2020. We, however, that new text has been added, in Feb. 2021 version, to Section 3.1.2.5 (Exposure Scenarios) addressing complete pathways that are not evaluated (i.e., nonrad dermal soil contact and ingestion of surface water, sediment, fish, irrigated crops). Text for dermal contact is OK, but text for ingestion pathways is not acceptable. That is, lack of evaluation of ingestion of surface water, sediment, fish, and irrigated crops (i.e., nonrads in crops) represents a major deficiency in the exposure assessment. Re food ingestion, text states, "EPA does not provide intake equations or recommend performing food chain analyses for chemicals (EPA/540/1-89/002)." This statement is entirely not true (see EPA/RAGS, Exhibits 6-17 to 6-19).	5/12/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-7	3.2.1	3-8	Figure 3-1	SVV		7/6/2017	This figure shows that contamination from the five Sources Of Contamination infiltrate and percolate into groundwater, and subsequently that groundwater is then considered an Exposure Route and is evaluated as a Complete Exposure Pathway for several of the Receptor Scenarios, for example, ingestion of groundwater. If any of the receptor scenarios that evaluate ingestion of groundwater were to actually happen, it would not be possible for the receptor to filter out the component from current contamination in groundwater. I realize the stated purpose of the BRA is to evaluate remedial action alternatives for the five sources of contamination listed in Section 3.2.1.1 and in Figure 3-1, but the receptor scenarios that evaluate ingestion and use of groundwater are not realistic, as they do not evaluate the true groundwater concentrations, and this causes a conceptual problem.		Provide an explanation as to why a baseline risk assessment for WMA C does not include ALL sources of contamination. I understand that current groundwater contamination is addressed in another project or document, but then it ends up there are no documents that provide a total risk assessment for WMA C, and evaluation of remedial action alternatives is not based on knowledge of total risk, but rather is in the context of only a subset of contaminant sources at the site.	2	MR	10/24/2017	The BRA for WMA C was performed in according to the work plan, RPP-PLAN-3877, approved by the Ecology. Evaluations of groundwater contamination and remediation are not in the scope of Phase 2 work plan. Investigating groundwater contamination under WMA C was part of the 200-BP-5 groundwater operable unit remedial investigation/feasibility study. The existing revised WMA C BRA provided the evaluation of soil and vadose zone contamination on groundwater for both radiological and nonradiological COPCs. The revised WMA C RFI/CMS report will include a summary of the groundwater risk assessment for the unconfined aquifer under WMA C.	**Revised 1/22/2018** See response to comment BRA1-1. **3/26/20** Resolved through IAMIT decision 2019-007	Ecology expressed a great deal of concern about the lack of consideration of current groundwater contamination during the resolution of RFI comments. Ecology prepared comments on RPP-RPT-58297 "Screening-level evaluation of groundwater monitoring data collected in the vicinity of WMA C." None of the comments were dispositioned or addressed and several meetings were held on this issue without resolution. Ecology continues to have concerns about the fragmenting of the risk analyses. Ecology is not asking for groundwater alternatives to be covered in this document, but instead is convinced that vadose zone remedies for WMA C should consider present and future groundwater contamination, as vadose zone and groundwater contamination will mix when vadose zone contamination arrives at groundwater. SEE ECY REVISIONS ON 12/14/17 FOR BRA1-1, 4/2/20: The terms of the IAMIT decision are not available for this comment; it will remain open. 4/14/21 Ecology and USDOE agreed to the following in IAMIT determination 2019-007: • Ecology is the lead regulatory agency for the 200-BP-5 operable unit (OU), underlying WMA C. • Currently a CERCLA interim action has been proposed for the 200-PO-1/200-BP-5 OUs. • DOE, Ecology and EPA may coordinate the groundwater-related comments on the WMA C BRA with a future final remedial action for these OUs, • Ecology will make a future permitting decision for WMA C, that incorporates the closure plans (Tier 2 and 3) for WMA C into the Hanford RCRA permit,• Through that permitting action, Ecology will establish both closure performance standards and compliance monitoring requirements. Detection Monitoring for dangerous constituents will be established in the permit – assessment monitoring is required only if detection monitoring finds dangerous constituents above action limits, • Further, Ecology as the lead regulatory agency for the 200-BP-5 OU, will ensure that final actions for groundwater will be documented in a Record of Decision. Performance monitoring to confirm that the cleanup action has attained cleanup standards will also be documented in the Remedial Design/Remedial Action Work Plan for the 200-BP-5 OU, • DOE is preparing a Cumulative Impact Evaluation (CIE) for the Hanford Central Plateau. Ecology and EPA may use the CIE results to inform their future regulatory decisions, and can at the same time consider the Ecology groundwater-related comments on the WMA C BRA, and • The Ecology comments listed above are deemed closed with no further revisions to this part of the WMA C BRA.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-8	3.2.1.1	3-7	general comment	SVV		7/6/2017	The list of five sources of contamination in WMA C leaves out what is perhaps the most significant source of contamination from a risk perspective, which is the groundwater. Intuitively, the term Baseline Risk Assessment implies a complete risk assessment, not one that is fragmented.		Specify that current groundwater contamination is a significant source of contamination at WMA C, but it is not included in this analysis. Provide explanation as to why there is a fragmented approach to reporting risk at WMA C. Explain what document will report on total risk from this WMA.	2	MR	10/24/2017	See response to the comment No BRA3-7.	**Revised 1/22/2018** See response to comment BRA1-1. **3/26/20** Resolved through IAMIT decision 2019-007	See Ecology's Status Details for Comment BRA3-7. SEE ECY REVISIONS ON 12/14/17 FOR BRA1-1 4/2/20 The terms of the IAMIT decision are not available for this comment; it will remain open. 4/14/21 Ecology and USDOE agreed to the following in IAMIT determination 2019-007: • Ecology is the lead regulatory agency for the 200-BP-5 operable unit (OU), underlying WMA C. • Currently a CERCLA interim action has been proposed for the 200-PO-1/200-BP-5 OUs. • DOE, Ecology and EPA may coordinate the groundwater-related comments on the WMA C BRA with a future final remedial action for these OUs, • Ecology will make a future permitting decision for WMA C, that incorporates the closure plans (Tier 2 and 3) for WMA C into the Hanford RCRA permit,• Through that permitting action, Ecology will establish both closure performance standards and compliance monitoring requirements. Detection Monitoring for dangerous constituents will be established in the permit – assessment monitoring is required only if detection monitoring finds dangerous constituents above action limits, • Further, Ecology as the lead regulatory agency for the 200-BP-5 OU, will ensure that final actions for groundwater will be documented in a Record of Decision. Performance monitoring to confirm that the cleanup action has attained cleanup standards will also be documented in the Remedial Design/Remedial Action Work Plan for the 200-BP-5 OU, • DOE is preparing a Cumulative Impact Evaluation (CIE) for the Hanford Central Plateau. Ecology and EPA may use the CIE results to inform their future regulatory decisions, and can at the same time consider the Ecology groundwater-related comments on the WMA C BRA, and • The Ecology comments listed above are deemed closed with no further revisions to this part of the WMA C BRA.	6/18/20 IAMIT closed

RPP-RPT-58329, Rev. 2	BRA3-9	3.2.1.4	3-11 - 3-15	General	BR		7/6/2017	The soil adherence factors for different scenarios differ slightly and come from different references. While the differences are subtle, the reasoning for these differences is not given, so the variations seem arbitrary. Also, the soil adherence factor and the skin surface area are not given for the CERCLA construction worker.	For instance, the industrial worker has a skin adherence value of 0.12 mg/cm^2; the maintenance/surveillance worker 0.1 mg/cm^2; the adult resident 0.07 mg/cm^2.	Instead of giving the scenario parameters in the text, consider preparing a table and including a column in the table that gives a brief explanation of the basis for parameter values.	1	MR	10/24/2017	Concur. The assigned values and their references for soil adherence factors under various receptor scenarios were presented in table format within their corresponding receptor-specific ECFs. However, those values will be added for each receptor in the BRA.	Accepted: 11/8/2017. 8/19/21 Comment Noted. The assigned values and their references for soil adherence factors under various receptor scenarios were presented in table format within their corresponding receptor specific Environmental Model Calculation Files. Sections 3.1.2.5.1, 3.1.2.5.3, 3.1.2.5.4, 3.1.2.5.5, and 3.1.2.5.6 present the assigned values and their references for soil adherence factor under CERCLA Industrial Worker, Construction Worker, Maintenance/Surveillance Worker, Adult and Youth Trespasser and Residential receptors, respectively. It should be noted that soil adherence factors depend on indoor and outdoor activities related to soil contact. The activity-specific soil adherence factor for CERCLA Construction Worker and CERCLA Adult Residential Receptor are the highest and the lowest among all receptor scenarios. In the next revision of this document, a footnote will be added in Section 3.1.2.5 to explain the variation of the soil adherence factors for various receptors	The comment will be closed once the footnote is added to the text. 4/6/20 Cannot find where the inconsistencies have been addressed. 7/8/21 USDOE response simply referred to the EMCFs and did not provide a table for this document or give the rationale in this document. 8/24/21 ECY: Closed with the Attachment 1 table.	8/24/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-10	3.2.1.4	3-11	10, 11	SVV		7/6/2017	Text states the scope of this document is to evaluate existing contamination within WMA C and in groundwater up to 100 m downgradient. Yet line 26 on page 1-1 (Section 1.1) states that 'no groundwater evaluation was performed for the WMA *C*'. These two statements are not consistent.		Clarify statement.	1	MR	10/24/2017	The text will be revised as follows: "The scope of this document are limited to the evaluation of existing soil contamination within WMA C and its potential impact to groundwater up to 100 m downgradient from migration in contaminated soil through the vadose zone to the aquifer. Radiological and nonradiological contaminants in the vadose zone were evaluated using vadose zone models developed in RPP-RPT-59197, "Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington." No groundwater evaluation was performed for the WMA C as it is currently being evaluated as a part of the 200-BP-5 groundwater remedial investigation report. When the Hanford Site Cumulative Impacts Evaluation is updated, it will also include updated information on these impacts."	**Revised 1/22/2018** The text will be revised as follows: "The scope of this document are limited to the evaluation of existing soil contamination within WMA C and its potential impact to groundwater up to 100 m downgradient from migration in contaminated soil through the vadose zone to the aquifer. Radiological and nonradiological contaminants in the vadose zone were evaluated using vadose zone models developed in RPP-RPT-59197, "Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington." No groundwater evaluation was performed for the WMA C as it is currently being evaluated as a part of the 200-BP-5 groundwater remedial investigation report. A site-wide cumulative impact assessment analysis will performed to evaluate the risk posed to human health and the environmental from all completed exposure pathways including soil and groundwater to meet the regulatory requirements for a RCRA Facility Investigation, a Corrective Measures Study and to determine closure actions. **3/26/20** Resolved through IAMIT decision 2019-007	Scott accepts disposition. Ecology needs to discuss this issue internally to arrive at a consistent response for this and comments BRA3-7, BRA3-8. ECY REVISED and sent 12/14/17 the text paragraph from the BRA3-10 disposition: ["The scope of this document…RPP-RPT-59197, "Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington."] AND OUR REVISED TEXT TO ADD TO DISPOSITION: 'Because no groundwater evaluation was performed for the WMA C, and long-term risks posed by groundwater are not adequately evaluated in the 200-BP-5 groundwater remedial investigation report, additional groundwater information must be obtained to support a decision for WMA-C Closure. To provide sufficient information to meet the TPA Appendix I requirements and the Ecology regulatory responsibility for SST Closure the Hanford Site Cumulative Impacts Evaluation will be updated to include information on the impacts from WMA-C and the SST soil contamination." The Tri-parties will develop a milestone for the Hanford Site Cumulative Impacts Evaluation for future GW integration and regulatory decisions.' ECY REVISED on 12/14/17, contingent on revision of the disposition: Ecology has reviewed the response and edited it to clarify the USDOE deficiency. To meet the requirements of WAC 173-303-610(2), USDOE must evaluate all media including groundwater to provide enough information to determine if the residual contamination does or does not pose a risk to human health and the environment. Ecology supports the joint development of site-wide cumulative model such as the Hanford Site Cumulative Impacts Evaluation. This model must be developed and maintained cooperatively with the TPA agencies and regularly updated as new waste site information is collected. Until the Cumulative Impacts Evaluation is developed, updated and the Agencies agree, Ecology will utilize the TC & WM EIS modeling impacts analysis and results to evaluate the risk posed to human health and the environment from the groundwater pathways. This information will be used to provide information to meet the regulatory requirements for a RCRA Facility Investigation, a Corrective Measures Study and to determine closure actions until the TPA cumulative modeling is developed and Ecology accepts the analysis. FURTHER ECOLOGY RESPONSE on 2/6/18: Ecology will expect the disposition for this comment to be the same as that for comment BRA1-1, once there is agreement on the dispositions. Also, in addition to the example of a Washington site where risk and hazard were calculated by summing the risk and hazard of all pathways including groundwater ingestion, submitted by D. Delistraty on 2/2/18, we also point to the Hanford Site Risk Assessment Methodology (DOE/RL-91-45, Rev. 3), Chapter 3 and appendices. Also, see RPP-RPT-47479, Rev. 0, Exposure Scenarios for the Waste Management Area C Performance Assessment, Subsistence Farmer Receptor, which includes summation of all pathways including groundwater. 3/30/20: The terms of the IAMIT decision are not available for this comment; it will remain open. 4/14/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-11	3.2.1.4	3-12	19-21	DD		7/6/2017	Re potential Columbia River impacts, text states, "The impacts of waste left within WMA C on these surface water bodies will be evaluated through the use of a regional fate and transport model." More detail is needed on this model, including where this information will be presented.	Models need to be described and documented.	Provide details on the "regional fate and transport model" to be used to assess impacts to the Columbia River.	2	MR	10/24/2017	This evaluation will be completed in the Hanford Site Cumulative Impacts Evaluation. The evaluation approach document will be prepared as a primary TPA document during FY2018.	**Revised 1/29/2018** This evaluation will be completed in the Hanford Site Cumulative Impacts Evaluation (CIE). The evaluation approach document will be prepared as a primary TPA document during FY2018. The CIE is currently described in the RI/FS Work Plans for source area OUs including, 200-DV-1, 200-WA-1, and 200-SW-2. **3/26/20** Resolved through IAMIT decision 2019-007	This disposition needs to be added to the text to inform the reader. SEE ECY REVISIONS ON 12/14/17 FOR BRA1-1 Ecology addition on 2/12/18: Comment remains open. 4/8/20-Have not yet seen IAMIT 2019-007. 4/14/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-12	3.2.1.4	3-12	26-29	DD		7/6/2017	Text states, "Food chain pathways were evaluated for radiological COPCs. They were not evaluated for nonradiological COPCs as EPA does not provide intake equations or recommend performing food chain analyses for chemicals (EPA/540/1-89/002)." This is not true. EPA (RAGS) does recommend evaluating intake of chemicals in food (e.g., fish, produce, meat, dairy), and RAGS provides intake equations for chemicals in food (Exhibits 6-17 thru 6-19). Therefore, both rads and nonrads should be evaluated in food chain pathways. As noted in the Executive Summary, this issue (previously described in Rev 0 of the BRA) remains an area of disagreement between Ecology and USDOE.	A receptor is clearly exposed to both radionuclide and nonradionuclide COPCs in food. There is extensive precedent in Hanford risk assessments for evaluating both radionuclides and nonradionuclides via food exposure (e.g., HSRAM, CRCIA, WTP, RCBRA, Exposure Scenarios for Hanford Tank Waste PAs [HNF-SD-WM-TI-707]). The overall uncertainty in risk estimation of radionuclides and nonradionuclides should be approximately equal. In this regard, many radionuclides and nonradionuclides have toxicity factors (e.g., risk coefficients for radionuclides, slope factors and RfDs for nonradionuclides), and many exposure factors are independent of a radionuclide vs nonradionuclide grouping (e.g., food intake rates, wet to dry conversion factors, exposure duration). Transfer factors (e.g., soil to plant, plant to beef) are based on empirical data and can be modeled based on structural properties, independent of radionuclide vs nonradionuclide differences. For example, a nonradionuclide (e.g., Se-76) would have the same transfer factor as a corresponding radionuclide of the same element (e.g., Se-79). That is, all isotopes of an element are assigned the same transfer factor (e.g., RESRAD), since chemical reactivity (including transfer properties) is determined by electron configuration (in an atom's outermost valence shell), rather than nuclear	Re food consumption, evaluate both rad and nonrad COPC exposure.	4	MR	10/24/2017	A response was provided for the comment during the earlier version of the report. A slightly revised response is provided below. EPA's RAGS provides intake equations for food chain models. However, EPA did not provide any guidance documents to calculate the concentrations of the chemicals within the food chain. Most of the uncertainty associated with the food chain pathway is related to the ingestion of fruits and vegetables pathway. The RAGS text states clearly that these considerations will introduce substantial uncertainties to the evaluation. In one of guidance documents (EPA 2005), Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA provides a number of equations for calculating the concentration of chemicals in the produce due to direct deposition, air to plant transfer and root update. However, there are significant uncertainties associated with the bioaccumulation and biomagnification factors associated with those equations such that EPA did not include those equations in their RSL website. This conclusion has been confirmed by previous studies conducted at the Hanford Site such as the River Corridor Baseline Risk Assessment (DOE/RL-2007-21, Volume II; Record Accession #: 0093675 and 0093676). Therefore, other approved Baseline Risk Assessments for Hanford Site uplands areas (100-DH Area; DOE-RL-2010-95, Rev 0; Record Accession #: 0083383H) did not evaluate the food chain pathways for chemicals. In addition, MTCA did not provide any equation related to food-chain pathways either. However, EPA does include the equations associated with the food chain for radionuclides in their PRG calculator. It should be noted that by not calculating chemical risk for food chain pathways, total site risk could be underestimated for certain land uses. Therefore, text will be updated to include information related to the uncertainties associated with chemical	**3/26/20** Resolved through IAMIT decision 2019-007	EPA recommends evaluating intake of chemicals in food, and RAGS provides intake equations for fish, produce, meat, and dairy. There is extensive precedent in Hanford risk assessments for evaluating both radionuclides and nonradionuclides via food exposure (e.g., HSRAM, CRCIA, WTP, RCBRA, Exposure Scenarios for Hanford Tank Waste PAs [HNF-SD-WM-TI-707]). Two experts were consulted on this issue. Bruce Napier (PNNL), author of the GENIE code, concurred that the uncertainties in evaluating radionuclides vs nonradionuclides in food exposure are not that different. He emphasized that both of these risk estimates are order of magnitude at best. Brad Sample (Ecorisk), EcoSSL workgroup member, noted that that the key issue relates to derivation methodology of transfer factors (e.g., median BAF vs regression). A regression based approach has less uncertainty (consistent with EPA EcoSSL guidance), and this is independent of a radionuclide vs nonradionuclide differences. In fact, he noted that most radionuclide models rely on BAFs, the less preferable approach with greater uncertainty. USDOE's primary rationale for excluding nonradionuclide (but including radionuclide) evaluation from food exposure relates to excessive alleged uncertainty. However, this is inconsistent from a broader risk assessment perspective, given the large uncertainty in upstream aspects of the assessment (e.g., source term characterization and contaminant fate transport modeling). USDOE also claims that there is no requirement by the state of Washington to assess nonradionuclides via a food pathway. Although food exposure is not a standard pathway in Model Toxics Control Act (MTCA), MTCA does allow for evaluation of foodchain contamination by nonradionuclides, if warranted (WAC 173-340-740(1)[c][i]). MTCA also includes evaluation of nonradionuclides via human fish consumption (WAC 173-340-730[3][b][iii]). USDOE states that the 100 DH RI/FS (DOE/RL-2010-95, Rev 0) did not evaluate nonradionuclides via food exposure. In fact, the 100 DH RI/FS presents RCBRA data (DOE/RL-2007-21, Vol 2, Part 1, Rev 0) which includes exposure to both radionuclides and nonradionuclides in food. In particular, Table 6-7 (100 DH RI/FS) lists several waste sites with As and Hg above EPA regulatory limits (risk>1E-4, HI>1) for produce and beef ingestion. Finally, USDOE has pointed out that EPA has an online calculator for preliminary remediation goals (PRGs) for human food exposure for radionuclides (but not nonradionuclides). Although true, convenience of an online calculator is not a valid reason to dismiss analysis of nonradionuclides for this pathway. 5/11/20 Ecology expects that signatures on the IAMIT agreement will be signed for this in the near future. 4/15/21 IAMIT determination 2019-008 signed 5/12/2020. We, however, that new text has been added, in Feb. 2021 version, to Section 3.1.2.5 (Exposure Scenarios) addressing complete pathways that are not evaluated (i.e., nonrad dermal soil contact and ingestion of surface water, sediment, fish, irrigated crops). Text for dermal contact is OK, but text for ingestion pathways is not acceptable. That is, lack of evaluation of ingestion of surface water, sediment, fish, and irrigated crops (*i.e.*, nonrads in crops) represents a major deficiency in the exposure assessment. Re food ingestion, text states, "EPA does not provide intake equations or recommend performing food chain analyses for chemicals (EPA/540/1-89/002)." This statement is entirely not true (see EPA/RAGS, Exhibits 6-17 to 6-19).	5/12/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-13	3.2.1.4.2	3-13	31-32	DD		7/6/2017	Groundwater ingestion should also be evaluated for the industrial worker under MTCA Method C (WAC 173-340-720[5][b][iii]).	All complete exposure pathways should be evaluated for the industrial worker.	In addition to soil ingestion and inhalation of vapors and dust, add groundwater ingestion for the MTCA industrial worker (specified in WAC 173-340-720[5][b][iii]).	2	MR	10/24/2017	See response to the Comment no BRA3-7.	**Revised 1/22/2018** See response to comment BRA1-1. **3/26/20** Resolved through IAMIT decision 2019-007	Risk from groundwater ingestion (calculated after an institutional control period) should be evaluated in the BRA, rather than evaluated in a separate document (i.e., 200-BP-5 RI). In this way, risk from groundwater ingestion can be added to risk from other exposure pathways for receptors which ingest groundwater (e.g., industrial worker, resident, Native American). Otherwise, risk from all relevant pathways is not being included. REVISED on 1/10/18 to: SEE ECY RESPONSES for BRA1-1 and BRA3-10. 4/8/20-Have not yet seen IAMIT 2019-007. 4/15/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-14	3.2.1.4.6	3-15	general comment	SVV		7/6/2017	According to Figure 3-1, the exposure route of using groundwater to irrigate crops is not evaluated for residential and tribal scenarios, yet using groundwater for drinking water is evaluated. It is not intuitive that if a well exists to use groundwater as drinking water, that the same water would not be used to irrigate crops and provide water for livestock. It appears the exposure routes are not complete.		Provide explanation as to what water is used to irrigate crops and why groundwater is not used for this purpose, especially considering that groundwater is used for drinking water, which implies a well exists. Earlier, in Section 1.2, the text states that the BRA is based on a complete set of exposure pathways. If this is true, then groundwater should be used for irrigation of crops and water for livestock.	2	MR	10/24/2017	For CERCLA residential receptor scenario, water from on-site well was used for crops. See response to the Comment no BRA3-7 for ignoring ingestion of groundwater pathway during this BRA. **Revised 1/22/2018** According to Figure 3.1, consumption of irrigated crops was considered an exposure pathway, but was not evaluated in this BRA. Ingestion of groundwater pathway was completed and evaluated for residential tap water and Native American drinking water exposure scenario due to exposure to existing groundwater contamination in the 200-BP-5 OU BRA. However, it was not considered due to exposure to soil contamination in this vadose risk assessment. A footnote will be added in the figure to provide such explanation.	**Revised 1/29/2018** According to Figure 3.1, consumption of irrigated crops was considered an exposure pathway, but was not evaluated in this BRA. Ingestion of groundwater pathway was completed and evaluated for residential tap water and Native American drinking water exposure scenario due to exposure to existing groundwater contamination in the 200-BP-5 OU BRA. However, it was not considered due to exposure to soil contamination in this vadose risk assessment. This is consistent with the definition of the resident exposure scenario provided in RPP-RPT-47479, Exposure Scenarios for the Waste Management Area C Performance Assessment. A footnote will be added in the figure to provide such explanation. In addition, the uncertainty section will also include an evaluation of this pathway for the residential exposure scenario. This evaluation is included in this response as Attachment BRA3-14. **3/26/20** Resolved through IAMIT decision 2019-007	According to Figure 3.1, consumption of irrigated crops was considered an exposure pathway, but was not evaluated, yet consumption of groundwater was evaluated. Provide an explanation as to why consumption of irrigated crops is not evaluated. The disposition does not address the comment. We realize that the contamination in groundwater comes from the soil, not current gw contamination. 12/14/17 SEE ECY REVSIONS in BRA1-1. Further response on 1/24/18: It appears that the issue of considering application of groundwater that has been contaminated by leaching in the vadose zone was actually presented in RPP-RPT-47479, Rev. 0, Exposure Scenarios for the Waste Management Area C Performance Assessment, for the Subsistence Farmer Receptor, Section 3.2.2.1.2, 2nd paragraph of section: "The food chain pathway includes exposure from ingestion of fruits and vegetables grown in a backyard garden and consumption of meat (beef and poultry) and milk from livestock raised in the contaminated area. Uptake of contamination into crops and livestock is solely from contamination present in soil, and includes use of groundwater contaminated by migration of contaminants in the soil beneath the waste site." Garden produce and other produce was also considered for the Resident and the All Pathways Farmer in the former Exposure Scenarios document (Table 3-12). Ecology will keep this open and reconsider after discussion of revisions in the exposure scenarios document, as requested in comment BRAG-2. FURTHER ECOLOGY RESPONSE ON 2/5/18: See Ecology response to the disposition for Comment BRAG-2. 3/30/20: The terms of the IAMIT decision are not available for this comment; it will remain open. 4/15/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-15	3.2.1.4.6	3-15	34-36	DD		7/6/2017	Exposure pathways for the CERCLA resident for food intake (produce, meat, milk) should include both rad and nonrad COPCs.	See Comment #11.	Re food consumption, evaluate both rad and nonrad COPC exposure for the CERCLA resident.	4	MR	10/24/2017	See response to the comment no BRA3-12.	**3/26/20** Resolved through IAMIT decision 2019-008	Please see Ecology response for BRA3-12. 5/11/20 Ecology expects that signatures on the IAMIT agreement will be signed for this in the near future. 4/15/21 IAMIT determination 2019-008 signed 5/12/2020. Also see response for comment BRA3-12.	5/12/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-16	3.2.1.4.7	3-16	11-12	DD		7/6/2017	Groundwater ingestion should also be evaluated for the resident under MTCA Method B (WAC 173-340-720[4][b][iii]).	All complete exposure pathways should be evaluated for the resident.	In addition to soil ingestion and inhalation of vapors and dust, add groundwater ingestion for the MTCA resident (specified in WAC 173-340-720[4][b][iii]).	2	MR	10/24/2017	See response to the comment no BRA3-7.	**Revised 1/22/2018** See response to comment BRA3-10. **Revised 1/29/2018** Risks from existing groundwater contamination under WMA C are evaluated in the 200-BP-5 groundwater OU Remedial Investigation (DOE/RL-2009-127; Draft A). This risk assessment evaluates the leaching pathway for soils and the vadose zone under WMA C. In evaluation of the leaching pathway, drinking water standrads are used to compare predicted impacts from soil and vadose zone contamination on the underlying groundwater aquifer. **3/26/20** Resolved through IAMIT decision 2019-007	Please see Ecology response for BRA 3-13. 12/14/17 SEE ECY REVSIONS in BRA1-1 4/8/20-Have not yet seen IAMIT 2019-007. 4/15/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed

RPP-RPT-58329, Rev. 2	BRA3-17	3.2.2	3-16	general comment	SVV		7/6/2017	Generally speaking, calculation of statistical quanties for a limited set of samples is intended to determine characteristics of the true population of samples. This process is typically valid when the samples represent random samples. However, in this case of this BRA, statistical (UCL) quantities are determined from a set of biased (judgement) samples.		See prior comment on Section 2.1 regarding judgemental sampling and the use of statistics.	4	MR	10/24/2017	See response to the comment no BRA2-2. **3/26/20** Resolved through IAMIT decision 2019-006	--	See Ecology's Status Details for Comment BRA2-2.	11/25/19 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-18	3.2.2		general comment on EPCs	SVV	BR (response to disposition)	7/6/2017	The validity of the sample sets upon which the EPCs are based, is suspect. From a radiological standpoint, the most significant contribution to risk for almost all of the exposure scenarios at almost all of the exposure areas (see Tables 3-3 thru 3-9) is from external gamma, which is a near-surface phenomena, i.e. contamination below approx. 2 feet has little impact on external exposure. Yet, most of the EAs have only one single sample location, and most of the samples at that location are at depths below which there will be an impact from external gamma. In a situation where it is known external gamma will be the significant contributor to risk, it is important to have information on the surface distribution of contamination throughout the EA. Yet, in this BRA, the contaminant information comes from a single location in which many of the samples come from depths that will have no impact on external exposure. Thus, the EPCs are in no way representative of the distribution of suface contamination, and their use in estimating exposure from external gamma is highly questionable. As a fictional example, if Cs-137 is detected at the surface, but is found at very low or non detect concentrations at depth, then the EPC for the entire soil column would be "lowered" by the results at depth, and thus the concentrations at the surface that influence external exposure would be lower than they should be.		This issue needs to be discussed, as I believe it has significant impacts on the results of the risk assessment.	2	MR	10/24/2017	Under the 2007 Washington State Model Toxics Control Act (MTCA) (Revised Code of Washington 70.105D, "Hazardous Waste Cleanup — Model Toxics Control Act") cleanup regulations (Washington Administrative Code [WAC] 173-340-740, "Unrestricted Land Use Soil Cleanup Standards"), the point of compliance for soil cleanup levels based on the direct contact pathway is defined as the zone extending from the ground surface to 15 ft below ground surface (bgs). To be consistent with the point of compliance, soil samples collected the ground surface to 15 ft bgs were included during the risk assessment. In addition, both DOE and Ecology were jointly involved during the development of the work plan and SAP and the selection of biased surface and subsurface sampling locations within each borehole for WMA C. As mentioned earlier, the locations for those samples were based on available significant knowledge of known and suspected releases, elevated survey results of surface gamma radiation, surface geophysical exploration, down-hole gamma logging and neutron moisture. Hence, such approaches resulted in the elevated sample results for known and suspected release locations. Therefore, there is highly unlikely to find any location within each EA with concentrations greater than those biased locations.	**Revised 1/22/2018** Even though the maximum concentrations for three gamma-emitters and pre-dominant risk radionuclides (Cs-137, Sn-126 and Sr-90) are located in the surface soil for most of the EAs, their highest concentrations are present at a depth greater than 6' bgs, especially at EA P. To evaluate the impact of their presence at various depths, an evaluation was performed to assess the radiological risk under industrial worker scenario by using two different approaches - (1) assessment of risk based on direct contact exposure scenario (0 to 15 ft. bgs soil contamination); and (2) assessments of risk by summing risks associated with surface soil (0-6 inch with no soil cover) and subsurface soil (0.5' to 15' bgs of soil contamination with 0.5' of soil cover. The results of the evaluation showed that the risk associated with direct contact exposure was more conservative, hence this approach was utilized during this BRA. These evaluations will be added to the uncertainty discussion. **3/26/20** Resolved through IAMIT decision 2019-006	It does turn out that at least for radiological results (where most of the risk often comes from external gamma, and hence only contamination near the surface contributes to risk), the EPCs are not necessarily conservative. For example, if a gamma emitting contaminant has a high surface concentration, but low or undetected concentrations at depth, then the EPC result will be less than the high result at the surface, and the risk will be less than actual. In other words, the EPC can be lowered due to low concentrations at depth (that don't contribute to external gamma) and thus the risk from external gamma is incorrectly calculated. For gamma emitting radionuclides, it is the concentrations near the surface that contribute to exposure. Low concentrations at depth, that do not contribute to external gamma exposure, can lower the EPC. ECOLOGY ADDITION/REVISION 12/11/17 Ecology asks that the sample data not be averaged over depths. First of all, if a large component of risk is due to gamma radiation, averaging over depths that are greater than the attenuation distance (roughly 2 to 3 feet) will not give meaningful results. Furthermore, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective sampling, such as cases when the depths were not chosen randomly or systematically. Further response on 1/24/18: Ecology asks that sample data not be averaged over depths. Please evaluate individual sample results against the thresholds of concern using WAC 173-340-740(7)(d)(iii) and (e) for direct comparison, and discuss any exceedences. 5/13/20 This comment can be closed when Appendix F comments are closed. 5/10/21 A sample-by-sample analysis has been provided in the latest draft of this document. Ecology will use the results from the sample-by-sample evaluation, and use the results from individual samples to address this issue. This comment will be closed even though some issues remain in Appendix F.	5/10/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-19	3.2.2	3-16 - 3-17	4-10	BR		7/6/2017	The document quotes OSWER 9285.6-10 regarding the EPC and exposure areas, "An exposure unit is the area throughout which a receptor moves and encounters an environmental medium for the duration of the exposure." To use this definition for this document there would need to be a reason for expecting that the exposure areas designated here actually represent areas throughout which a receptor would move and encounter an environmental medium for the duration of the exposure. It does not appear that the exposure areas designated represent human or ecological exposure units. Also, it appears in Table 3-2 that all depths may have been used when calculating the EPC. Furthermore, the samples taken from these areas were chosen judgmentally, and do not have a statistical basis. Therefore, using statistics that assume random sampling, such as 95 UCLs, is not appropriate. Pooling data for different depths and from more than one core is also difficult to defend given the non-statistical sample design.	Table 2-1 indicates that the exposure areas are actually characterization areas, sampled to characterize particular releases, rather than to represent exposure units for humans or ecological receptors.	Evaluate individual samples (unique sample numbers) by comparing results against thresholds (individual contaminant thresholds, total risk and hazard index thresholds). This includes evaluating each depth from each core against thresholds.	2	MR	10/24/2017	See responses to the comments no BRA2-2 and BRA2-5. **3/26/20** Resolved through IAMIT decision 2019-006	--	See Ecology's response to the dispositions for comments BRA2-2 and BRA2-5. 5/6/20 Ecology has several new comments that pertain to the new appendices, G, F, H. They are included at the end of this RCR. This comment will be closed when the new comments are resolved. 5/10/21 Comments BRA2-2, and BRA2-5 have been resolved. This comment is being closed even though some issues remain for Appendix F comments.	5/10/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-20	3.2.2	3-17	11	DD		7/6/2017	ProUCL 4.00.05 has been updated. Please use ProUCL 5.1 (May 2016).	https://www.epa.gov/land-research/proucl-software	The most recent version of ProUCL software (ver 5.1) should be used.	1	MR	10/24/2017	Ecology accepted DOE's response for this comment (BRA 18) during the first review. Based on the response, ProUCL version 5.1 was used to calculate the EPCs and the results were presented in in Appendix G of the BRA. In addition, a comparison between the EPCs calculated using versions 4.1 and 5.1 of the ProUCL software was provided in the uncertainty section (3.6.2) of the report. **3/26/20** Ecology accepted DOE's response for this comment (BRA 18) during the first review. Based on the response, ProUCL version 5.1 was used to calculate the EPCs and the results were presented in in Appendix I of the BRA. In addition, a comparison between the EPCs calculated using versions 4.1 and 5.1 of the ProUCL software was provided in the uncertainty section (3.4.2) of the report.	Accepted: 12/18/2017	Although ProUCL version 5.1 results, as well as a comparison of ProUCL version (4.00.05 vs. 5.1) results, are presented in Appendix G, please clarify which version was actually used to calculate EPCs in the BRA (given text on p. 3-17: "OSWER 9285.6-10 is the most recent EPA guidance for UCL calculation, and ProUCL 4.00.05 serves as the computation software package for this guidance"). Ecology's comment was not asking for a comparison of versions but rather that the most recent ProUCL version (5.1) be used in BRA calculations. A comparison of Table 3-2 with Table 2 in Appendix G shows that the older ProUCL version 4.00.05 was used in BRA calculations.	Closed
RPP-RPT-58329, Rev. 2	BRA3-21	3.2.2	3-17	20 - 22	SVV		7/6/2017	ProUCL is used on data sets with non-detect results. It is not clear how non-detect results are handled.		Provide an explanation as to how non-detect results are handled in the UCL calculations. Even if a laboratory considers a result not-detected, typically an actual value is reported (rads), and this value is the best estimate of the sample's true concentration, and the reported value should be used in statistical calculations. Use, for example, of a detection limit instead of a reported value results in un-necessarly biased statistical quantities. Reported values (rads) should be used in statistical calculations, regardless of detection status.	2	MR	10/24/2017	Chapter 4 of ProUCL version 5.0.00 User's Guide provides a detailed explanation related to the handling of non-detect results during the UCL calculation. To summarize, each non-detect value is considered to be a measurment that is less than or equal to the detection limit. For parameteric methods, where a distribution is fitted to the observations, this information is added as a constraint to the maximimum likelihood estimation methods. For non-parameteric methods, a vareity of methods are implemented by the proUCL software to handle non detects. Section 3.2.2 of the BRA provided a brief summary how ProUCL software utilizes both detect and non-detect sample results during the calculation of 95%UCL. For radiological contaminants, the reported results were utilized during the calculation of 95%UCL. REVISED on 1/8/18 to: See response to the comment no BRA2-3.	**1/8/2018** See response to the comment no BRA2-3.	The explanation of how ProUCL uses non detect data is accepted. To clarify, are you saying that if a sample has a reported numerical value, even if flagged with a U, that the numerical value is used in UCL calcs? If so, then all is good. Please clarify this. REVISED ON 1/11/18 to: Accept. The comment will be closed once the text is added to the document. 04/22/20 SVV: This is similar to comment BRA2-3, and the disposition is accepted.	4/28/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-22	3.2.2	3-17	28-39	DD		7/6/2017	The text, cited in Ecology Letter 16-NWP-130, may apply to the 200-SW-2 Radioactive Landfills Group OU, but does not apply universally.	In an email (10/26/2016) with Dr. Anita Singh (lead statistician for ProUCL development), she indicated that the UCL is the best statistic to estimate EPC and should be used irrrespective of its value (> or < maximum).	See comment for p. ES-iv.	4	MR	10/24/2017	See response to the comment no BRAES-5. **3/26/20** Resolved through IAMIT decision 2019-006	8/19/21 Comment Noted. In the next revision of this document, the first two paragraphs including the reference (Ecology Letter 16 NWP 130) will be deleted and the following text can be added: "During this RA, the EPC for each COPC within each EA was selected by implementing the agreement presented in IAMIT 2018-001, Tri Party Program Managers' agreement on the use and application of the most recent version of the EPA-approved ProUCL software."	Please see Ecology response to BRAES-5. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and Ecology response for BRA2-2. 4/3/20-IAMIT 2019-006 supports the use of direct comparison of each sample result with a cleanup level for judgmental (nonrandom) sampling. This comment applies to the inappropriate reference to Ecology Letter 16-NWP-130 which relates to statistical (random) sampling at 200-SW-2. That is, the Ecology letter is not relevant to WMA-C soils, where samples were collected judgmentally. Therefore, text referring to Ecology Letter 16-NWP-130 should be deleted. 4/15/21 This comment was partially addressed by adding the sample-by-sample approach, but the statistical data analysis remains and simply confuses the conclusions. Also, Ecology letter 16-NWP-130 is not applicable to these data and reference to it should be removed from the document. 7/8/21 USDOE's response indicated that no changes would be made. **8/24/21 ECY: Accept, pending revision.**	Open
RPP-RPT-58329, Rev. 2	BRA3-23	3.2.2	3-19, for example	Table 3-2	SVV		7/6/2017	Isotopic uranium concentrations appear to be similar to background concentrations. Therefore, it appears that the BRA is calculating risk that includes a contribution from background.		Provide rationale for keeping isotopic uranium as COPCs when it appears the EPC concentrations are background. If they are indeed considered as background, then perhaps they should not be retained.	2	MR	10/24/2017	Noted. As a conservative approach and to be consistent with EPA's risk assessment methodologies, risk assessment for both radiological and nonradiological contaminants were performed without taking any credit for the background.	**Revised 1/22/2018** The following footnote will be added after Table 3-2. Even though uranium concentrations for all EAs are well below its background concentration (3,210 µg/kg), as a conservative approach, it was retained as a COPC during the risk assessment. The following footnote will be added after Table 3-2. **3/26/20** Even though uranium concentrations for all EAs are less than its background concentration, as a conservative approach, it was retained as a COPC during the risk assessment.	No problem with the conservative approach, however, since uranium can be an actual contaminant at Hanford, it would be helpful to the reader to note that the uranium concentrations in this case are indistinguishable from background, but they are retained as a COC to be conservative. Ecology addition on 2/12/18: Waiting on text revision requested in meeting. 04/22/20 SVV: The footnote has been added, dispostion accepted.	4/29/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-24	3.2.2; 3.5.1	3-18 - 3-19; 3-81 - 3-104	Table 3-2; Table 3-14	BR		7/6/2017	The table gives chromium, but doesn't specify the species. Ecology will assume that this is hexavalent chromium in the absence of speciation information.	Hexavalent chromium was extensively used at Hanford, and is significantly more toxic than chromium (III). Ecology has to err on behalf of protecting human health and the environment so we will assume the more toxic form of chromium in the absence of speciation information.	Add a footnote on chromium specifying that the form of chromium will be assumed to be chromium (VI).	1	MR	10/24/2017	Concur. The following footnote will be added for Table 3-2 and Table 3-14: "All chromium analytical results for the WMA C soil data sets were assumed to be in the form of hexavalent chromium."	'Accepted: 11/8/2017	The comment will be closed once the footnote is added to the text. 4/6/20 Changes made.	4/6/20 Closed

RPP-RPT-58329, Rev. 2	BRA3-25	3.2.3.3	3-44	general comment	SVV		7/6/2017	The text mentions radiological dose assessment and the EPA's FGR 11 and FGR 12. Yet, it appears that dose assessment is not discussed in this BRA. Only risk, not dose, is discussed. Further, FGRs 11 and 12 are for calculating dose. So, why is a dose assessment, and the use of FGRs 11 and 12 mentioned?		Clarify if any radiological dose assessments are actually carried out, and if results from FGRs 11 and 12 are actually used somewhere in this BRA.	2	MR	10/24/2017	Concur. No dose assessment was performed in this BRA. Hence, the last sentence of Section 3.2.3.3 will be deleted. Instead of dose coefficients, risk coefficients included in FGR 13 were used. Hence the following text will be added: "RESRAD version 6.5 utilizes Federal Guidance Report (FGR) No. 13 includes the risk coefficient values for all radionuclides (EPA 2002). The risk coefficients derived in FGR No. 13 are based on methods and models that take into account the age- and gender-dependence of radionuclide intake, metabolism, dosimetry, radiogenic risk, and competing causes of death in estimating the cancer risk from low-level exposures to radionuclides in the environment. These risk coefficient slope factors are presented in units per pCi (internal pathways) or risk per year per pCi/g (external pathways)."	Accepted: 11/27/2017	The comment will be closed once the text is added to the document. 04/22/20 SVV: Section 3.2.3.3 is now Section 3.1.2.7.3, and the proposed text has been added, disposition accepted.	4/29/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-26	3.2.3.3	3-44	18-20	DD		7/6/2017	Clarify RESRAD calculation of dose from water independent (ground, inhalation, plant, meat, milk, soil) and water dependent (water, fish, plant, meat, milk) pathways (e.g., see Appendix Table D-6-1).	Models should be well described and transparent.	Briefly describe rationale underlying RESRAD calculation of dose from water independent (ground, inhalation, plant, meat, milk, soil) and water dependent (water, fish, plant, meat, milk) pathways (e.g., see Appendix Table D-6-1). Also, clarify why dose from water ingestion and radon inhalation appear to be excluded (e.g., pathways set to inactive in Appendix Table A-2-1). Re drinking water ingestion, explain how risk from this pathway will be incorporated into the BRA, given that Table A-2-1 indicates that drinking water will be "evaluated as part of GW OU" (another project/document). Therefore, risk from groundwater ingestion should be added to risk from other exposure pathways for receptors which ingest groundwater (e.g., resident). Re radon, please provide the reference, NRC (1994), because I was unable to retrieve this reference.	2	MR	10/24/2017	The following text will be added for clarification: "RESRAD model calculates risk from both water-independent and water dependent pathways. The water-independent pathways include external radiation, inhalation, ingestion of plants (water-independent component), and ingestion of soil. The Water-dependent pathways include ingestion of water, fish, meat, milk and plants (from irrigation water-dependent component). The risks from both pathways are combined together to calculate the total risk." Risk due to ingestion of groundwater were performed as a part of site-wide and well-specific groundwater risk assessment in 200-BP-5 RI (DOE/RL-2009-127, Draft A) report as defined in the Work Plan. Therefore, it was not included in this BRA. On August 22, 1994 (59 FR 43200), the NRC published a proposed rule for comment in the Federal Register to amend 10 CFR part 20 of its regulations ''Standards for Protection Against Radiation'' to include radiological criteria for license termination. The NRC published its final rule in the Federal Register, Vol. 62, No. 139, Monday, July 21, 1997, Rules and Regulations (https://www.gpo.gov/fdsys/pkg/FR-1997-07-21/pdf/97-17752.pdf). According to this rule, the NRC noted that "radon would not be evaluated when developing release criteria due to: the ubiquitous nature of radon in the general environment, the large uncertainties in the models used to predict radon concentrations; and the inability to distinguish between naturally occurring radon and that which occurs due to licensed activities." Hence, radon pathway was not considered during the risk assessment.	**Revised 1/22/2018** The following text will be added for clarification: "RESRAD model calculates risk from both water-independent and water dependent pathways. The water-independent pathways include external radiation, inhalation, ingestion of plants (water-independent component), soil, **meat and milk.** The Water-dependent pathways include ingestion of water, fish, meat, milk and plants (from irrigation water-dependent component). The risks from both pathways are combined together to calculate the total risk." Risk due to ingestion of groundwater were performed as a part of site-wide and well-specific groundwater risk assessment in 200-BP-5 RI (DOE/RL-2009-127, Draft A) report as defined in the Work Plan. Therefore, it was not included in this BRA. On August 22, 1994 (59 FR 43200), the NRC published a proposed rule for comment in the Federal Register to amend 10 CFR part 20 of its regulations ''Standards for Protection Against Radiation'' to include radiological criteria for license termination. The NRC published its final rule in the Federal Register, Vol. 62, No. 139, Monday, July 21, 1997, Rules and Regulations (https://www.gpo.gov/fdsys/pkg/FR-1997-07-21/pdf/97-17752.pdf). According to this rule, the NRC noted that "radon would not be evaluated when developing release criteria due to: the ubiquitous nature of radon in the general environment, the large uncertainties in the models used to predict radon concentrations; and the inability to distinguish between naturally occurring radon and that which occurs due to licensed activities." Hence, radon pathway was not considered during the risk assessment.	In addition to those water independent pathways listed in the USDOE disposition, Table D-6-1 shows risk from water independent pathways for ingestion of meat and milk. ADDED 12/4/11 Therefore, the USDOE disposition for water independent pathways should also include ingestion of meat and milk. Revised on 1/22/18 to: Comment will be closed when the document revisions are made. 4/8/20-OK	4/8/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-27	3.4.2	3-50	32	SVV		7/6/2017	Text states that the area of contamination for each EA is greater than 2,000 m2. I suspect that what you mean is that the area of each EA is greater than 2,000 m2, and that contamination is assumed to be equally distributed throughout the entire EA (the acutal area of contamination is not known due to limited sampling.		Clarify statement. Also, why not just use the actual area of each EA? Is that information not know?	2	MR	10/24/2017	The area of contamination for each EA is greater than 2,000 m2. Therefore, a sensitivity analysis was performed using RESRAD model for various receptor scenarios in the ECFs to determine whether the risk is sensitive when AOC is greater than 2,000 m2. Under sensitivity analysis, radiological risk assessments were performed for three AOCs – (1) base AOC (2,000 m2); (2) Upper AOC; and (3) Lower AOC. The upper and lower AOCs were determined by multiplying and dividing the base AOC by a common factor of 2. Therefore, radiological risk calculations were performed for AOCs of 1,000 m2, 2,000 m2 and 4,000 m2, respectively. The results of the sensitivity analyses showed that risk is not sensitive when area of contamination is greater than 1,000 m2. However, as a conservative approach and to be consistent with the area considered in EPA's Soil Screening Guidance Document for residential receptor, the AOC for each EA was assumed to be 2,000 m2.	**Revised 1/22/2018** The text within Lines 32 to 35 of Page 3-50 will be revised as follows: "While the actual area of contamination for each contaminant is not known, sensitivity analyses were performed using the RESRAD software and they showed that calculated risks are not sensitive when the area is greater than 2,000 m^2. Therefore, the area for each EA was assumed to be 2,000 m^2." **3/26/20** Text will be revised as follows: The actual area of contamination for each contaminant is not known. However, sensitivity analyses performed using the RESRAD model showed that risk is not sensitive when the area is greater than 2000 m2. Therefore, the area for each EA was assumed to be 2000 m2.	I think my comment was misinterpreted. The original text says that "the area of contamination" for each EA is greater than 2000. But I think what you mean to say is that "the area" (not the area of contaminatino) for each EA is greater than 2000, and that you assume contamination is distributed throughout that area. In other words, you don't know the area of contamination since sampling is limited, what you do know is the area of each zone. I'm suggesting that the text be changed to clarify. Ecology addition on 2/12/18: Waiting on text revision requested in meeting. 04/22/20 SVV: This section is now Section 3.1.4.2, and the proposed text has been added, disposition accepted.	4/29/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-28	3.4.2	3-50	32-35	DD		7/6/2017	It is not clear why "risk is not sensitive when the area of contamination is greater than 2000 m^2."	A lack of sensitivity of risk to area of contamination implies uniform contamination throughout shallow soils (0-15 ft bgs) in WMA-C.	Please provide rationale as to why "risk is not sensitive when the area of contamination is greater than 2000 m^2." Please include this sensitivity analysis in an appendix to the BRA, and provide it to Ecology for review.	2	MR	10/24/2017	See response to the comment no BRA3-27.	Accepted: 11/27/2017		Closed
RPP-RPT-58329, Rev. 2	BRA3-29	3.4.2	3-50	37-43	DD		7/6/2017	Provide more detail on the risk to source ratio (RSR) method to calculate risk for radionuclides. For example, Appendix D (e.g., Table D-1-2, p D-3) provides RSR values (risk/[pCi/g]) for each radionuclide for ground, inhalation, and soil pathways. Please describe (in greater detail) ground, inhalation, and soil pathways, and note that RSRs differ from risk coefficients (e.g., risk/pCi for inhalation).	Methodology should be adequately described.	Provide more detail on RSR method to calculate radionuclide risk, as well as more detail on ground, inhalation, and soil exposure pathways.	1	MR	10/24/2017	As a part of the risk assessment, risks for all applicable exposure pathways were calculated initially based on unit concentration (1 pCi/g) over a period of 1000 years. The risk to source ratio (risk per unit concentration) for each COPC was multiplied with its corresponding EPC to calculated to risk for individual radionuclide. The risk results for all radionuclides were summed to calculate the total risk. Hence, an explanation will be provided in the text to clarify this.	'Accepted: 11/8/2017		Closed
RPP-RPT-58329, Rev. 2	BRA3-30	3.5.7.2	3-67	7-8	DD		7/6/2017	Because this scenario is the CERCLA resident, refer to the CERCLA HI target, rather than the MTCA HI target (even though they are the same, i.e., HI=1). This misplaced reference to MTCA occurs in the evaluation of each EA for the CERCLA resident.	Scenarios, receptors, and regulatory limits should be internally consistent.	Refer to the CERCLA HI target for the CERCLA resident.	1	MR	10/24/2017	Concur. Text will be updated to make the suggested changes.	'Accepted: 11/8/2017	The comment will be closed once the text is added to the document. 4/8/20-OK.	4/8/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-31	3.5.7.2	3-67	13-25	DD		7/6/2017	Identification of major health effects of noncarcinogens for the purpose of segregating hazard index (HI) should follow EPA/RAGS guidance. RAGS does not limit information sources for health effects to the IRIS database. Other useful sources include PPRTV, RAIS, and ATSDR. In fact, RAGS specifically mentions ATSDR Toxicological Profiles as an information source for health effects, and recommends identifying major effects of each chemical, including those observed at higher doses than the critical effect (i.e., most sensitive endpoint).	Hazard quotients (HQs) for multiple chemicals are additive if these chemicals adversely impact the same target organ. HQ should be calculated with the specific toxicity factor (e.g., RfD, MRL) derived for the effect described by that toxicity factor.	When segregating HI, consult multiple sources to identify noncancer health effects (e.g., IRIS, PPRTV, RAIS, ATSDR). For example, ATSDR lists hematological effects for intermediate oral MRLs for both V and Co, while IRIS lists a dermal effect (as the critical effect) for a chronic oral RfD for V. Therefore, HQ for both V and Co are additive for hematological effects, independent of a dermal effect listed for V in IRIS.	4	MR	10/24/2017	The toxicity values are determined using the recommended reference hierarchy, as described in Memorandum OSWER Directive 9285.7-53, "Human Health Toxicity Values in Superfund Risk Assessments." That means, those values are not only limited to IRIS. PPRTV, ATSDR and other sources are used for those toxicity values. The toxicity value for each chemical is based on the most critical effect on the target organ. There are potential for other side effects from each chemical. However, toxicity values are not always derived for those side effects. Therefore, by assigning the same toxicity value for each of those side effects will result in extremely overestimate of risk. Therefore, those effects were not considered during this BRA. DOE team reviewed a large number of HHRA reports, prepared under CERCLA and RCRA related to this issue. All of those reports utilized the same methodology for selecting toxicological ends, DOE used during this BRA. Therefore, DOE is requesting Ecology to provide an example where their suggested methodology was implemented.	**3/26/20** Resolved through IAMIT decision 2019-005. 8/19/21 Comment noted. In the next revision of this document, the following text can be added. "Based on the resolution included in IAMIT 2019-005, Baseline Risk Assessment (BRA) for Waste Management Area C (WMA C) - Hazard Index (HI), if toxicity and mechanism information is available in IRIS, that other toxicity and mechanism information beyond IRIS will not be considered and evaluated."	The grey box in RAGS Chapter 8 (top of p. 8-15) states, "Although higher exposure levels may be required to produce adverse health effects other than the critical effect, the RfD can be used as the toxicity value for each effect category as a conservative and simplifying step." This could lead to multiple HQs for different effects for the same chemical (all using the RfD derived for the critical effect). Revised on 3/1/18: Ecology would like to discuss this comment to avoid disputing it. We would like to discuss contaminants that have more than one target organ, but IRIS has assigned the same reference dose for two effects (example: arsenic, which is assigned an RfD of 3E-04 mg/kg/day for both cardiovascular and dermal effects (arsenic is also carcinogenic)). 4/8/20-IAMIT 2019-005 states, "Add clarifying language to the WMA C BRA on DOE's position regarding the calculation of hazard indices." I could not locate USDOE's position in the BRA (i.e., if tox data are available in IRIS, other information sources need not be consulted). 4/15/21 There appears to be new language in section 3.1.4.1.2; however, even though the IAMIT 2019-005 resolution is not conservative, it should be referenced in this section of the document. 7/13/21 Text changes pending for future revision. **8/24/21 ECY: Accept, pending revision.**	Open
RPP-RPT-58329, Rev. 2	BRA3-32	3.5.9	3-75	40-42	DD		7/6/2017	Text states, "The risk characterization was performed for information purposes; consequently, no risk and hazard contributors are identified during the risk characterization." Given that ELCR and HI exceed CERCLA risk (1E-4) and HI (1) limits for many of the EAs for CTUIR residents (Table 3-12) and Yakama residents (Table 3-13), rationale should be provided on how this information may or may not influence remedial decisions. For example, radiological ELCR exceeds 1E-3 in some cases.	All relevant information (e.g., exposure scenarios) should be considered in remedial decision making.	Clarify how results of tribal scenarios (e.g., CTUIR, Yakama) are considered in remedial decisions.	2	MR	10/24/2017	DOE performed risk Assessment for the CTUIR and Yakama Nation receptors scenarios to ensure fair consideration of differing views and to assist interested parties in providing input to risk managers.	**Revised 1/22/2018** DOE performed risk Assessments for the CTUIR and Yakama Nation receptors scenarios to assist interested parties in providing input to risk managers. The report will be available in the Administrative Record so that everyone will have an opportunity to review and provide comments related to the report. **Revised 1/29/2018** Text will be changed to: "The risk characterization was performed for information purposes." That is text starting with ", consequently ...." will be deleted.	Please clarify why tribal risk results do not contribute to risk or hazard during risk characterization, given that some of these results exceed CERCLA limits. Revised on 1/29/18 to: Comment will be closed when the document revisions are made. 4/8/20-OK	4/8/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-33	3.5.9	3-76	Table 3-12	DD		7/6/2017	Under "Carcinogenic Risk-Radiological Contaminants of Potential Concern," "External Gamma" is listed twice. It looks like "Soil Ingestion" is missing.	All relevant exposure pathways should be included.	In Table 3-12 under "Carcinogenic Risk-Radiological COPCs," replace one of the "External Gamma" entries with "Soil Ingestion."	1	MR	10/24/2017	Concur. The risks associated with external gamma pathway will be replaced by the risks associated with soil ingestion pathway.	Accepted: 11/27/2017	The comment will be closed once the text is added to the document. 4/8/20-OK	4/8/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-34	3.5.11.1	3-77	1-4	DD		7/6/2017	Texts states, ".....COPCs for which maximum detected concentrations were greater than their corresponding cleanup levels and background concentrations." Replace "maximum detected concentrations" with "EPC," because EPC is not always the max (Table 3-2 or Table 3-14).	EPC is typically a 95UCL, rather than always the max sample concentration.	Replace "maximum detected concentration" with "EPC," because EPC is not always the max (Table 3-2 or Table 3-14).	1	MR	10/24/2017	Concur. The "maximum detected concentration" will be replaced by "EPC".	'Accepted: 11/8/2017	The comment will be closed once the text is added to the document. 3/30/20 Samples were judgmental. This was resolved through IAMIT decision 2019-006. 4/8/20-OK	4/8/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-35	3.5.11.1	3-78	17-19	DD		7/6/2017	Text states, ".....a background comparison was performed to compare the maximum detected concentration to the 90th percentile background concentration." Replace "maximum detected concentration" with "EPC," because EPC is not always the max (Table 3-2 or Table 3-14).	EPC is typically a 95UCL, rather than always the max sample concentration.	Replace "maximum detected concentration" with "EPC," because EPC is not always the max (Table 3-2 or Table 3-14).	1	MR	10/24/2017	Concur. The "maximum detected concentration" will be replaced by "EPC".	'Accepted: 11/8/2017	The comment will be closed once the text is added to the document. 3/30/20 Samples were judgmental. This was resolved through IAMIT decision 2019-006. 4/8/20-OK	4/8/20 Closed

RPP-RPT-58329, Rev. 2	BRA3-36	3.5.11.1	3-78	32-35	BR		7/6/2017	The text states "However, the site-wide EPC (1 mg/kg) is below maximum soil background concentration." There are two problems here. First of all, WAC 173-340-709(3)(c) gives Ecology's definition for background for lognormal distributions as the 90th percentile background concentration (or 4 times the true 50th percentile, whichever is larger). Ecology will do all comparisons with the WAC 173-340 definition for background concentration and will disregard comparisons against the maximum background concentration. Second, this appears to be the first mention of a 'site-wide EPC' in the body of the document. This term is not defined and is not meaningful from the perspective of receptors. Ecology will disregard comparisons against a 'site-wide EPC.'	See WAC 173-340-709(3) for the definition of background. Also see prior comments on Section 3.2.2.	Discontinue comparisons against maximum background concentrations, and discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	Lines 30 to 35 will be replaced as follow: In RPP-RPT-59197, Analysis of Past Tank Waste Leaks and Losses in the Vicinity of Waste Management Area C at the Hanford Site, Southeast Washington, a STOMP© 3-D groundwater flow and transport model was used to perform a screening analysis over two time frames to identify those contaminants that are not sufficiently mobile to impact groundwater - a period of 1,000 year and a time frame between 1,000 to 10,000 years. According to the screening model results, the minimum Kd values that produce an impact to groundwater within 1,000 years and 10,000 years are less than 0.5 mL/g (without any gravel correction), and less than 2 mL/g (without any gravel correction), respectively. MTCA 3-phase model soil CUL for cadmium is based on Kd value of 6.7 mL/g. Therefore, cadmium will not likely impact the groundwater within 10,000 year due to its elevated Kd value. Therefore, Cd will not be retained as a soil COPC.	**Revised 1/22/2018** The response to this comment will be updated based on the conclusion to be made during the comment-response resolution of the "RCRA Closure Analysis" and/or Past Leak Analysis" reports. **3/26/20** Resolved through IAMIT decisions 2019-006 and 2019-007	First, it is accepted that the use of the site-wide EPC will not be continued. However, the comment also asks for comparisons against maximum background values to be discontinued; only comparisons against 90th percentile background values should be used. Also, STOMP modeled results, instead of 3-phase model results, for evaluation of the soil pathway to groundwater is new in this BRA. STOMP modeling is said to be site-specific, yet the cadmium Kd used was not. Ecology simply does not have enough evidence to allow cadmium to be dropped as a COPC. Retain cadmium as a COPC at the sites where its sample results exceed the 90th percentile background and the 3-phase model values. FURTHER RESPONSE on 1/10/18: Also see Ecology's response for comment BRAES-2. FURTHER RESPONSE on 1/24/18: This and associated comments will remain open until resolved in the comment resolution process for the Past Leaks and RCRA Closure documents. **4/6/20** Accept changes. It appears that reference to a site-wide EPC has been discontinued and comparisons are made against 90th percentile background values (rather than maximum background). Also, STOMP modeling is not being used for this document.	4/6/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-37	3.5.11.1; 5.2	3-78; 5-2	24-35; 30-34	DD	BR	7/6/2017	When comparing EPC to background concentration, MTCA prescribes the 90th percentile of background concentration for lognormal distributions (WAC 173-340-709[3][c]), not the maximum background concentration. This site-wide EPC for Cd (1 mg/kg) exceeds the MTCA soil CUL for protection of groundwater (0.69 mg/kg). On an EA basis, according to text and Table 3-14, soil EPCs for Cd at 2 EAs (2.9 mg/kg at E, 3.1 mg/kg at R) exceed the MTCA soil CUL for protection of groundwater (0.69 mg/kg), as well as Hanford soil background (0.56 mg/kg, ECF-HANFORD-11-0038, Rev 0). Therefore, soil Cd may adversely impact groundwater at EAs E and R, due to a leaching pathway.	MTCA prescribes the 90th percentile of background concentration (or 4 times the true 50th percentile, whichever is larger) for lognormal distributions (WAC 173-340-709[3][c]), not the maximum background concentration.	Delete language implying that the maximum background concentration is an acceptable limit for background concentration. State that the cadmium concentrations at areas E and R exceed the MTCA soil CUL for protection of groundwater (0.69 mg/kg), as well as Hanford soil background (0.56 mg/kg, ECF-HANFORD-11-0038, Rev 0).	2	MR	10/24/2017	See response to the comment no BRA3-36.	**Revised 1/22/2018** See response to comment BRA3-36. **3/26/20** Resolved through IAMIT decisions 2019-006 and 2019-007	Ecology has not agreed to contaminant fate and transport modeling methods used at WMA-C. If available, please provide a Hanford-specific Kd for Cd. Also see Ecology's response to the dispositions for comments BRA3-36. FURTHER RESPONSE on 1/10/18: Also see Ecology's response for comment BRAES-2. FURTHER RESPONSE on 1/24/18: This and associated comments will remain open until resolved in the comment resolution process for the Past Leaks and RCRA Closure documents. 4/10/20-Have not yet seen IAMIT 2019-007. Soil Cd should be retained at EAs E and R. 4/15/21 For comparison of sample concentrations to background MTCA prescribes the 90th percentile of background concentration (or 4 times the true 50th percentile, whichever is larger) for lognormal distributions (WAC 173-340-709[3][c]), not the maximum background concentration. The IAMIT agreements 2019-006 and 2019-007 did not address this. Ecology is closing this comment but will continue to to use WAC 173-340-709[3][c] as the definition for background concentrations and will not dismiss exceedences on the basis of maximum background values.	4/15/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-38	3.5.11.1	3-79	12-17	DD		7/6/2017	Clarify why the MTCA Method B screening level values for groundwater for lindane and beta-BHC are used to assess their aqueous concentrations above the water table (rather than in groundwater). Also, note that these results indicate that lindane and beta-BHC may adversely impact groundwater after 1000 years.	Modeling analysis should be transparent.	Clarify why the MTCA Method B screening level values for groundwater for lindane and beta-BHC are used to assess their aqueous concentrations above the water table (rather than in groundwater). Also, note that these results indicate that lindane and beta-BHC may adversely impact groundwater after 1000 years.	2	MR	10/24/2017	Both lindane and beta-BHC did not reach the groundwater within 1,000 years. Therefore, no comparison of their aqueous concentrations above the groundwater table should be performed with respect to their corresponding MTCA B screening values. Therefore, lines 12 to 19 will be replaced as follows: "Therefore, based on the results of STOMP© model, both lindane and beta BHC concentrations in soil will not impact the groundwater present at WMA C for over a period of 1,000 years."	**Revised 1/22/2018** The response to this comment will be updated based on the conclusion to be made during the comment-response resolution of the "RCRA Closure Analysis" and/or Past Leak Analysis" reports. **3/26/20** Resolved through IAMIT decisions 2019-006 and 2019- 007	Ecology has not agreed to contaminant fate and transport modeling methods used at WMA-C. 12/11/17 Revised to remove extraneous text. FURTHER RESPONSE on 1/10/18: Regarding modeling, Ecology will address modeling issues in association with comment resolution for the Past Leaks document (RPP-RPT-59197) and the RCRA Closure document (RPP-ENV-58806). We also request that an evaluation be performed that addresses how the fate and transport modeling for WMA C meets each element of WAC 173-340-747(8); the evaluation should be placed in the Past Leaks and RCRA closure documents. This comment will remain open until modeling issues are resolved for the IPA. FURTHER RESPONSE on 1/24/18: This and associated comments will remain open until resolved in the comment resolution process for the Past Leaks and RCRA Closure documents. 4/10/20-Have not yet seen IAMIT 2019-007. 4/15/21 This comment was resolved because the MTCA 3-phase analysis is no longer replaced by STOMP modeling.	4/15/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-39	3.5.11.1	3-81	Table 3-14	DD		7/6/2017	Please clarify if the total number of samples for a given analyte per EA differ in Table 3-2 vs. Table 3-14 is due to shallow samples (0-15 ft) vs. shallow plus deep samples (entire vadose zone), respectively. The distinction should be noted in text and tables.	Data tables should be fully described.	Please clarify why total number of samples for a given analyte per EA differ in Table 3-2 vs. Table 3-14. If this relates to shallow samples (0-15 ft) vs shallow plus deep samples (entire vadose zone), this should be noted in text and tables.	1	MR	10/24/2017	Section 2.5 of the BRA provided detailed information related to this issue. However, this information could be added in sections 3.22 and 3.5.11. REVISED 11/27/17 to: Section 2.5 of the BRA provided detailed information related to this issue. The following text will be added at the after line 19 of Page 3-77 (Section 3.5.11). The sampling results for both shallow (ground surface to 15 ft bgs) and deep vadose zone (>15 bgs) are included during the protection of groundwater evaluation. Line 16 of Page 3-78 will be replaced as follows: "Table 3-14 presents a comparison between the EPCs, based on combined shallow and deep vadose zone sample results for COPCs within each EA and their corresponding soil cleanup levels based on the three phase model." REVISED on 1/8/18 to: See response to the comment no BRA3-5. The following text will be added after line 19 of page 3-77 (Section 3.5.11). "Soil samples collected from both shallow zone (0 to 15 ft bgs) and deep vadose zone (>15 ft bgs) were utilized to perform the assessment for protection of groundwater pathway. " The Title for Table 3-14 will be updated as "Results of Data Assessment for Protection of Groundwater Pathway Using Shallow and Deep Vadose Zone Soil Sample Results and Three-Phase Equilibrium Partitioning Model " .	**Revised 11/27/2017** Section 2.5 of the BRA provided detailed information related to this issue. The following text will be added at the after line 19 of Page 3-77 (Section 3.5.11). The sampling results for both shallow (ground surface to 15 ft. bgs) and deep vadose zone (>15 bgs) are included during the protection of groundwater evaluation. Line 16 of Page 3-78 will be replaced as follows: "Table 3-14 presents a comparison between the EPCs, based on combined shallow and deep vadose zone sample results for COPCs within each EA and their corresponding soil cleanup levels based on the three phase model." **Revised 1/8/2018** See response to the comment no BRA3-5. The following text will be added after line 19 of page 3-77 (Section 3.5.11). "Soil samples collected from both shallow zone (0 to 15 ft. bgs) and deep vadose zone (>15 ft. bgs) were utilized to perform the assessment for protection of groundwater pathway. " The Title for Table 3-14 will be updated as "Results of Data Assessment for Protection of Groundwater Pathway Using Shallow and Deep Vadose Zone Soil Sample Results and Three-Phase Equilibrium Partitioning Model ". **3/26/20** See response to the comment no BRA3-5. The following text will be added after line 19 of page 3-77 (Section 3.1.6). "Soil samples collected from both shallow zone (0 to 15 ft. bgs) and deep vadose zone (>15 ft. bgs) were utilized to perform the assessment for protection of groundwater pathway. " The Title for Table 3-14 will be updated as "Results of Data Assessment for Protection of Groundwater Pathway Using Shallow and Deep Vadose Zone Soil Sample Results and Three-Phase Equilibrium Partitioning Model " .	The title of Table 3-2 should clearly indicate that these EPC data are from shallow samples only (0-15 ft) and apply to direct contact. REVISED on 1/10/18 to: Ecology now agrees with the revised USDOE disposition. The comment will be closed once the text is added to the document. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-40	3.5.11.1	3-81 - 3-104	Table 3-14	BR		7/6/2017	The table gives the 3-phase model value chromium as 2,000,400 ug/kg. This is for chromium (III). The hexavalent chromium value is missing but is 200 ug/kg using a site-specific Kd value of 0 L/kg from PNNL-13895; therefore, the values of hexavalent chromium at sites A&B, C, E, F&G, H&I, J, L1&L2, P, R, and U exceed the 3-phase model value.	Ecology assumes that the species of chromium is hexavalent in the absence of speciation data.	Change the 9th column to 'yes' to indicate that the chromium concentrations exceed the WAC 173-340 3-phase model value.	1	MR	10/24/2017	Concur. Table 3-14 will be updated to reflect the changes. When the EPC for chromium exceeds the 3-phase model value, "Yes" will be entered for column 9. REVISED 11/27/17 to: Concur. An additional row will be added in Table 3-14 to show the comparison for chromium results against the 3-phase model value (0.192 mg/kg) for chromium (VI). When the EPC for chromium exceeds the 3-phase model value, "Yes" will be entered for column 9.	**Revised 11/27/2017** Concur. An additional row will be added in Table 3-14 to show the comparison for chromium results against the 3-phase model value (0.192 mg/kg) for chromium (VI). When the EPC for chromium exceeds the 3-phase model value, "Yes" will be entered for column 9. **Accepted11/27/2017** **Revised 1/8/2018** The Title for Table 3-14 will be updated as "Results of Data Assessment for Protection of Groundwater Pathway Using Shallow and Deep Vadose Zone Soil Sample Results and Three-Phase Equilibrium Partitioning Model " . An additional row will be added in Table 3-14 to show the comparison for chromium results against the 3-phase model value (0.192 mg/kg based on Kd value of 0) for chromium (VI). When the EPC for chromium exceeds the 3-phase model value, "Yes" will be entered for column 9. **3/26/20** The Title for Table 3-14 will be updated as "Results of Data Assessment for Protection of Groundwater Pathway Using Shallow and Deep Vadose Zone Soil Sample Results and Three-Phase Equilibrium Partitioning Model " . An additional row will be added in Table 3-14 to show the comparison for chromium results against the 3-phase model value (192 ug/kg based on Kd value of 0) for chromium (VI). When the EPC for chromium exceeds the 3-phase model value, "Yes" will be entered for column 9. 8/19/21 Comment noted. In the next revision of this document, Table 3-14 will be updated to include the data evaluation based on hexavalent chromium and thallium. It should be noted that both hexavalent chromium and thallium were included for "Soil to Groundwater Protection Assessment" in Appendix H using sample-by-sample approach. Section 3.2.3.2 summarizes the results of that data evaluation.	We need to discuss the changes that will be made in Table 3-14 and the species of chromium that are being considered. 11/27/17 Comment will be closed when revision is made. 4/6/20 The table has the total chromium background value in the hexavalent chromium row. Please move the total chromium background value to the total chromium row. 4/19/21 The table still has the total chromium background value in the hexavalent chromium row, and has 960 ug/kg as the 3-phase model value for chromium, rather than 192 ug/kg as the comment requests and the disposition of 3/26/20 indicated. Ecology continues to be concerned about the lack of hexavalent chromium analyses for tank farm soils and residuals. Ecology assumes that the species of chromium is hexavalent chromium in the absence of speciation data. 7/13/21 Table correction and eventual analyses of hexavalent chromium in samples pending for future revision. **8/24/21 ECY: Accept, pending a corrected and revised table.**	Open
RPP-RPT-58329, Rev. 2	BRA3-41	3.5.11.1	3-81 - 3-104	Table 3-14	BR		7/6/2017	Thallium is missing from the table for site C. The maximum thallium value for site C was 304 ug/kg on 6/12/12 at a slant depth of 6.5 ft. It is also missing from site R where its maximum value was 1220 ug/kg on 5/11/2010 at a slant depth of 0.5 ft.	These values exceeds the soil value to protect groundwater (3-phase model) value in the CLARC database.	Add thallium for site C and enter 'yes'for column 9 in the table.	2	MR	10/24/2017	Concur. Table 3-14 will be updated to add the information for Thallium. When the EPC for thallium exceeds the 3-phase model value, "Yes" will be entered for column 9. It should be noted that 3-phase value for thallium is derived based on Kd value of 71 mL/g. As mentioned in the response for comment no, BRAES-2, the site-specific model showed that any analyte with Kd value> 1.5 mL/g will not reach the groundwater over a period of 10,000 years. **3/26/20** Resolved through IAMIT decision 2019-006	**Revised 1/22/2018** See response to comment BRA3-36. 3/26/20 Resolved through IAMIT decision 2019-006	Ecology does not have enough information about the STOMP modeling to accept the results from this modeling. Also, it has not been demonstrated that the STOMP modeling meets the requirements in WAC 173-340-747(8) for this unit. 12/11/17 Deleted last sentence of response. FURTHER RESPONSE on 1/10/18: Regarding modeling, Ecology will address modeling issues in association with comment resolution for the Past Leaks document (RPP-RPT-59197) and the RCRA Closure document (RPP-ENV-58806). We also request that an evaluation be performed that addresses how the fate and transport modeling for WMA C meets each element of WAC 173-340-747(8); the evaluation should be placed in the Past Leaks and RCRA closure documents. This comment will remain open until modeling issues are resolved for the IPA. FURTHER RESPONSE on 1/24/18: This and associated comments will remain open until resolved in the comment resolution process for the Past Leaks and RCRA Closure documents. 4/6/20 Please add thallium to Table 3-14 for site C. 4/20/21 Please add thallium to Table 3-14 for site C. Eology's CLARC database recognizes an oral RfD of 1E-05 mg/kg/day from the PPRTV appendix. IRIS does not give an RfD so we use the next tier, PPRTV. 7/13/21 Table changes pending for future revision. **8/24/21 ECY: See response to comment BRA3-67 disposition.**	Open
RPP-RPT-58329, Rev. 2	BRA3-42	3.5.11.2	3-109	Table 3-15	DD		7/6/2017	Re Table 3-15, it appears that units for peak concentration for Total Uranium should be µg/L for both the fenceline and 100 m downgradient (in order to be consistent with each other and with units in Figures 6-23 and 6-21 in RPP-RPT-59197, Rev 1).	Units should be correct.	Re Table 3-15, it appears that units for peak concentration for Total Uranium should be µg/L for both the fenceline and 100 m downgradient (in order to be consistent with each other and with units in Figures 6-23 and 6-21 in RPP-RPT-59197, Rev 1).	1	MR	10/24/2017	Concur. The units should be µg/L instead of mg/L. Changes will be made as suggested.	Accepted: 11/8/2017. **3/26/20** Site-specific STOMP model results have been removed from the BRA. Resolved through IAMIT decision 2019-007	The comment will be closed once the text is added to the document. 4/10-Have not yet seen IAMIT 2019-007. 4/15/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-43	3.6.1	3-110	26	SVV	BR (response to disposition)	7/6/2017	UCLs are based on biased sampling.		Discuss the uncertainty introduced from using biased, rather than random, sampling when calculating statistical quantities.	2	MR	10/24/2017	See response to the comment no BRA2-2. **3/26/20** Resolved through IAMIT decision 2019-006	--	See Ecology's response to the disposition of comment BRA2-2. Please include a discussion of the uncertainty as requested in the comment. 4/6/20 Ecology will expect to see the revisions agreed to in the IAMIT decison. We have not seen the appendix that will address this comment. 4/19/21 See Ecology's response to the disposition of comment BRA2-2.	11/25/19 IAMIT closed

RPP-RPT-58329, Rev. 2	BRA3-44	3.6.1	3-110	30-31	DD	BR	7/6/2017	Text states, "A total of 136 soil samples were collected at various depths (near surface [0 to 3 ft bgs], shallow surface [0 to 15 ft bgs] and deep [>15 ft bgs]) from 10 EAs within WMA C." However, Table N-1 (Appendix N in RPP-RPT-58339, Rev 0) appears to show about 150 soil samples. Please clarify.	Related documents should present data consistently.	Text states, "A total of 136 soil samples were collected at various depths (near surface [0 to 3 ft bgs], shallow surface [0 to 15 ft bgs] and deep [>15 ft bgs]) from 10 EAs within WMA C." However, Table N-1 (Appendix N in RPP-RPT-58339, Rev 0) appears to show about 150 soil samples. Please clarify. Also, include Table N-1 (Appendix N in RPP-RPT-58339, Rev 0) in this document.	2	MR	10/24/2017	DOE provided a response to this comment (BRA 42) during the first review of the document. Ecology did not provide any follow-up comment for that response. Anyway, the response is provided below. Additional samples were collected during the installation of two nearby monitoring wells (299-E27-20 and 299-E27-24). Because they are located outside the 10 exposure areas (EAs). Those two well locations were not considered during this BRA. Text changes will be made throughout the document to state that soil sampling results of 136 samples collected from 13 judgment sampling locations were utilized during this BRA.	**Revised 1/22/2018** See response to comment BRA2-1. Table 2-2 will address the discrepancies associated with the sample numbers in this report and Table N-1 of Appendix N in RPP-RPT-58339. A reference to Appendix N, Table N-1 of RPP-RPT-58339 will be included as a footnote to Table 2-2. **3/26/20** No change to text. The WMA C BRA text reflects the number of depths in which samples were collected. Table N-1 of the WMA C RFI shows all sample intervals, including duplicate depths for various locations.	Ecology would like to see the text changes. Also, please include table N-1 (Appendix N in RPP-RPT-58339, Rev 0) in this document. Ecology addition on 2/12/18: Waiting on text revision requested in meeting. 4/10/20-Not sure if a text change is due or not. 5/7/20 No reference to RFI Table N-1 has been included in this document. 4/20/21 Section 3.4.1 (Uncertainties Associated with Analytical Data) now references Table N-1 (WMA-C RFI) and provides some explanatory text about the 136 sample number.	4/20/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-45	3.6.1	3-110	30 - 33	SVV		7/6/2017	Text states that a sufficient number of samples where collected to adequately characterize the nature and extent of the contamination. This is clearly not true, as the extent of contamination cannot be characterized by information at a single sample location (most of the EAs).		Correct, or eliminate, this statement.	2	MR	10/24/2017	See response to the comment no BRA2-5.	**Revised 1/22/2018** See response to comment BRA2-1. The lines will be revised as follows: "A total of 136 soil samples, collected from various depths (near surface [0 to 3 ft. bgs], shallow surface [0 to 15 ft. bgs] and deep [>15 ft. bgs]) within 10 EAs were utilized to characterize the nature and extent of the soil contamination for WMA C." **3/26/20** Resolved through IAMIT decision 2019-006 Text in this location will be revised as follows: "A total of 136 soil samples, collected from various depths (near surface [0 to 3 ft. bgs], shallow surface [0 to 15 ft. bgs] and deep [>15 ft. bgs]) within 10 EAs were utilized to characterize the nature and extent of the soil contamination for WMA C."	See Ecology's response to the disposition for comment BRA2-5. 04/22/20 SVV: The proposed text has been added in Section 3.4.1. However, the sentence "Therefore, a sufficient number of samples were collected to adequately characterize the nature and extent of the contamination." follows the proposed text, and this statement is still not valid. The fact remains that most of the samples are from a single location (with several different depths) within an EA, and are judgement samples, so the extent of contamination is not known. Text needs to be modified. Disposition not accepted and comment still open. 4/19/21 Ecology generally considers the Phase 2 RFI sample design, which was judgmental, to require a sample-by-sample (direct comparison) data analysis approach. There were sample collection constraints due to infrastructure and we recognize that truly characterizing nature and extent would require a more extensive statistically-based design. We accept the Phase 2 design at this time given the constraints. However, we consider the large UPRs sampled in Phase 1 and Phase 1.5 to be the greatest direct contact/exposure risks in the tank farm as far as we know, and will contiue to expect the large UPRs to be adequately addressed during closure, and to be included in discussions of tank farm risks. We are closing this comment but will pursue resolution of comment BRAG-1.	4/19/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-46	3.6.1	3-110	33 - 40	SVV	BR	7/6/2017	Here it states that only shallow surface zone (0 to 15 ft bgs) results are used in the risk assessment. As stated in 'general comment on EPCs' from the comment on Section 3.2.2 above, contaminaton below approximately two feet will not contribute to external gamma exposure (the most significant contributor to radiological risk), and so use of data below a few feet may actually result in underestimating risk. Further, lines 37 - 40 result in an unclear description of the basis for the EPCs at each EA.	The reader cannot tell exactly what values were used in the UCL calculations, and the EPC values and their basis. When statements such as "…. was often selected as the EPC rather than …." the reader is left not knowing the criteria for making such decisions.	Clarify. It would be beneficial for this BRA to contain a table, perhaps in an appendix, that shows the raw data from each location (see previous comment for p. 3-110, lines 30-31).	2	MR	10/24/2017	See response to the comment no BRA3-18.	**Revised 1/22/2018** See response to comment BRA3-18. **3/26/20** Resolved through IAMIT decision 2019-006	See Ecology's response to the disposition for comment BRA3-18. 04/28/20 SVV: See BRA3-18. 4/19/21 See Ecology's response to the disposition of comment BRA2-2.	11/25/19 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-47	3.6.1	3-110	34-37	DD		7/6/2017	Text states, "Since the RME receptors are exposed to contamination present in the shallow surface soil, soil sampling results from the shallow surface zone (0 to 15 ft bgs) for each EA were then used to determine the source term during the risk assessment." This source term (shallow soils) does not capture a groundwater drinking scenario, where receptors ingest groundwater that has been contaminated by soil COPCs leaching to groundwater through the full depth of the vadose zone.	Groundwater can be contaminated by contaminant leaching throughout the vadose zone.	Re a groundwater ingestion pathway, note that receptors may be exposed to contaminants throughout the vadose zone that migrate to groundwater.	2	MR	10/24/2017	See response to the comment no BRA3-7.	**3/26/20** Resolved through IAMIT decision 2019-007	Please see Ecology response for BRA 3-13. 4/10/20-Have not yet seen IAMIT 2019-007. 4/15/21 See response for BRA3-7 regarding IAMIT agreement.	6/18/20 IAMIT closed
RPP-RPT-58329, Rev. 2	BRA3-48	3.6.1	3-110	37-40	DD	BR	7/6/2017	Text states, "Due to these reasons, a limited number of samples (<6) were used to determine the EPCs for many of the COPCs. In such cases, the maximum detected sample result was often selected as the EPC rather than a UCL (RPP-RPT-57218). Therefore, use of maximum detected concentration as the EPC resulted in a very conservative overestimation of risk for various EAs."	This conclusion is not necessarily true, especially in the case of small samples sizes (e.g., n<6).	Alternatively and more statistically sound, the highest 95% UCL, "suggested" by ProUCL output, should be used as the EPC (when nonjudgmental sampling has been performed). In cases where a 95% UCL cannot be calculated or is not suggested by ProUCL, EPC may default to the sample maximum. The maximum should not be used, simply because a 95% UCL exceeds the maximum. EPA has previously stated, "… defaulting to the maximum observed concentration may not be protective when sample sizes are very small because the observed maximum may be smaller than the population mean" (OSWER 9285.6-10).	2	MP	10/24/2017	The following text will be added: During site characterization efforts, biased sampling locations for surface soil samples and boreholes were based on • Available significant knowledge regarding locations and sources for known and suspected releases in and around WMA C, • Elevated survey results of surface radiation and surface geophysical exploration In addition, the results of elevated downhole gamma logging and neutron moisture readings were utilized during the selection of subsurface soil sample locations for each borehole. Both approaches resulted in very conservative source term.	**3/26/20** Resolved through IAMIT decision 2019-006 The sentence commented on: "Therefore, use of maximum detected concentration as the EPC resulted in a very conservative overestimation of risk for various EAs." will be removed.	Unfortunately, the sampling efforts in WMA C did not reveal where the subsurface contamination resides. For this reason, Ecology does not agree that these approaches gave conservative source term results. Please strike the last sentence of the disposition and do not include this in the document. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and EcologyBRA2-2.	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-49	3.6.1	3-111	12-13	DD		7/6/2017	Although these two conservative approaches (associated with COPC selection) are described that may overestimate risk, text is silent on issues that may underestimate risk. For example, risks may be underestimated, because chemicals with no toxicity factors may (in fact) be toxic, several exposure pathways have been excluded (e.g., food consumption for nonrad COPCs, groundwater ingestion, radon inhalation), interactions among chemicals may be synergistic or exhibit potentiation (greater than simple additivity), and transformation or degradation products (that are not accounted for) may contribute additional toxicity.	Uncertainties associated with analytical data, exposure assumptions, or toxicity assessment may result in both overestimation and underestimation of risks.	Revise text to include a more objective accounting of both conservative and nonconservative methodology in risk estimation.	2	MR	10/24/2017	The uncertainty associated with no toxicity values was addressed based on the response to the comment no BRA3-2. The uncertainty associated with excluding food chain pathway for chemicals will be addressed as follows: "Food chain pathways were evaluated for radiological COPCs. They were not evaluated for nonradiological COPCs. By not calculating nonradiological for food chain pathways, total site risk is underestimated." See response to the comment no BRA3-26 for issues related to the pathway. Lines 15 to 21 of page 3-114 (section 3.6.3) provided detailed toxicity information related to interaction among chemicals. Therefore, no changes will be made.	Accepted: 12/18/2017	The comment will be closed once the text is added to the document. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-50	3.6.2	3-111	19-21	DD		7/6/2017	Please provide rationale for the statement, "Uncertainty associated with the exposure assumptions used in this risk assessment is low to moderate, and most likely overestimates the actual risks."	Statements ranking risk level should be supported with rationale.	Add rationale to statements which qualitatively or quantitatively describe level of risk or uncertainty.	2	MR	10/24/2017	The rest of the paragraph of this section presented the rationale to that statement. Therefore, this statement will be moved from the first paragraph to the end of this section.	Accepted: 12/18/2017	The comment will be closed when the text is moved in the document. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-51	3.6.2	3-111	27-30	DD		7/6/2017	Text states, "The uncertainty from a relatively small sample size (i.e., less than five) requires a greater amount of conservatism during the estimation of mean, while a large sample size requires less conservatism during the estimation of mean. Therefore, maximum detected concentrations were selected as the EPCs for small sample size." The concluding (final) statement infers that the maximum detected sample concentration is a conservative estimate of EPC for small sample sizes. This is not necessarily true.	OSWER 9285.6-10 (EPA, 2002) states, "It is important to note, however, that defaulting to the maximum observed concentration may not be protective when sample sizes are very small, because the observed maximum may be smaller than the population mean."	Revise this text to note that defaulting to max with small sample size (e.g., n<5) is allowed, only because UCL cannot be reliably calculated, not due to alleged conservatism.	2	MR	10/24/2017	The text will be updated as follows: "Due to smaller sample size, the maximum detected concentrations were selected as the EPCs. The maximum detected concentration from areas with known or suspected releases with highest gamma reading will result in a conservative risk estimate. " **3/26/20** The text will be updated as follows: "Due to smaller sample size, the maximum detected concentrations were selected as the EPCs." See disposition for BRA2-2.	--	The second sentence of the updated text in the ISDOE disposition is not necessarily true. That is, there may be areas not sampled with higher contaminantion, so that judgemental sampling results are nonconservative. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and Ecology's response for BRA2-2. 4/10/20-Direct sample comparison to the CUL is needed for judgmental sampling (see IAMIT 2019-006). Please delete the following statement: "Therefore, due to smaller size, the maximum detected concentrations were selected as the EPCs." Small sample size should only be a basis to use max, if no other option is available. Direct comparison should be used for judgmental sampling. 4/20/21 Text revised in Section 3.4.2.	4/20/21 Closed
RPP-RPT-58329, Rev. 2	BRA3-52	3.6.2	3-111	43-44	DD		7/6/2017	Although a comparison of EPC results (ProUCL 4 vs 5) is presented in Table 2 (Appendix G), the most recent version of ProUCL should be used (version 5.1) to calculate EPC in this BRA. It is not appropriate to use older versions of ProUCL software.	The most recent version of software (e.g., ProUCL) should be used, due to dynamic nature of software development (e.g., incorporation of updates, improvements, corrections, and so on).	Use the most recent version of ProUCL software (version 5.1, May 2016) to estimate EPC.	2	MR	10/24/2017	See response to the comment no BRA3-20.	Accepted: 12/18/2017	Please see Ecology response to BRA3-20. 12/18/17 Ecology Accepted	Closed
RPP-RPT-58329, Rev. 2	BRA3-53	3.6.2	3-112	42-43	DD		7/6/2017	Text states, "Slope factors for external gamma radiation assume that the source is a semi-infinite slab." Re external radiation, FGR 12 notes that the radionuclide concentration in a given environmental medium is assumed to be uniform with a semi-infinite source for submersion in contaminated air and an infinite source region for immersion in contaminated water or exposures to contaminated soil.	Assumptions should be accurately stated with regard to source regions for external exposure in specific environmental media.	Clarify that the source for external gamma radiation in soil is characterized as infinite. In particular, FGR 13 states that the contaminated ground surface is an infinite plane, and soil occupies an infinite half space.	1	MR	10/24/2017	Concur. The following text will be added: "The source for external gamma radiation is assumed to be uniformly contaminated with infinite depth."	Accepted: 11/27/2017 **3/26/20** Concur. The following text will be added: "Slope factors for external gamma radiation assume that the source is uniformly contaminated with infinite depth."	The comment will be closed once the text is added to the document. 4/10/20-OK	4/10/20 Closed

RPP-RPT-58329, Rev. 2	BRA3-54	3.6.3	3-114	24-28	DD		7/6/2017	Text states, "Toxicity information was not available for 2 radiological indicator parameters (gross alpha and gross beta), 17 metals, 2 VOCs, 11 SVOCs and 4 pesticides/herbicides. All excluded metals are radiological in nature. Only risk coefficients are available for their radiological isotopes, and were used when they were detected during radiological risk assessment." For metals, this text appears internally contradictory, because it does not make sense that "toxicity information was not available" and "risk coefficients are available for their radiological isotopes."	Risk coefficients are toxicity information.	Clarify text on why 17 metals (with radiological risk coefficients for some of their isotopes) were excluded.	2	MR	10/24/2017	The following text will be added to clarify such statement: Toxicity information was not available for 2 radiological indicator parameters (gross alpha and gross beta), 17 metals, 2 VOCs, 11 SVOCs and 4 pesticides/herbicides. All excluded metals are radiological in nature and risk coefficients are available for their corresponding radiological isotopes. When they were detected, they were included as a part of the radiological risk assessment. No risk assessment was performed for non-detected analytes."	Accepted: 12/18/2017	The comment will be closed once the text is added to the document. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-55	3.6.3	3-115	7-26	DD		7/6/2017	These two paragraphs on overestimation of risk present a unilateral view. Nonconservative factors are not mentioned here. For example, chemicals with no toxicity factors may (in fact) be toxic, several exposure pathways have been excluded (e.g., food consumption for nonrad COPCs, groundwater ingestion, radon inhalation), interactions among chemicals may be synergistic or exhibit potentiation (greater than simple additivity), and transformation or degradation products (that are not accounted for) may contribute additional toxicity.	Uncertainties associated with risk characterization may result in both overestimation and underestimation of risks.	Revise text to include a more objective accounting of both conservative and nonconservative methodology in risk characterization.	2	MR	10/24/2017	See response to comment no BRA3-49.	Accepted: 12/18/2017	The comment will be closed once the text is added to the document. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-1	4.0	4-1	general comment	SVV		7/6/2017	It is not clear if, or how, DOE-STD-1153-2002 (A Graded Approach For Evaluating Radiation Doses To Aquatic And Terrestrial Biota) is used in the ecological risk assessment.		Discuss how DOE-STD-1153-2002 is used in the risk assessment.	1	MR	10/24/2017	A specific reference to the DOE-STD-1153-2002 (A Graded Approach For Evaluating Radiation Doses To Aquatic And Terrestrial Biota) will be added on Page 4-1, beginning on line 20. In addition, the following sentence will be added at the beginning of line 29 (Section 4.4.1.4). "For the purposes of developing Tier 1 values, radionuclide exposure in the wildlife receptor species was estimated based on the internal and external radiation exposure models (the kinetic-allometric modeling methodology) incorporated into DOE-STD-1153-2002. That kinetic-allometric modeling methodology is incorporated into Level 3 of the RESRAD-BIOTA Version 1.5 tool, DOE/EH-0676 (DOE-STD-1153-2002)."	'Accepted: 11/8/2017	The comment will be closed when the text is added to the document. 04/28/20 SVV: Text has been added. Accept disposition.	4/29/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-2	4.0	4-2	14 - 22	SVV		7/6/2017	Is a sum-of-fractions approach used?	The sum of several contaminants that have concentrations below a screening level can end up having significant contribution to risk.	It appears that a sum-of-fractions approach is not used. Clarify, and discuss why it is not used.	1	MR	10/24/2017	As noted in the previous comment, DOE's Graded Approach guidance document was used in conducting the SLERA (clarifying text added on page 4-1), which includes use of the SOF approach. Lines 27 to 37 of page 4-9 provided a detailed summary of the "Sum-of-fraction approach."	'Accepted: 11/8/2017	The comment will be closed when the text is added to the document. 04/28/20 SVV: Verified that sum of fractions approach is discussed, found in Section 4.3. Accept disposition.	4/29/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-3	4.0	4-2; 4-3	45-46; 1-9	DD	BR	7/6/2017	As part of the SMDP process after Tier 1 and Tier 2 screening, text states, "The site-wide EPCs for those COPECs were used as the source term during this evaluation." The BRA and SLERA have divided WMA C into EAs. Because site-wide sampling is biased (by design), a statistical approach to extrapolate to the wider population (which requires random sampling) is not warranted. Re the SLERA, use of a site-wide EPC is not compatible with the HQ and SOF values that were calculated on an EA basis.	Among the six COPECs with HQ>1 in the Tier 2 screen, three COPECs (B, Mo, Tl) have screening values based on plants and soil biota (Table 4-6); these are immobile receptors (e.g., plants), or have limited mobility (e.g., soil biota). Site-wide EPCs are less relevant than those for co-located soil values.	See the comment for Section 3.5.11.1, p. 3 78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	4	MR	10/24/2017	There is precedent in Hanford risk assessments for applying SMDP to evaluate the potential for population-level risks to wildlife and community-level risks to plants and invertebrates for (e.g., River Corridor OU BRAs, 300-RI/RS, 100-D/H, and 100-N). The methodology for performing generic, Tier 1 and Tier 2 screening was revised based on Ecology's following comment provided during their first review of this WMA C report: "A 95UCL should preferably be calculated to represent EPC, independent of receptor type when local populations are considered. For example, a population of individuals of sessile biota (e.g., plants) or mobile biota (e.g., birds or mammals) may be distributed over a range of concentrations of a given soil COPC. As a representative measure of COPC soil concentration, EPC should capture variability in COPC concentration which is independent of receptor mobility/immobility. Therefore, a UCL95 (rather than max), which contains a measure of variability (standard deviation), is the best estimate of EPC for sessile biota (just as it is for mobile biota). In addition, use of max ignores most of the information in the data set." The 95 UCL site-wide EPC is therefore retained. No change warranted. REVISED on 1/8/18 to: See response to the comment BRAES-1.	**Revised 1/8/2018** See response to the comment BRAES-1.	Because spatial boundaries of local populations or communities of ecological receptors have not been defined here, expansion of the exposure area from individual EAs to a site-wide WMA-C area does not improve the realism of the SLERA. Spatial boundaries of EAs and WMA-C are unrelated to ecological population and community properties. The Ecology comment (cited in the USDOE disposition) is directed toward calculation of EPC (independent of receptor mobility/immobility) with a random sampling design (allowing calculation of 95UCL), not toward defining spatial boundaries of local populations and communities of ecological receptors. Furthermore, it is not clear how aggregation of judgementally collected soil samples (on an EA basis) for calculation of a site-wide EPC was accomplished nor if this aggregation methodology is statistically sound. Additionally, the units listed in the disposition are not TSDs; the tank farms are TSDs. No TSD units use the SMDP process, especially an SMDP process that had no Ecology involvement. WAC 173-303 and its referenced sections do not include this process. Ecology does not accept this process for TSD units. Furthermore, as described in OSWER 9285.7-25, p. I-11, "SMDPs are significant communication points which should be passed with the consensus of all involved parties." This did not take place for this unit; Ecology is an involved party and did not approve of the decisions made for this unit. Please do not use the SMDP process to eliminate contaminants. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and Ecology's response for BRA2-2. REVISED on 1/10/18 to : Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/10/20-OK	4/10/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-4	4.1	4-4	41-43	DD		7/6/2017	Text states, "Future land use for the inner area of the Central Plateau will be industrial and will remain under Federal ownership and control." Revise this statement, because land use cannot be guaranteed, due to increasing uncertainty into the future.	Future land use becomes increasingly uncertain, as time goes on.	Revise the statement on future land use to be an objective, rather than a reality.	2	MR	10/24/2017	This statement was discussed in detailed within the first paragraph of page 3-10 (section 3.2.1.3). However, the references cited in Section 3.2.1.3 (i.e., HFSUWG 1992, DOE/EIS-0222-F, DOE/EIS-0222-SA-01) will be added to the end of the statement.	**Revised 1/22/2018** The text will be revised as follows: "Future land use for the inner area of the Central Plateau is currently designated as industrial. "	As noted in the comment recommendation, revise the statement on future land use to be an objective, rather than a reality. REVISED ON 2/6/18 TO: The comment will be closed when the text is added to the document. 4/13//20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-5	4.3	4-6	10 - 11	SVV		7/6/2017	Not clear if sum-of-fractions is used.		Clarify if sum-of-fractions approach is used, in particular for radionuclides.	1	MR	10/24/2017	See response to comment no BRA4-2.	'Accepted: 11/8/2017	The comment will be closed when the text is added to the document. 04/28/20 SVV: Verified that sum of fractions approach is discussed, found in Section 4.3. Accept disposition.	4/28/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-6	4.4.1.1	4-12	44-46	DD		7/6/2017	Re olfactory bulb uptake, text states, "In addition, manganese and cadmium are not significant Hanford Site contaminants that needed to be evaluated using such site-specific methods." However, HQ>1 for Cd was observed for both generic (Table 4-2) and Tier 1 (Table 4-4) screens. Therefore, Cd should not be dismissed as an insignificant COPEC in this SLERA.	Although "methods for olfactory exposure and risk characterization are not well established," this pathway should be noted as an uncertainty.	Because HQ>1 for Cd in both generic and Tier 1 screens, Cd should not be dismissed as an insignificant COPEC in this SLERA.	2	MR	10/24/2017	Concur. The following sentence will be included in Section 4.7. "The site-specific methods for olfactory exposure and risk characterization are not well established for maganese and cadmium, and hence, an uncertainty exist. "	Accepted: 12/18/2017 **3/26/20** Concur. The following sentence will be included in Section 4.7. "It has been noted that olfactory bulb uptake in fossorial mammals affords a significant exposure route to manganese and cadmium in soils. The site-specific methods for olfactory exposure and risk characterization are not well established for manganese and cadmium, and hence, an uncertainty exist. "	The comment will be closed when the text is added to the document. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-7	4.4.1.2	4-13	26	DD		7/6/2017	Note that omission of reptiles and amphibians constitutes an uncertainty in the SLERA.	Uncertainties in exposure assessment should be noted.	Note the omission of reptiles and amphibians as an uncertainty in the SLERA.	2	MR	10/24/2017	As stated in the Tier 1 SSL document (CHPRC-00784, pg 16), EPA EcoSSLs were not developed for reptiles, amphibians, and soil microbes because EPA concluded that toxicity data for amphibians and reptiles were insufficient for EcoSSL development. Concur to adding the lack of toxicity data to evaluate amphibians and reptiles to the uncertainty section of the SLERA.	Accepted: 12/18/2017	The comment will be closed when the text is added to the document. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-8	4.4.1.2	4-16	12-14	DD		7/6/2017	A default value of BAF=1 may not be conservative for certain organic lipophilics (e.g., PBTs, POPs, pesticides).	Default BAF values should be conservative for all contaminants.	Clarify that BAF=1 is a default value for nonrad inorganic and rad contaminants.	2	MR	10/24/2017	Concur. In the absence of published BAF values and applicable bioaccumulation models for some COPECs, a default value of BAF =1 was used. Table 6-4 of CHPRC-00784 lists the BAFs for all contaminants and their sources. The table shows that the BAF values for a number of COPECs are greater than 1.	Accepted: 12/18/2017. 8/19/21 Comment Noted. The first paragraph in page 4-16 includes the following text. "In the absence of applicable bioaccumulation models, a default value of 1 (i.e., soil and tissue concentrations are equal) was assumed (as in the case of boron uptake to small mammals). Table 6-4 of CHPRC-00784 lists the bioaccumulation factors for all contaminants and their sources. The table shows that the bioaccumulation factor values for a number of COPECs are greater than 1."	4/13/20-Could not locate the "fix" in the redline, qualifying that BAF=1 only applies to rads and inorganic COPCs. So, comment re-opened. 4/28/21 This text does not appear to be given in the document.	Closed 4/13/20 Reopened 8/24/21 Closed
RPP-RPT-58329, Rev. 2	BRA4-9	4.4.1.3	4-16	36-44	DD		7/6/2017	MTCA Table 749-5 should also be listed as a source for nonrad TRVs for birds and mammals.	MTCA lists TRVs for several metals, pesticides, other chlorinated organics, and other nonchlorinated organics for the shrew, vole, and robin.	If more site-specific or receptor-specific TRVs are not available, MTCA Table 749-5 could be used as a source for TRVs for birds and mammals.	1	MR	10/24/2017	This SLERA relies on the Tier 1 SSL values as developed in CHPRC-00784, which did not include TRVs listed in MTCA Table 749-5.	**Revised 1/22/2018** Tables 749-4 and 749-5 requirements do not provide the citations for the exposure factors, BAFs, or TRVs, so Ecological Indicator Soil Concentrations for wildlife are not readily comparable with wildlife EcoSSLs. Therefore, during the development of Tier 1 SSLs, instead of calculating ecological indicator soil concentrations using parameters listed in tables 749-4 and 749-5, Hanford-specific exposure factors and bioaccumulation model included in EPA's EcoSSL guidance were used. It should be noted that ecological indicator soil concentrations for plant, soil biota and wildlife presented in WAC 173-340, Table 749-3 were considered during the development of generic screening levels for COPCs. The screening values for soil biota and wildlife were based on the exposure model provided in Table 749-4 and chemical-specific values provided in Table 749-5. 8/19/21 Comment Noted. In the next revision of this document, the last sentence of the first paragraph on page 4-17 will be updated as follows. "The screening values for wildlife were based on the exposure model provided in Table 749 4 and chemical-specific values provided in Table 749-5."	Use PRGs from Tier 2 (CHPRC-01311) when available, instead of Tier 1 (CHPRC-00784), since Tier 2 is more site-specific. Also, add rationale for excluding TRVs listed in MTCA Table 749-5. REVISED ON 2/6/18 TO: The comment will be closed when the text is added to the document. 4/13/20-Do not see rationale in redline for excluding TRVs in MTCA Table 749-5. 4/20/21 New text has been added on p. 4-17 that generally addresses the comment by indicating that TRVs in MTCA were considered. However, the new text in the last sentence of the first paragraph on p. 4-17 should be corrected as follows "The screening values for ~~soil biota and~~ wildlife were based on the exposure model provided inTable 749-4 and chemical-specific values provided in Table 749-5." **8/24/21 ECY: Accept, pending text revision**	Open

RPP-RPT-58329, Rev. 2	BRA4-10	4.4.1.3	4-17	5-7	DD		7/6/2017	Text states, "There are a number of uncertainties associated with literature-based effects data for plants and soil invertebrates. Therefore, CHPRC-00784 did not attempt to select literature-based effect values; hence, no Tier 1 SSLs were derived for plants and soil invertebrates." Please describe these uncertainties.	Uncertainties should be described.	Describe uncertainties associated with literature-based effects data for plants and soil invertebrates and how these uncertainties compare with those associated with bioassay-based effects data used to derive Tier 2 nonrad PRGs for plants and invertebrates (ECF-HANFORD-11-0158).	2	MR	10/24/2017	Concur to add a description to page 4-17, line 6, regarding the uncertainties associated with the literature-based effects data in deriving Tier 1 SSLs and Tier 2 PRGs for plants and invertebrates, as follows: For many constituents, particularly metals, the available LOECs, MATCs, EC10, and EC20 values provide a large range of concentrations, sometimes two or three orders of magnitude. In general, values at the low-end of the concentration range also fall within the range of Generic Screening Levels and background concentrations in soil. These two factors create difficulty in selecting a risk-based concentration using a statistic drawn from the available literature data. Use of a lower percentile value, such as 10th or 20th percentile provides risk-based concentrations that resemble Generic Screening Levels or background concentrations in soil. Values at the high ends of the concentration ranges could create a high bias to central tendency values such as medians or geometric means. Based on these uncertainties, this document did not attempt to select literature-based values for use as Tier 1 risk-based concentrations for plants and soil invertebrates. During the derivation of Tier 2 PRGs for plants and invertebrates, site-specific bioassay-based data, and various literature values were evaluated to identify multiple values for each analyte/receptor combination. Among those, the highest value with the lowest uncertainty/highest confidence was identified as the final recommended PRG.	Accepted: 12/18/2017. **Revised 1/29/2018** Concur to add a description to page 4-17, line 6, regarding the uncertainties associated with the literature-based effects data in deriving Tier 1 SSLs and Tier 2 PRGs for plants and invertebrates, as follows: For many constituents, particularly metals, the available LOECs, MATCs, EC10, and EC20 values provide a large range of concentrations, sometimes two or three orders of magnitude. In general, values at the low-end of the concentration range also fall within the range of Generic Screening Levels and background concentrations in soil. These two factors create difficulty in selecting a risk-based concentration using a statistic drawn from the available literature data. Use of a lower percentile value, such as 10th or 20th percentile provides risk-based concentrations that resemble Generic Screening Levels or background concentrations in soil. Values at the high ends of the concentration ranges could create a high bias to central tendency values such as medians or geometric means. Based on these uncertainties, this document did not attempt to select literature-based values for use as Tier 1 risk-based concentrations for plants and soil invertebrates. During the derivation of Tier 2 PRGs for plants and invertebrates, site-specific bioassay-based data, and various literature values were evaluated to identify multiple values for each analyte/receptor combination. Among those, the highest observed no-effect concentration (NOEC) value with the lowest uncertainty/highest confidence was identified as the final recommended PRG.	The comment will be closed when the text is added to the document. Ecology Request on 1/22/18: Ecology requested that the last sentence of the disposition be slightly revised to state that the highest NOEC value with the lowest uncertainty… REVISED on 2/6/18 to: The comment will be closed when the text is added to the document. 4/13/20-Please revise new sentence in section A.5.1: "During the derivation of Tier 2 PRGs for plants and invertebrates, site-specific bioassay-based data, and various literature values were evaluated to identify multiple values for each analyte/receptor combination. Among those, the highest observed no-effect concentration (NOEC) value with the lowest uncertainty/highest confidence was identified as the final recommended PRG." 4/20/21 While we aren't satisfied with the lack of uncertainties described in the response, we are closing the comment because it has been partially addressed.	4/20/21 Closed
RPP-RPT-58329, Rev. 2	BRA4-11	4.4.1.3	4-17	9-15	DD		7/6/2017	The rad COPEC description in Section 4.4.1.3 should also specify rad dose limits for terrestrial biota, underlying BCGs or SSLs (i.e., 1 rad/d for terrestrial plants and 0.1 rad/d for terrestrial animals). Note too that the EU has proposed a generic screening value (PNEDR) of 10 uGy/h (0.024 rad/d) for nonhuman biota (Anderson et al. 2009. JER 100:1100-1108).	Dose limits should be specified from several sources to provide perspective.	Specify rad dose limits for terrestrial biota, including the lower EU recommendation.	1	MR	10/24/2017	As mentioned earlier, the graded approach included in DOE-STD-1153-2002 was utilized during the development of the Tier 1 SSLs used in this SLERA. The DOE standard adopted ICRP-60's recommendation for effect threshold criteria (the EU standard was not considered). The following text will be added to Section 4.4.1.3: "Based on guidance from ICRP-60, Recommendations of the International Commission on Radiological Protection; IAEA 332, Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards; and Sources and Effects of Ionizing Radiation (UNSCEAR, 2000), two radiological effect threshold criteria were considered during the development of both generic and Tier 1 SSLs - Radiological doses to aquatic animals (including vertebrates and invertebrates) and to terrestrial plants and terrestrial animals (invertebrates and vertebrates) should not exceed 1.0 rad/day for terrestrial plants and 0.1 rad/day for terrestrial animals, respectively. DOE has adopted these effect thresholds and integrated them into the graded approach (DOE-STD-1153-2002)". REVISED on 1/8/18 to: The following text will be added to Section 4.4.1.3: "Based on guidance from ICRP-60, Recommendations of the International Commission on Radiological Protection; IAEA 332, Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards; and Sources and Effects of Ionizing Radiation (UNSCEAR, 2000), two radiological effect threshold criteria were considered during the development of both generic and Tier 1 SSLs – 1. Radiological doses to aquatic animals and to terrestrial plants should not exceed 1.0 rad/day and 2. Radiological doses to terrestrial animals should not exceed 0.1 rad/day. DOE has adopted these effect thresholds and integrated them into the graded approach (DOE-STD-1153-2002)".	**Revised 1/8/2018** The following text will be added to Section 4.4.1.3: "Based on guidance from ICRP-60, Recommendations of the International Commission on Radiological Protection; IAEA 332, Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards; and Sources and Effects of Ionizing Radiation (UNSCEAR, 2000), two radiological effect threshold criteria were considered during the development of both generic and Tier 1 SSLs – 1. Radiological doses to aquatic animals and to terrestrial plants should not exceed 1.0 rad/day and 2. Radiological doses to terrestrial animals should not exceed 0.1 rad/day. DOE has adopted these effect thresholds and integrated them into the graded approach (DOE-STD-1153-2002)" 8/19/21 Comment Noted: In the next revision of this document, the reference "ICRP (1991)" will be deleted from Section 4.4.1.3.	Re dose limits, it looks like the USDOE disposition is mixed up. This text should state that the dose limit for aquatic biota and terrestrial plants is 1.0 rad/d, while the limit for terrestrial animals is 0.1 rad/d. REVISED on 1/10/18 to: The revised USDOE disposition is OK on rad limits for eco receptors, but appropriate references are IAEA (1992), NCRP (1991), and UNSCEAR (1996). ICRP-60 (1991) and UNSCEAR (2000) are more related to human health. This comment can be closed when USDOE revisions are made to the text. 4/13/20-Because this section is about ERA, remove references in redline which relate to human health (ICRP-60 [1991], UNSCEAR [2000]). Also ,please cite Andersson et al (2009) to provide more complete info on eco rad limits. 5/3/21 ICRP (1991) should be removed form Section 4.4.1.3 (Screening Level Eco Effects Assessment), because this reference predominately relates to human rad risk (not eco). **8/24/21 ECY: Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2	BRA4-12	4.4.1.3	4-17	12-15	DD		7/6/2017	Please provide more detail on how radionuclide transfer parameters (i.e., concentration ratios) were derived by Beresford et al (2008) for birds and mammals.	Methodology needs to be described adequately.	Provide more detail on how radionuclide transfer parameters (i.e., concentration ratios) were derived by Beresford et al (2008) for birds and mammals, including a description of this source of uncertainty.	2	MR	10/24/2017	Concur. The following text will be added on page 4-17, starting on line 15: For example, Beresford et al 2008 derived transfer factors by extracting data from original literature references. Where desired data necessary for establishing concentration ratios were not reported in original publications Beresford et al. utilized a set of standard assumptions so that the data could be converted to estimate concentration ratios (CRs). For a significant number of constituents the original literature did not provide a basis for establishing CRs and in these instances CRs were developed using (i) a CR for a taxonomically similar organism (ii) an available CR for a similar reference organism, (iii) a CR value recommended in or derived in previous review articles and (iv) use of specific activity models (tritium, carbon 14)."	Accepted: 12/18/2017	The comment will be closed when the text is added to the document. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-13	4.5	4-19	29-41	DD		7/6/2017	Re plants and soil invertebrates, clarify why Tier 2 SSLs were developed but not Tier 1 SSLs, given that CHPRC-00784 states that Tier 2 values represent Hanford Site-specific values and several of the sources for Tier 2 values are not Hanford Site-specific (e.g., EcoSSLs, Sheppard et al [2005], MTCA Table 749-3).	Rationale for the tiered approach (used to develop eco PRGs) should be clearly stated and consistently implemented.	Re plants and soil invertebrates, clarify why Tier 2 SSLs were developed but not Tier 1 SSLs, given that CHPRC-00784 states that Tier 2 values represent Hanford Site-specific values and several of the sources for Tier 2 values are not Hanford Site-specific (e.g., EcoSSLs, Sheppard et al [2005], MTCA Table 749-3).	2	MR	10/24/2017	See response to the comment BRA4-10. 8/19/21 Comment Noted. In the next revision of this document, the following text will be added at the end of Section 4.4.1.3. "Insufficient site-specific information for the effects of nonradioactive contaminants to specific plants and insects found at Hanford was available to develop a traditional Tier 1 PRG. Hence, generic screening levels were recommended as Tier 1 PRGs."	--	The USDOE disposition for BRA4-10 notes that Tier 2 PRGs for plants and invertebrates were derived from a combination of literature data and site-specific bioassays. Therefore, "Hanford-specificTier 2 PRGs for plants and invertebtres" is a bit of a misnomer, given that literature data were used in over 30% of these PRGs (e.g., EcoSSLs, Sheppard et al [2005], MTCA Table 749-3). FURTHER ECOLOGY RESPONSE 12/18/17 I located a possible clarification requested for my comment in ECF-HANFORD-11-0158 (Rev 1), where text states: "Insufficient site-specific information for the effects of nonradioactive contaminants to specific plants and insects found at Hanford was available to develop a traditional Tier 1 PRG. Hence, generic screening levels were recommended as Tier 1 PRGs." Could this text be added to the USDOE disposition and the BRA document, along with acknowledgement that "Hanford Site-specific Tier 2 PRGs for plants and invertebrates" reflect a combination of site-specific bioassays and literature? FURTHER ECOLOGY RESPONSE on 1/19/18: Re BRA4-13, OK on Status Details (on RCRs 1/8/2018 and 1/11/2018), but the meeting minutes (12-18-2017) should still note that the new USDOE disposition ("The Tier 2 PRG values for birds and mammals represent Hanford Site-specific values where feasible") does not address the comment and needs revision. Ecology addition on 2/12/18: Ecology waiting on revision to meeting notes on 12-18-17. 4/13/20-See Status Details for comment BRA4-10. Also, as noted above, ECF-HANFORD-11-0158 (Rev 1) states: "Insufficient site-specific information for the effects of nonradioactive contaminants to specific plants and insects found at Hanford was available to develop a traditional Tier 1 PRG. Hence, generic screening levels were recommended as Tier 1 PRGs." 5/3/21 Text in Section 4.4.1.3 (Screening Level Eco Effects Assessment) provides rationale for lack of Tier 1 nonrad PRGs for plants and soil invertebrates. Should also add the following statement to Section 4.4.1.3 from ECF-HANFORD-11-0158 (Rev 1): "Insufficient site-specific information for the effects of nonradioactive contaminants to specific plants and insects found at Hanford was available to develop a traditional Tier 1 PRG. Hence, generic screening levels were recommended as Tier 1 PRGs." 7/13/21 Text changes pending for future revision. 7/14/21 Will make revisions rath'er than just 'consider'. **8/24/21 Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2	BRA4-14	4.5	4-19	41-43	DD		7/6/2017	Re Tier 2 SSLs for plants and soil invertebrates, text states, "Multiple values were evaluated for each analyte/receptor combination and the highest value with the lowest uncertainty/highest confidence (as described by the original authors) was identified as the final recommended PRG." A lower value with low uncertainty/high confidence should be selected as the PRG.	In a regulatory framework, lower SSLs should be selected as PRGs.	Revise text to indicate that conservatism (a lower concentration) and confidence (lower uncertainty) should be optimized when selecting a PRG.	2	MR	10/24/2017	Not Concur. This SLERA is based upon the Generic, Tier 1, and Tier 2 values and the methodologies described for these within the Tier 1 and Tier 2 reports. As stated in these reports, the generic, Tier 1 and Tier 2 values (including Tier 3 values if they were available) follow a tiered and iterative risk-based framework that begins with highly conservative generic screening values and progresses to more site-specific values (a standard approach for evaluating ecological risk). Defaulting to the most conservative value as recommended is out of step with the tiered and iterative framework as established in the Tier 1 and Tier 2 reports. Note that Generic, Tier 1 and Tier 2 values have been used in a tiered ecological risk assessment approach at other Hanford sites in addition to WMA C. No change to the text is considered warranted.	**Revised 1/22/2018** Text will be revised as follows: "The highest concentration tested (no effects were observed at or below these concentrations) with the lowest uncertainty/ highest confidence was identified as the final recommended PRG."	In the SLERA process, increasing tiers should reflect increasing site specificity (with lower uncertainty/higher confidence). The magnitude of the PRG is independent of tier progression. That is, sometimes a higher tier results in a higher PRG, sometimes a lower PRG. In all cases, however, a PRG derived at a higher tier should be more site-specific (with lower uncertainty/higher confidence). Increased site specificity is the objective, not a higher PRG. REVISED on 2/6/18 to: The comment will be closed when the text is added to the document. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-15	4.5.1	4-21	34-35	DD		7/6/2017	Note that "Memorandum 1221558" is a policy decision that specifies a soil As concentration of 20 mg/kg (MTCA Method A) that far exceeds a 1E-6 risk limit (i.e., 3E-5 risk, as calculated with MTCA Method B), as well as the 90th percentile of lognormal measured background concentrations for As at Hanford (6.47 mg/kg, as listed in DOE/RL-92-24).	Policy decisions need to be adequately explained.	Explain the use of MTCA Method A for As (20 mg/kg), as substituting for natural background at Hanford (6.47 mg/kg) when the two differ by more than a factor of 3 (20/6.47).	2	MR	10/24/2017	Concur. However, based on Ecology response to the first question of that memorandum, the following will be added to the text in 2c, line 35: " [Note: the arsenic background value approved for Hanford use in this memorandum represents a natural statewide background concentration.]"	**Revised 1/22/2018** Bullet c will be revised as follows: "For arsenic, Ecology has chosen to use Method A value of 20 mg/kg for the Hanford Background (Ecology Memorandum 1221558)."	The text needs to indicate that this memo is entirely policy-based, since it is not supported by Hanford soil background data (DOE/RL-92-24). In this sense, a soil concentration of 20 mg/kg for As clearly does not represent "a natural statewide background concentration." Therefore, the text proposed in the disposition is not accepted. The document should include the Hanford site background for Hanford based on DOE/RL-92-24 (90th percentile of 6.47 (or 6.5) mg/kg), and can state that Ecology has chosen to use the Method A value of 20 mg/kg for Hanford (and the memo can be referenced). REVISED on 2/6/18 to: The comment will be closed when the text is added to the document. 4/13/20-OK	4/13/20 Closed

RPP-RPT-58329, Rev. 2	BRA4-16	4.6	4-26	7-10	DD	BR	7/6/2017	Text states, "In addition, a limited number of biased soil samples were collected for a number of EAs. Due to small sample size, the maximum detected concentrations were the EPCs for those EAs. Those EPCs are not representation source terms at which representative species will be exposed. Therefore, SMDP steps were performed….." SMDP steps cannot entirely resolve problems stemming from biased sampling, as well as inadequate sample numbers to derive representative EPCs.	An EPC should reflect exposure. Local EAs are a better measure of exposure for immobile and low mobility receptors (e.g., plants, soil biota, some small mammals), relative to the larger overall waste site. ERAGS notes that SMDPs are communication points intended to reduce uncertainty associated with the risk assessment and should be approved with consensus among all involved parties.	Any SMDP process should reflect consensus among all involved parties (according to ERAGS). Also, see the comment for Section 3.5.11.1, p. 3-78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	See the response to comment BRA4-3. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	See Ecology response to USDOE disposition for BRA4-3. REVISED on 1/10 /18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-17	4.6.1	4-27	8-9	DD	BR	7/6/2017	Text states, "During this evaluation for nonradiological contaminants, the site-wide EPCs for COPECs were compared against their corresponding Tier 1 SSLs based on LOAEL TRVs to calculate an HQ." This same methodology was also applied to Tier 2 nonrads and Tier 1 rads. By employing a "site-wide EPC," the SLERA is fundamentally altered by averaging EAs across the entire WMA-C. When characterizing risk, this eliminates waste source specificity (Table 2-1) needed for any spatially targeted remediation and can potentially increase or decrease HQ, depending on contaminant spatial distribution.		See the comment for Section 3.5.11.1, p. 3-78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	See response to the comment no BRA4-3. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	See Ecology response to USDOE disposition for BRA4-3. REVISED on 1/10 /18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-18	4.6.1	4-27	14-23	DD	BR	7/6/2017	Tier 1 nonrads with HQ>1 (Cd at EAs E and R, V and Zn at EA P, see Table 4-4) were eliminated when HQ was re-calculated with a site-wide EPC (HQ<1) or when considering background for V. Text is silent on how a site-wide EPC (for each nonrad) is calculated, and more importantly, use of site-wide EPCs is not warranted.		See the comment for Section 3.5.11.1, p. 3-78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	See response to comment no BRA4-3. Text and a table will be added to summarize the site-wide EPCs and to show the comparison results. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	See Ecology response to USDOE disposition for BRA4-3. REVISED on 1/10 /18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-19	4.6.1	4-27	25-30	DD	BR	7/6/2017	Tier 1 rads with SOF>1 (Sr-90, H-3, Cs-137 at EA P, see Table 4-5) were eliminated, when SOF was re-calculated with a site-wide EPC (SOF<1). Text is silent on how a site-wide EPC (for each rad) is calculated, and more importantly, use of site-wide EPCs is not warranted.		See the comment for Section 3.5.11.1, p. 3-78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	See response to comment no BRA4-3. Text and a table will be added to summarize the site-wide EPCs and to show the comparison results. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	See Ecology response to USDOE disposition for BRA4-3. REVISED on 1/10 /18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-20	4.6.2	4-27 to 4-29	entire section	DD	BR	7/6/2017	Section 4.6.2 describes a systematic elimination of all 6 Tier 2 nonrad COPECs with HQ>1 (see Table 4-7: B at EA J; Mo at EAs H+I, L1+L2, U; Se at EAs L1+L2, U; Tl at EA R, SO4 at EAs A+B, H+I, BEHP at EAs F+G, J, L1+L2, P) by recalculating HQ with a site-wide EPC (HQ<1) . Text is silent on how a site-wide EPC (for each COPEC) is calculated, and more importantly, use of site-wide EPCs is not warranted.		See the comment for Section 3.5.11.1, p. 3-78, lines 32-35, discontinue the use of 'site-wide EPC' values. Compare individual sample results against the pertinent risk thresholds. Highlight exceedences and carry the contaminants and their locations forward for remedial decision making.	2	MR	10/24/2017	See response to comment no BRA4-3. Text and a table will be added to summarize the site-wide EPCs and to show the comparison results. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Section 4.6 including subsection 4.6.1 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	See Ecology response to USDOE disposition for BRA4-3. REVISED on 1/10 /18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-21	4.6.2	4-28	32-35, 45-46	DD		7/6/2017	Without institutional controls, Ecology requires a standard POC down to a depth of 15 ft for terrestrial eco receptors (WAC-173-340-7490[4][b]).	Conditional POCs require institutional controls (WAC-173-340-7490[4][a]).	Without institutional controls, Ecology requires a standard POC down to a 15 ft depth for terrestrial eco receptors (WAC-173-340-7490[4][b]).	1	MR	10/24/2017	Comment noted. REVISED 1/8/18 to: All statements related to the bioactive zone of 10 ft will be removed from the report.	**Revised 1/8/2018** All statements related to the bioactive zone of 10 ft. will be removed from the report.	The USDOE response is "non-responsive." Ecology does not agree with a 10 ft bioactive zone at the Hanford Site, as described in text here and proposed in CHPRC-00651 (Draft B). REVISED 1/10/18 to: Because the revised USDOE disposition indicates that USDOE is no longer referring to a 10 ft bioactive zone, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-22	4.6.2	4-28	40-43	DD		7/6/2017	Re BEHP, specify HQ>1 at EA J too (Table 4-7, HQ=12.2).	All exceedances of the HQ limit (HQ=1) should be listed at each EA.	Re BEHP, specify HQ>1 at EA J too (Table 4-7, HQ=12.2).	2	MR	10/24/2017	Concur. The following text will be revised to include sample results for BEHP at EA J. "The EPCs (4.03 mg/kg, 1.84 mg/kg, 2.07 mg/kg and 2.3 mg/kg) at EA F plus G, EA L1 plus L2, EA J and EA P, respectively are greater than the corresponding Tier 2 screening value (0.17 mg/kg, California Quail). Hence, the HQs (23.7, 10.8, 12.2 and 13.5) are significantly greater than 1. It should be noted that two of the most elevated concentrations (7.2 mg/kg and 2.8 mg/kg) at EA F plus G were detected at 15 and 11 ft bgs, respectively. Both of those samples are below the Hanford bioactive zone of 10 ft. The reporting limits for those sample results are 0.58 mg/kg. For EA L1 plus L2, the EPC is equal to the sample result of one detected sample (with "J" qualifier). The reporting limit for that sample is 0.57 mg/kg. For J, only 1 sample was detected with "J" qualifier at depths between 15 and 19 ft bgs." REVISED on 1/8/18 to: See response to the comment BRAES-1 and BRA4-21. Therefore, Text within entire Section 4.6 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1 and BRA4-21. Therefore, Text within entire Section 4.6 will be deleted.	Ecology agrees with the requested inclusion of BEHP results for EA J in the USDOE disposition but does not agree with the statement on the bioactive zone of 10 ft. REVISED on 1/10/18 to: Because the revised USDOE disposition indicates that USDOE is no longer referring to an SMDP process and a 10 ft bioactive zone, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-23	4.6.2	4-29	1-5	DD		7/6/2017	The description of data here for BEHP at EA P (2 "J" qualified detects) conflicts with data presented in Table N-3 in the WMA-C RFI (RPP-RPT-58339, Rev 0). In particular, Table N-3 shows 6 "J" qualified detects for BEHP for shallow samples at EA P, ranging from 0.80-5.05 mg/kg.	Data should be described consistently in related documents.	Re BEHP at EA P, revise text so that it is consistent with data in Table N-3 in WMA-C RFI (RPP-RPT-58339, Rev 0).		MR	10/24/2017	The description for BEHP at EA P is correct. Table N-3 of Appendix N will be updated. Appendix Q of WMA C RFI report includes the correct data. 2/10/21 The descriptino fo BEHP at EA P is correct. Table N-3 had an error, Appendix Q of the RFI report includes the correct data. Table N-3 should show 3 qualified detects for BEHP for shallow samples at EA P (2,300 µg/kg, 2,040 µg/kg, and 804 µg/kg).	--	It is not clear how Figure Q-44 captures the "J" data qualifications for BEHP at EA P. Why are Appendix N (Table N-3, showing 9 results) vs. Appendix Q (Figure Q-44, showing 2 results) so different for BEHP at EA P? Ecology addition on 2/12/18: Ecology will wait to see the revised Appendix N. 4/13/20-Please resolve the inconsistency for BEHP at EA P in the RFI (RPP-RPT-58339, Rev 0) for Table N-3 (10 results, all J-qualified) vs. Figure Q-44 (6 results). 5/11/21 This no longer applies to this document because section 4.6.2 has been eliminated. Ecology assumes the corrections have been made in the RFI to show the 3 qualified detects for BEHP for shallow samples at EA P. We are closing the comment with that assumption.	5/11/21 Closed
RPP-RPT-58329, Rev. 2	BRA4-24	4.6.2	4-29	9-11	DD		7/6/2017	Again, text is silent on how a site-wide EPC (for each COPEC) is calculated. More importantly, use of site-wide EPCs is not warranted.			2	MR	10/24/2017	Text and a table will be added to summarize site-wide EPCs and to show the comparison results. REVISED on 1/8/18 to: See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	**Revised 1/8/2018** See response to the comment BRAES-1. Therefore, Text within entire Section 4.6 will be deleted.	Ecology's comments asks how site-side EPCs are calculated. FURTHER ECOLOGY RESPONSE ON 12/18/17 Comments addressing statistical analysis of soil data at WMA-C do not apply here, because these samples were collected judgmentally (not randomly). In particular, deriving a population average by calculating a 95 UCL is only meaningful when the randomness assumptions of that calculation are met. When this is not the case, WAC 173-340-740(7)(d)(iii) and (e) for direct comparison is the option for selective (i.e., judgmental) sampling. See comment and Ecology's response for BRA2-2. REVISED on 1/10/18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA4-25	4.7	4-29	37-42	DD		7/6/2017	Text states, "A data review was performed to compare the result of the minimum detection limit for each analyte with respect to its corresponding NOAEL- and LOAEL-based Tier 1 SSL. It should be noted that the detection limits for analytes were based on 10% of their ecological SSLs in most cases. The results of the data review showed that the minimum detection limit and maximum reporting limit for all non-detect sample results did not exceed their corresponding NOAEL- and LOAEL-based SSL." Although this may be true for Tier 1 SSLs, this is apparently not true for all Tier 2 SSLs (e.g., BEHP, as noted in Section 4.6.2).	The reporting limit should be below the screening limit to adequately assess the screening limit.	Please acknowledge the uncertainty associated with inadequate MDLs or reporting limits to assess Tier 2 SSLs (e.g., BEHP).	1	MR	10/24/2017	Concur. The text will be update as follows: The results of the data review showed that except for bis (2-ethylhexyl) phthalate, the minimum detection limit and maximum reporting limit for all non-detect sample results did not exceed their corresponding NOAEL- and LOAEL-based SSL.	Accepted	In addition to all Tier 1 SSLs and Tier 2 BEHP SSL, please compare minimum detection limit and maximum reporting limit for all non-detect sample results against their corresponding Tier 2 NOAEL- and LOAEL-based SSLs and report these results. FURTHER ECOLOGY RESPONSE 12/4/17: Although text indicates that MDL and MRL for nondetects was compared to Tier 1 SSLs, this comparison should also be done for all Tier 2 SSLs (including BEHP). 4/13/20-Please clarify if MDL and MRL were less than all Tier 2 SSLs (except for BEHP). 4/29/21 Text clarified to include Tier 2 SSLs.	4/29/21 Closed
RPP-RPT-58329, Rev. 2	BRA4-26	4.7	4-30	4-6	DD		7/6/2017	Text states, "Evaluation of soil concentration data that extends beyond the biologically active zone would have a tendency to overestimate the potential for risk discussed in this SLERA." This is true only if deep soil concentrations are higher than shallow concentrations (which is not always the case).		Delete the sentence, "Evaluation of soil concentration data that extends beyond the biologically active zone would have a tendency to overestimate the potential for risk discussed in this SLERA."	2	MR	10/24/2017	The sentence is factually correct but will be edited as follows: "It should be noted that evaluation of soil concentration data extending beyond the biologically active zone would have a tendency to overestimate the potential for risk to ecological receptors." REVISED on 1/8/18 to: The following sentence will be deleted. "Evaluation of soil concentration data that extends beyond the biologically active zone would have a tendency to overestimate the potential for risk discussed in this SLERA."	**Revised 1/8/2018** The following sentence will be deleted. "Evaluation of soil concentration data that extends beyond the biologically active zone would have a tendency to overestimate the potential for risk discussed in this SLERA."	The revised statement is true only if deep soil concentrations are higher than shallow concentrations (which is not always the case). REVISED on 1/10/18 to: Ecology accepts the new USDOE disposition, contingent on text revision. 4/13/20-The sentence in the redline was deleted and reinstated (no net change). Please delete it. 5/3/21 Sentence deleted.	5/3/21 Closed
RPP-RPT-58329, Rev. 2	BRA4-27	4.7	4-30	10-13	DD		7/6/2017	Text states, "The lack of COPEC SSLs may not adequately address risk potential, although early consideration of remedial alternatives protective of receptors with SSLs should be protective of receptors lacking sufficient toxicity data." Please clarify this statement.		Please clarify how "early consideration of remedial alternatives" can address uncertainty associated with COPECs without SSLs.	2	MR	10/24/2017	The text will be revised as follows: "The lack of COPEC SSLs may not adequately address risk potential at WMA C."	**Revised 1/22/2018** See response to comment BRA4-18.	Please identify this as a source of uncertainty. REVISED on 2/6/18 to: The comment will be closed when the text is added to the document. Note that comment BRA4-18 (referenced in the revised dispositon) corresponds to Section 4.6 rather than Section 4.7. 4/13/20-OK	4/13/20 Closed

RPP-RPT-58329, Rev. 2	BRA4-28	4.7	4-30	16-17	DD		7/6/2017	Text states, "The maximum measured concentration provides a conservative estimate for sessile biota or those with a limited home range." This is not necessarily true, due to small sample size and lack of inferential statistics (e.g., 95UCL). The sample max does not represent the population max, so any a claim of conservatism with respect to the population cannot be made.		Delete the sentence, "The maximum measured concentration provides a conservative estimate for sessile biota or those with a limited home range."	2	MR	10/24/2017	Not Concur. As mentioned earlier, the locations for both surface and subsurface sample locations were based on available significant knowledge of known and suspected releases, elevated survey results of surface gamma radiation, surface geophysical exploration, down-hole gamma logging and neutron moisture. Hence, such approaches resulted in the highly elevated sample results from known and suspected release locations. Therefore, the maximum result among those highly elevated sample results should provide a conservative estimate for sessile biota or those with a limited home range. REVISED on 1/8/18 to: The following sentence will be deleted. "The maximum measured concentration provides a conservative estimate for sessile biota or those with a limited home range."	**Revised 1/8/2018** The following sentence will be deleted. "The maximum measured concentration provides a conservative estimate for sessile biota or those with a limited home range."	The USDOE response is conjecture only. Any sampling design (e.g., whether random or judgemental) may miss contaminantion. Furthermore, results from judgemental sampling cannot be extrapolated to the underlying population, because all members of the population do not have an equal chance of selection. REVISED on 1/10/18 to: Ecology accepts the new USDOE disposition, contingent on text revision. 4/13/20-The sentence in the redline was deleted and reinstated (no net change). Please delete it. 5/3/21Sentence deleted.	5/3/21 Closed
RPP-RPT-58329, Rev. 2	BRA5-1	5.2	5-2	34-43	DD		7/6/2017	Clarify why the MTCA Method B screening level values for groundwater for lindane and beta-BHC are used to assess their aqueous concentrations above the water table (rather than in groundwater). Also, note that these results indicate that lindane and beta-BHC may adversely impact groundwater after 1000 years.	Modeling analysis should be transparent.	Clarify why the MTCA Method B screening level values for groundwater for lindane and beta-BHC are used to assess their aqueous concentrations above the water table (rather than in groundwater). Also, note that these results indicate that lindane and beta-BHC may adversely impact groundwater after 1000 years.	2	MR	10/24/2017	See response to the comment no BRA3-38. **3/26/20** Resolved through IAMIT decision 2019-007 Site-specific STOMP model results have been removed from BRA	--	Please see Ecology response for BRA3-38. 4/13/20-Have not yet seen IAMIT 2019-007. 5/3/21 STOMP results for lindane and beta-BHC have been deleted from Section 5.2.	5/3/21 Closed
RPP-RPT-58329, Rev. 2	BRA5-2	5.3	5-3	44	DD		7/6/2017	Replace "divided to" with "divided by."	Editorial.	Replace "divided to" with "divided by."	1	MR	10/24/2017	Text will be changed as suggested.	Accepted: 11/27/2017		Closed
RPP-RPT-58329, Rev. 2	BRA5-3	5.3	5-4	34-35	DD		7/6/2017	Same comment on "site-wide EPC" (see comment for Section 4.0, Page 4-2, Lines 45-46).			2	MR	10/24/2017	See response to comment no BRA4-3. REVISED on 1/8/18 to: See response to the comment no BRAEA-1. All information from line 22 to line 46 will be deleted. Text will be updated to identify both radiological and nonradiological COPECs, retained for remedial action.	**Revised 1/8/2018** See response to the comment no BRAEA-1. All information from line 22 to line 46 will be deleted. Text will be updated to identify both radiological and nonradiological COPECs, retained for remedial action. **3/26/20** See response to the comment no BRAES-1. All information from line 22 to line 46 will be deleted. Text will be updated to identify both radiological and nonradiological COPECs, retained for remedial action.	Please see Ecology response to BRA4-3. REVISED on 1/10/18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA5-4	5.3	5-4, 5-5	37-46, 1-7	DD		7/6/2017	The Tier 1 assessment is performed on COPECs that were retained from the generic screening. In contrast, Tier 1 and Tier 2 screens are performed independently. That is, there are separate results (i.e., a unique mix of COPECs/EAs) for nonrads for Tier 1 (Table 4-4) vs. Tier 2 (Table 4-7). Generic screen exceedances (HQ>1 and SOF>1) are disregarded due to generic status, while more site-specific Tier 1 and Tier 2 exceedances are improperly eliminated by invoking use of a site-wide EPC. Use of a site-wide EPC was employed with a unilateral SMDP process (i.e., consensus was not reached between USDOE and Ecology), and Ecology rejects this site-wide EPC adjustment for reasons outlined in our previous comment (Section 4.0, Page 4-2, Lines 45-46). Therefore, the final conclusion of retaining no COPECs appears flawed in this SLERA.	ERAGS notes that SMDPs are communication points intended to reduce uncertainty associated with the risk assessment and should be approved with consensus among all involved parties. As such, the purpose of the SMDP process is to reduce uncertainty, not to necessarily eliminate COPECs. For example, if an SMDP highlights new high quality research that shows increased sensitivity in a receptor to a specific COPEC, uncertainty is reduced (with respect to receptor sensitivity), but this may lead to retention of that COPEC (rather than its elimination).	Please clarify that Tier 1 and Tier 2 screens are performed independently. While the Tier 1 screen should define COPECs for rads with SOF>1 (since there is no Tier 2 for rads), the Tier 2 screen should define COPECs for nonrads with HQ>1, based on greater site-specificity than Tier 1. Retain 6 nonrad COPECs from Tier 2 (B, Mo, Se, Tl, sulfate BEHP) at several EAs (Table 4-7) and 3 rad COPECs from Tier 1 (Sr-90, H-3, Cs-137) at EA P (Table 4-5) for further baseline ecorisk evaluation at WMA-C.	2	MR	10/24/2017	See response to comment no BRA4-3. REVISED on 1/8/18 to: See response to the comment BRA5-3.	**Revised 1/8/2018** See response to the comment BRA5-3.	Please see Ecology response to BRA4-3. REVISED on 1/10/18 to: Because the revised USDOE disposition indicates that USDOE is no longer using the SMDP process, this Ecology comment can be closed when text is revised. 4/13/20-OK	4/13/20 Closed
RPP-RPT-58329, Rev. 2	BRA3-56	3.0 and 4.0		General comment	JL	BR	9/28/2017	Ecology completed our review of the WMA C BRA and submitted our comments to USDOE on July 14, 2017. The document was a component of the Appendix I Performance Assessment for WMA C. However, there was a significant omission from this document that became evident during our review of the Waste Management Area C Phase 2 Corrective Measures Study Report (RPP-RPT-59379, Rev. 0), which we would like corrected. Risk and hazard values were not reported in the WMA C BRA, as given in the WMA C CMS, for three significant unplanned releases and the 216-C-8 French drain.	While Ecology focused our review on the Phase 2 sample locations discussed in the WMA C BRA document, we emphasize that two of these three UPRs (UPR-200-E-82 and UPR-200-E-86), and releases to the 216-C-8 French drain (estimated to be lower risk than UPRs 200-E-81, -82, and -86) were entirely omitted from the WMA C BRA.	Considering the extremely large radiological cancer risks estimated for these releases under baseline conditions, Ecology expects the risk information about these releases, such as that contained in Appendix B of the WMA C CMS report (RPP-RPT-59379, Rev. 0), to be included in the WMA C BRA.		MR/MPB	10/24/2017	Response under development	--	See comment BRAG-1.	This comment was replaced
RPP-RPT-58329, Rev. 2	BRA3-57	3.0 and 4.0		General comment	JL	BR	9/28/2017	Additionally, the WMA C BRA was not updated for consistency with the updated values in RPP-ENV-58813, *Exposure Scenarios for Risk and Performance Assessments in Tank Farms at the Hanford Site, Washington.* However, the WMA C BRA, Rev. 02 was released in October, 2016, while RPP-ENV-58813 had been released in February, 2016. To address this issue, Ecology requests a meeting to discuss the nature of the exposure scenario changes, revision of the WMA C BRA to incorporate appropriate changes, and addition of RPP-ENV-58813 to the Hanford Administrative Record.		To address this issue, Ecology requests a meeting to discuss the nature of the exposure scenario changes, revision of the WMA C BRA to incorporate appropriate changes, and addition of RPP-ENV-58813 to the Hanford Administrative Record.		MR/AA	10/24/2017	The WMA C BRA, Rev. 02 was prepared to address Ecology's comments for WMA C BRA, Rev. 0 report. The WMA C BRA, Rev. 0 was released in November, 2014. The exposure and receptor scenarios representing both unrestricted and reasonably anticipated future land uses for WMA C are outlined in RPP-RPT-47479, *Exposure Scenarios for the Waste Management Area C Performance Assessment* (January 2011) and were considered for the WMA C BRA. It is noted that following issuance of the BRA, the assigned exposure parameters were updated to be consistent with the most recent EPA guidance. This guidance was issued in 2014 after the BRA Rev. 0 was reviewed by Ecology. The BRA Rev. 02 addressed Ecology's concerns on Rev. 0 but did not try to change other exposure factors to minimize confusion. Exposure factors are updated often by U. S. EPA. In this case, the industrial exposure scenario was replaced in the most recent guidance with three worker exposure scenarios (indoor worker, outdoor worker, and composite worker). To address this concern, a table will be added to the WMA C BRA to provide a list of all updated exposure factors.		See comment BRAG-2.	This comment was replaced
								In-process redline-version comments									**Ecology response**	
RPP-RPT-58329, Rev. 2 redline	BRA3-58	New 3.2.1.1	3-103 - 3-104		BR		4/16/2020	This section describes pooling data from similar depths and selecting maxima for contaminants when multiple samples were taken within a borehole. This does not represent a sample-by-sample approach.	A sample-by-sample approach involves calculating cancer risk and hazard quotients (and hazard indices for target organs) for each sample.	Please calculate cancer risks, hazard quotients, and hazard indices for each of the samples.			2/10/2021	The results of ELCR, HQs and HI were collected for each sample within the borehole. An example of such calculation is provided in the following. Two boreholes (C8102 and C8104) within EA A plus B. Within C8102, five samples were collected at various depth. Among those samples, two samples (B2B1L8 and B2B1L9) were collected at the same depth (0-1 ft bgs) and the samples were analyzed for different contaminants. Therefore, risks were calculated for both sample IDs and the results of risk calculations were added together to represent the total risk for that one-foot interval. Separate risk values were also calculated for three sample depth intervals (5.7-9.7, 11.5-15.5 and 16.1-18.1) within that borehole. Similarly, five samples were collected within borehole C8104. Among those samples, two samples (B2FPF1 and B2FPF2) were collected at the same depth interval (6-12 ft bgs) and the samples were analyzed for different contaminants. Therefore, risks were calculated for both sample IDs and the results of risk calculations were added together to represent the total risk for that depth interval. Separate risk values were also calculated for three sample depths (5.7-9.7, 11.5-15.5 and 16.1-18.1) within that borehole.	8/19/21 Comment Noted: In the next revision of this document, the following text will be included within Section 3.2.1.4 (second bullet) for better explanation. "An example of such calculation is provided in the following. Two boreholes (C8102 and C8104) were drilled within EA A plus B. Within C8102, five samples were collected at various depths. Among those samples, two samples (B2B1L8 and B2B1L9) were collected at the same depth (0-1 ft bgs) and the samples were analyzed for different contaminants. Therefore, risks were calculated for both sample IDs and the results of risk calculations were added together to represent the total risk for that one-foot interval. Separate risk values were also calculated for three sample depth intervals (5.7 ft to 9.7 ft, 11.5 ft to 15.5 ft and 16.1 ft to 18.1 ft) bgs within that borehole. Similarly, five samples were collected within borehole C8104. Among those samples, two samples (B2FPF1 and B2FPF2) were collected at the same depth interval (6 to 12 ft bgs) and the samples were analyzed for different contaminants. Therefore, risks were calculated for both sample IDs and the results of risk calculations were added together to represent the total risk for that depth interval. Separate risk values were also calculated for three sample depth intervals (5.7 ft to 9.7 ft, 11.5 ft to 15.5 ft and 16.1 ft to 18.1 ft) bgs within that borehole." It should be noted that similar explanation will be included in Section 3.2.2.4 for risk characterization involving nonradiological contaminants.	5/17/21 This explanation was discussed with Ecology. This text would be helpful in the document. **8/24/21 ECY: Accepted, pending addition of the explanation to the document.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-59	New 3.2.1.4	3-103 - 3-104		SVV		4/29/2020	Under "Calculation of ELCRs for Each Sample Result", text states that the maximum risk-to-source ratio over the 1,000 year period for each COPC was utilized, and then the COPC-specific risks for all COPCs were summed to determine sample-specific total ELCR. This method is potentially flawed, as the maximum risk for each COPC in a sample may occur at a different time for each COPC, so adding them together may not be appropriate.	As a made-up example, say COPC-1 has its maximum risk at time 0 years, while COPC-2 has its maximum risk at 600 years. In this made up case, adding the two maximum risks together is simply wrong, as the risks do not occur at the same time.	If the goal is to get the most accurate estimate of risk for a given sample, then the concentrations for each COPC need to be entered into RESRAD, and the total risk for all COPCs combined needs to be calculated at each time interval, and then the maximum risk determined. This way, the total risk will be temporally correct for all COPCs.			2/10/2021	For radiological COPCs, risk-to source ratios were evaluated over the 1,000-year period. For both CERCLA Industrial Worker and CERCLA Residential scenarios, the maximum risk-to-source ratio for all radionuclides except U-233 and U-234, and the total risk for all radionuclides were occurred at year 0. However, the concentrations for both U-233 and U-234 are very small and contribute negligible amount of risk to the total risk. Therefore, the maximum risk-to-source ratios at year 0 were used during the radiological risk calculations for each receptor scenario.	8/19/21 Comment Noted: In the next revision of this document, a new paragraph will be added within Section 3.2.1.4 (first bullet) for better explanation. "For radiological COPCs, risk-to-source ratios were evaluated over the 1,000-year period. For both CERCLA Industrial Worker and CERCLA Residential scenarios, the maximum risk-to-source ratio for all radionuclides except 233U and 234U, and the total risk for all radionuclides, occurred at year 0. However, the concentrations for both 233U and 234U are very small and contribute negligible amount of risk to the total risk. Therefore, the maximum risk-to-source ratios at year 0 were used during the radiological risk calculations for each receptor scenario."	5/17/21 This text would be helpful in the document. **8/24/21 ECY: Accepted pending text addition.**	Open

RPP-RPT-58329, Rev. 2 redline	BRA3-60	New 3.2.1.4	3-103 - 3-104		DD, SVV		4/29/2020	Under "Calculation of ELCRs for Each Depth Interval within a Borehole", text states, "When multiple samples were present at the same depth interval in a borehole (i.e., reflecting different sampling events), the maximum soil concentration for each detected COPC was used as the source-term concentration at the specified depth interval." This statement is not clear. This may reduce the individual sample ELCR or HI (i.e., ELCR Sample or HI Sample), as a result of excluding (from summation) the lower ELCR or HQ for a COPC in that depth interval.	For example, if Sample-1 contains COPC-1, and Sample-2 also contains COPC-1, then summing the risks will double count the risk from that COPC. To be more concrete, if Sample-1 contains Cs-137 at 100 pCi/g resulting in a risk of R1, and Sample-2 contains Cs-137 also at 100 pCi/g resulting in a risk of R1, then the total risk is not R1 + R1, rather it is simply R1.	Present ELCR and HI results for each sample (i.e., ELCR Sample or HI Sample in App F and G), as the sum of all component COPC-specific HQs or ELCRs.			2/10/2021	As mentioned within the response to comment no. BRA 3-58, two samples B2B1L8 and B2B1L9 were collected from the same depth (0 to 1 ft bgs) within borehole C8102. Cs-137 concentrations for both samples were 4.37 pCi/g and 4.17 pCi/g, respectively. However, as a conservative approach, the maximum detected concentration (4.37 pC/g at B2B1L8) was selected as the sourceterm for Cs-137 within this depth interval.	8/19/21 Comment Noted. In the next revision of this document, the following text will be included at the end of second bullet of Section 3.2.1.4 for better explanation. "Two samples B2B1L8 and B2B1L9 were collected from the same depth (0 to 1 ft bgs) within borehole C8102. Cesium-137 concentrations for both samples were 4.37 pCi/g and 4.17 pCi/g, respectively. However, as a conservative approach, the maximum detected concentration (4.37 pC/g at B2B1L8) was selected as the source term for 137Cs within this depth interval." The following text will also be added. "Attachment F-1 of Appendix F presents the sample results for radiological contaminants. Attachments F-2 and F-3 present the radiological risk assessment results for CERCLA industrial worker and CERCLA residential receptor, respectively."	5/17/21 The tables in Appendix F should be mentioned. This explanation was discussed with Ecology. This text would be helpful in the document. **8/24/21 ECY: Accepted pending text revision and addition.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-61	3.2.1.5		Tables 3-15 and 3-16	DD		4/20/2020	Tables 3-15 and 3-16 need some further clarifications and show some mismatch with corresponding text. Also, it is unclear why the statistical approach (in some cases) has higher ELCRs (or HIs) than the sample by sample approach (when max was apparently used if UCL>max).	Tables and text should be consistent.	Table 3-15: Please explain red ELCR values in a foonote to table. Clarify why the statistical approach (in some cases) has higher ELCRs than the sample by sample approach (when max was apparently used if UCL>max). Re the CERCLA worker, text says, "For EA P, the calculated risk using both methods resulted in an unacceptable risk." This is also true for EAs A+B, C, and E. Re the CERCLA resident, text says, "It should be noted that calculated risk using both methods resulted in unacceptable risk at EA P." This also true for EAs A+B, C, E, H+I, J, L1+L2, and U. Typo in resident F+G sample by sample ELCR.			2/10/2021	Under the statistical approach, due to small sample sizes at some locations, maximum observed concentrations were used as the EPCs for the COPCs with no regard for sampling depth. As an example, for EA C, the maximum concentrations for Sn-126 (Sample-B2FYM3) and Cs-137 (Sample- B2FPR8) are 53.1 and 7.09 pCi/g, respectively, and they were collected between 11 to 13 ft bgs and 1 to 1.5 ft bgs, respectively. Under the sample-bysample approach, separate risks were calculated for these two samples. However, under statistical approach, due to the small sample size, the EPCs for those COPCs were 53.1 and 7.09 pCi/g, respectively. As a result, the radiological risk resulted based on statistical approach is higher than the results for individual samples. A footnote has been added to explain the rationale for highlighted values. The rationale behind the statement (For EA P,….) is that even though the ELCRs based on sample-by-sample approach resulted in higher risk (4E-4 vs 2E-4) as compared to that for statistical approach, the final outcome is the same as the ELCRs resulted by both approaches resulted in an unacceptable risk (>1E-4) for that EA. Concur. The ELCR results for EA F Plus G have been changed from 1E4 to 1E-4.	8/19/21 Comment Noted. Section 3.2.1.5 presents a comparison of risk characterization results presented in Table 3-45 using statistical and sample-by-sample approach for both the CERCLA industrial worker and CERCLA residential receptor scenarios. Text was not intended to show a comparison of risk results against their corresponding risk threshold values. Based on Ecology's suggestion, in the next revision of this document, the following text will be added in the middle of first paragraph of Section 3.2.1.5. "For the CERCLA industrial worker scenario, the ELCRs for four EAs (A+B, C, E and P) are greater than the EPA upper risk threshold of 1 × 10-4 for both the statistical approach and sample-by-sample approach. For the CERCLA residential receptor scenario, except for EA R, the ELCRs for all other EAs are greater than the EPA upper risk threshold of 1 × 10-4 for both the statistical approach and sample-by-sample approach. "	5/17/21 For old Table 3-15 (which is now Table 3-45), text still only acknowledges that ELCR is unacceptable at EA P (ELCR>1E-5) in Section 3.2.1.5 (ELCR is also unacceptable for CERCLA worker at EAs A+B, C, and E; ELCR also unacceptable for CERCLA resident at EAs A+B, C, E, H+I, J, L1+L2, and U). Do not agree with methodology for the statistical approach. **8/24/21 ECY: Accept pending text addition.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-61, continued									Table 3-16: Clarify why the statistical approach (in some cases) has higher HI than the sample by sample approach (when max was apparently used if UCL>max). Text says, "Based on the WAC industrial worker and WAC residential receptor risk evaluations results for 10 EAs, the ELCRs based on sample by sample approach for four EAs (A plus B, F plus G, H plus I and L1 plus L2) are slightly higher than the corresponding ELCRs based on statistical approach." This is also true for EA P. Text also says, "It should be noted that calculated ELCRs using both methods did not result in unacceptable risk." This is not true for MTCA B for EA C. Text says, "The sample specific HIs for two EAs (A plus B and L1 plus L2) are slightly higher than their corresponding HIs based on a statistical approach." This is not true for A+B and MTCA C for L1+L2. Finally, text says, "It should also be noted that calculated HIs using both methods resulted in unacceptable risk." This is not true for MTCA C HI (also, this cited sentence should not refer to HI as risk).			2/10/2021	Under the statistical approach, due to small sample sizes at some locations, maximum observed concentrations were used as the EPCs for the COPCs with no regard for sampling depth. As an example, the EPCs at EA C for aluminum, arsenic, cobalt, iron, lithium, manganese and vanadium are 9,510, 21.2, 11, 28,600, 12.1, 449 and 78.5 mg/kg, respectively. The highest hazard within EA C was calculated for sample B2FYM3, and the sample concentrations for aluminum, arsenic, cobalt, iron, lithium, manganese and vanadium are 9,440, 21.2, 9.6, 23,700, 12.1, 408 and 52.4 mg/kg, respectively. Therefore, due to higher EPCs, the statistical approach has higher HI than the sample-by-sample approach. Text has been updated as follows: "For the WAC industrial worker and WAC residential receptor, the ELCRs based on sampleby-sample approach for five EAs (A+B, F+G, H+I, L1+L2 and P) are slightly higher than the corresponding ELCRs based on statistical approach. It should be noted that calculated ELCRs for those five EAs using both methods did not exceed the upper risk threshold value of 1E-5." For the WAC residential receptor, the HIs based on sample-by-sample approach for two EAs (A+B and L1+L2) are slightly higher than the corresponding HIs based on statistical approach. It should also be noted that calculated HIs using both methods resulted in unacceptable risk.	8/19/21 Comment Noted. Section 3.2.2.5 presents a comparison of risk characterization results using statistical and sample-by-sample approach for both the WAC industrial worker and WAC residential receptor scenarios. Texts were not intended to show a comparison of risk and hazard results against their corresponding threshold values. In the next revision of this document, the following text will be added at the end of second paragraph of Section 3.2.2.5. "For the WAC industrial worker scenario, the ELCRs and the HIs for the ten EAs did not exceed the 2013 MTCA cumulative risk threshold of 1 × 10-5 and the 2013 MTCA's acceptable target HI of 1, respectively for both the statistical approach and sample-by-sample approach. For WAC residential receptor scenario, the ELCR for only EA C is greater than the 2013 MTCA cumulative risk threshold of 1 × 10-5 for both the statistical approach and sample-by-sample approach. However, the HIs for the ten EAs are greater than the 2013 MTCA's acceptable target HI of 1 for both the statistical approach and sample-by-sample approach. "	5/17/21 For old Table 3-16 (which is now Table 3-96), text still does not acknowledge unacceptable ELCR (ELCR>1E-5) at EA C for MTCA Method B in Section 3.2.2.5. Do not agree with methodology for the statistical approach. **8/24/21 ECY: Accept pending text addition.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-62	New 3.2.1.5	3-103 - 3-104	Table 3-15	SVV		4/29/2020	The Sample-by-Sample Approach column shows a Range of ELCRs. Clarify what the range corresponds to. For example, is it the range of risk associated with the different depth intervals?		Clarify what the range corresponds to. For example, is it the range of risk associated with the different depth intervals?			2/10/2021	The following footnote has been added (current Table 3-96): "The range of excess lifetime cancer risk represents the minimum and maximum excess lifetime cancer risks within the different depth interval."		5/17/21 See Appendix F. Duplicate cores were sometimes required to get enough sample to analyze.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-63	3.2.3.1	3-103/3-104		DD		4/20/2020	Cannot locate ECF-Hanford -10-0042, Rev 3.	Cited documents should be available.	Please provide a link or copy of ECF-Hanford -10-0042, Rev 3.			2/10/2021	A copy of the document has been provided.			Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-64	3.2.3.2	3-103/3-104		DD		4/20/2020	The arsenic (As) background concentration of 20 mg/kg is a policy decision, not measured Hanford soil background level (6.5 mg/kg).	Policy decisions should be clearly labelled.	Re As, add a note to clarify that As background concentration of 20 mg/kg is a policy decision, not measured Hanford soil background level (6.5 mg/kg). Using this actual background, there would be 6 exceedences for soil As.			2/10/2021	Text has been updated as follows: "One sample result (21.2 mg/kg) exceeded the corresponding soil concentration protective of groundwater (2.92 mg/kg) and the arsenic value of 20 mg/kg provided in Memorandum 1221558."		5/17/21 Text was found on page 3-228.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-65	New 3.2.3.2	3-103 - 3-104		BR		4/20/2020	The text states "Hexavalent Chromium – It should be noted that soil samples were reported as total chromium. The results…" This leaves out the lack of analysis of hexavalent chromium.	Hexavalent chromium was not measured.	Please modify the text to the following: Hexavalent Chromium – It should be noted that soil samples were reported as total chromium. Hexavalent chromium was not measured. The results…			2/10/2021	Text has been updated as follows: "Soil samples were only analyzed for total chromium and were not analyzed for hexavalent chromium. Therefore, total chromium results were compared to the corresponding soil concentration protective of groundwater (2,000 mg/kg). The results showed that all sample results were less than the soil concentration protective of groundwater, derived for the River Corridor remedial investigation/feasibility documents. In response to Ecology's comment, if the chromium reported as total chromium is assumed to be present only as hexavalent chromium, then all sample results exceeded the soil concentration protective of groundwater (0.19 mg/kg)."	8/19/21 Comment noted. We are looking at analyzing soil samples for hexavalent ch	5/17/21 Text found on p. 3-228 - 3-229. Ecology is interested in the hexavalent chromium value to protect groundwater, rather than the total chromium soil concentration to protect groundwater; we will continue to use a value of 0.19 mg/kg as a default for hexavalent chromium. In the absence of hexavalent chromium data, Ecology will assume that all chromium measured is hexavalent chromium. Consequently, the background value for total chromium becomes irrelevant where it is necessary to assume that all of the chromium is hexavalent chromium, an anthropogenic form of chromium that should not be present in the background. This problem should be corrected by measuring and reporting hexavalent chromium in soil samples. **8/24/21 ECY: Ecology will continue to anticipate hexavalent chromium analyses in samples. This comment also is related to comment BRA3-40 and will maintain a similar status to Ecology.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-66	3.2.3.2	3-103/3-104		DD		4/20/2020	Several revisions and clarifications are needed for the Cr+6 discussion. Also, max soil background has no regulatory meaning. Soil Cr+6 exceeds soil CUL (to protect groundwater) and background in all cases (listed in Appendix H).	An accurate accounting of Cr species, background, and CULs is needed.	State that the soil Cr+6 was not measured. Delete max soil background concentration (no regulatory meaning). State that the soil CUL to protect groundwater for total Cr (2000 mg/kg) is based on the Kd for Cr+3 (1000 L/kg). Soil background concentration for Cr+6 is near zero (not 18.5 mg/kg), while the soil CUL to protect groundwater for Cr+6 is 0.19 mg/kg, using Kd=0 (see Table 3-14 here, as well as Table 10 in PNNL-13895r1). State that soil Cr+6 exceeds soil CUL (to protect groundwater) and background in all cases (listed in Appendix H).			2/10/2021	See response to the comment no BRA3-65.	8/19/21 Comment noted. A comparison between the Hanford Site 90th percentile background concentration and the detected soil concentration was mentioned in Section 3.2.3.1 of RPP RPT 58329, Rev. 3. Section 3.2.3.2 does not include any information related to maximum soil background value.	5/17/21 Text regarding the maximum soil background value is misleading because it is not consistent with the pertainent definitions of soil background values. WAC 173-340-709 defines soil background for lognormally distributed data as the 90th percentile or 4 times the 50th percentile, whichever is lower. (The Hanford soil background document for nonradionuclides, DOE/RL-92-24, states "essentially all of the systematic random analyte concentrations can be represented as a single statistical population by either Weibull or lognormal distributions"). Ecology will use the WAC 173-340-709 definitions for background.	8/24/21 Closed

RPP-RPT-58329, Rev. 2 redline	BRA3-67	3.2.3.2	3-103/3-104, footnote 5		DD		4/20/2020	Several revisions and clarifications are needed for the TI discussion. Soil TI exceeds soil CUL (to protect groundwater) and background in 9 cases (listed in Appendix H).	MTCA/CLARC regards PPRTV Appendix toxicity values (X) as usable for deriving CULs.	State that the MTCA soil CUL to protect groundwater for TI is 0.23 mg/kg (not 0.71 mg/kg), resulting in 9 exceedences of the soil CUL (to protect groundwater) and background for soil TI (listed in Appendix H).			2/10/2021	MTCA Method B value for Thallium was based on EPA's withdrawn toxicity value. Therefore, based on Federal MCLG of 0.50 ug/L and Kd value of 71 mL/g (CLARC 2019), the soil CUL protective of GW for Thallium is 0.71 mg/kg. No changes have been made.	8/19/21 Comment Noted. Due to availability of Federal MCLG, RfD value was not used during the calculation of soil to groundwater protection value for thallium. Based on Kd value of 71 mL/g (CLARC 2019), Federal MCLG level of 0.5 µg/L and Equation 747-1 from the 2013 WAC 173-340-747 were used to calculate the soil to groundwater protection. It is 0.71 mg/kg. It should be noted that IRIS performed a toxicological review of Thallium and Compounds (http://www.epa.gov/iris/toxreviews/1012tr.pdf). However, due to study and data quality limitations, an RfD was not derived. There are no human studies suitable for derivation of a provisional RfD. One of four animal studies was identified for the purpose of deriving an RfD that could be used for screening purposes. A screening RfD of 0.00005 mg/kg-day was derived for soluble thallium; an uncertainty factor of 1,000 was applied to the No-Observed-Adverse-Effect-Level (NOAEL) to derive the RfD. Thallium is not known to have been released to the Hanford Site from industrial use or other mechanisms listed above. As a result of the uncertainty associated with the screening RfD and because thallium was not released to the Hanford Site, the screening RfD derived for soluble thallium was not used for development of a PRG for use in this risk assessment. It should also be noted that the CLARC database recognizes the RfD of 1E-05 mg/kg/day for thallium, presented in the PPRTV database, and developed soil concentration protective of groundwater value of 0.16 mg/kg, which is more conservative (i.e., lower) than the 0.71 value calculated based on the MCLG.	5/17/21 The CLARC database and the PPRTV database has the RfD of 1E-05 mg/kg/day for thallium, and Ecology will continue to use this in thallium risk assessment. IRIS lacks an RfD for thallium. **8/24/21 ECY: The last paragraph of the disposition is appreciated. However, Ecology will continue to use the CLARC RfD for thallium, which gives a WAC 173-340 3-phase model soil to protect groundwater value of 0.23 mg/kg, rather than 0.16 mg/kg. Many thallium issues at Hanford could possibly be solved with a good Hanford site background value for thallium.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-68	3.3	3-105	2-8	DD		4/21/2020	Provide more context on the three supplemental risk assessments presented in this section. For example, explain why protection of groundwater is not evaluated in these supplements, because it has already been evauated in the past leaks document (if this is correct).	Evolution of the BRA document should be clearly explained.	Clarify why data in the three supplemental risk assessments were not presented as part of the initial BRA, why groundwater protection is not evaluated here, and why remedial alternatives (e.g., isolation barrier, concrete cover) are evaluated.			2/10/2021	High levels of radiological contamination are present at three unplanned release (UPR) locations within WMA C - 200-E-81 (UPR-81), 200-E-82 (UPR-82), and 200-E-86 (UPR-86). Due to safety concerns, no samples were collected, and risk assessments were not performed at these UPR locations as part of the RFI. Therefore, supplemental human health risk assessments were conducted for both radiological and nonradiological COPCs present within these three UPRs to support the CMS alternatives evaluation process as documented in Waste Management Area C Phase 2 Corrective Measure Study Report (RPP-RPT-59379). It should be noted that Department of Ecology reviewed and approved the document. Past leaks evaluation was performed in RPP-RPT-59197 to compare the peak concentrations for several radiological and non-radiological contaminants against their corresponding groundwater standards. Therefore, such evaluation was not included in three supplemental risk assessments.	8/19/21 Comment Noted. It is DOE's opinion that a very detailed evaluation of groundwater protection from these UPRs is included in the Analyses of Past Leaks documented in RPP-RPT-59197 and this information was summarized in the CMS.	5/17/21 This document should contain an analogous evaluation in this document for the large UPRs, similar to that used for the Phase 2 locations, regarding soil to protect groundwater. **7/13/21 USDOE plans no change.**	8/24/21 Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-69	New 3.3.1	3-105		SVV		4/29/2020	No information on composition of isolation barrier.		Provide more information on the isolation barrier, for example, what is its composition? Four inches is not very thick, even for concrete, and the barrier's ability to maintain structural integrity over 1,000 years needs to be addressed.			2/10/2021	Such information was documented in Waste Management Area C Phase 2 Corrective Measure Study Report (RPP-RPT-59379). Therefore, no changes have been made.	8/19/21 Comment Noted. In the next revision of this document, the following text will be added within the second paragraph of Section 3.3.1. "It should be noted that information related to specific remedial alternative such as isolation barrier is beyond the scope of this document."	8/24/21 ECY: Open. Ecology does not accept 4-inch thick concrete barriers or isolation barriers over UPRs as suitable remedial alternatives.	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-70	3.3.2	3-106	12	DD		4/20/2020	Looks like a typo, "RPP-RPT-59397." Should this be RPP-RPT-59379?		Fix the typo (if so).			2/10/2021	Concur. It should RPP-RPT-59379 instead of RPP-RPT-59397.			Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-71	New 3.3.2 and 3.3.2.2	3-107, 3-109		BR	DD	4/20/2020	Section 3.3.2 states "Therefore, radionuclides with a Kd value <0.15 mL/g are excluded due to high mobility in the vadose zone. Four (4) radionuclides were excluded based on Kd values corresponding to high mobility." Section 3.3.2.2 states "Similar to radiological contaminants, mobile nonradiological contaminants are not expected to be present within the shallow vadose zone (0 to 4.6 m [15 ft] bgs) and the inventories of the non mobile nonradiological contaminants are assumed to be uniformly distributed throughout the affected soil volume." The excluded contaminants aren't given. This introduces additional uncertainty to risk assessment.	The excluded contaminants are not too many to list, since the number of constituents would be limited by the BBI list. Also, if inventories were high, some of the mobile contaminants may remain near the surface.	List the contaminants that were excluded due to low mobilities, and the assumed inventories that would have been flushed from the soil. Ecology may ask that excluded contaminants actually be included.			2/10/2021	RPP-RPT-58329, Rev. 2 provides a summary of the supplemental risk assessments that were performed as a part of the RPP-RPT-59379. Department of Ecology reviewed and approved RPP-RPT-59379. RPP-CALC-61238 provides detailed information regarding the contaminants that were included and excluded due to low mobility. No changes have been made.	8/19/21 Comment noted. In the next revision of this document, the following revised text will be included in Section 3.3.2. "Four radionuclides (3H, 60Co, 79Se and 99Tc) were excluded based on Kd values corresponding to high mobility. They are not expected to be present within the shallow vadose zone (0 to 4.6 m [15 ft] bgs)." The following revised text will be included in Section 3.3.2.2. "Similar to radiological contaminants, mobile nonradiological contaminants (nitrate and nitrite) are not expected to be present within the shallow vadose zone."	5/17/21 No list of excluded radionuclides has been included. Excluding contaminants is a source of uncertainty, and exclusion of contaminants errs in the direction of underestimating risk. **8/24/21 ECY: As the original comment BRA3-71 indicated, Ecology is requesting that all excluded contaminants be maintained since some residues of those with high inventories may still be present in the vadose zone.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-72	New 3.3.2.1	3-108	Table 3-19	SVV		4/29/2020	Risk estimate results where ELCR > 1.		Discuss the interpretation of a risk that is greater than unity, and discuss the validity of the equations and methods for estimating risk for such extremely high concentrations that correspond to extremely high radiation dose.			2/10/2021	The results of the risk assessments under the baseline condition showed unacceptable risks are present for three UPRs. Linear dose and response relationship was assumed during the risk assessments. However, based on RAGS document, the linear relationship is only valid at low risk (ELCR<0.01). For sites with higher intake rates, an alternative method (One-Hit Equation) may be better option for calculating the carcinogenic risk. However, RESRAD model did not include such model. Due to the linear assumption between dose and response, large uncertainties associated with those risk calculations.	8/19/21 Comment Noted. In the next revision of this document, the following text will be added to address the comment. "The risk calculation using the RESRAD model is based on the linear low dose model assuming low intake and the dose-response relationship is linear in the low dose portion of the multistage model dose response curve. Based on those assumptions, the slope factor is a constant and risk is directly related to intake. However, this assumption is only valid when estimated risk is below 0.01 (ELCR<0.01). When this assumption is breached (i.e., ELCR>0.01), an alternative equation such as the One-Hit High Risk equation should be used. Thus, due to the high radiological contamination and risk associated with those UPRs, there are large uncertainties associated with those risk calculations."	5/17/21 The implications of ELCR >1 were not discussed in the document. **8/24/21 ECY: Accept, pending text addition.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-73	3.3.2.1	3-108	Table 3-19	DD	SVV	4/20/2020	Table 3-19 should include values for both radiation dose and ELCR.	Radiation doses associated with these contaminant levels are sufficient to cause death.	Add radiation dose (in mrem or rem) to Table 3-19, along with ELCR. Please include narrative regarding the interpretation of ELCR>1, as these situations illuminate that calculation of ELCR has limitations (since risk cannot exceed 1). Due to extreme conditions at these locations, this information should also be highlighted in the Executive Summary.			2/10/2021	In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the excess lifetime cancer risks for all CERCLA receptor scenarios were compared with respect to the EPA's acceptable risk range of 1 × 10-4 to 1 × 10-6. No site-specific Applicable or Relevant and Appropriate Requirement (ARAR) was established for acceptable radiological dose limit at the Hanford Site. Hence, no radiological dose assessments were performed in this RA and hence, dose results were not included in Table 3-19. It should be noted that due to elevated results of ELCR, a minimum of 3 ft of concrete barrier was proposed as a part of the corrective measure study within RPP-RPT-59379. Under such post-remediation condition, the ELCRs are within CERCLA acceptable risk range.	8/19/21 Comment noted. The CMS report provided the results of ELCRs and did not provide the results of dose assessments for the UPRs. However, in the next revision of this document, we will provide dose assessment results for three UPRs and 216-C-8 French Drain.	5/17/21 The dose was not given for these UPRs. These UPRs are a significant source of risk, and therefore, dose. 7/13/21 USDOE plans no changes. **8/24/21 Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-74	3.3.2.2	3-109	Table 3-20	DD		4/29/2020	Table 3-20 should contain soil concentrations for Pb for the 3 UPRs (per text). Also, there appears to be some discrepancies for Hg and Ni (Table 3-20 vs. Table 4-8).	Text and table should match.	Add Pb to Table 3-20, and reconcile Hg and Ni discrepancies in Tables 3-20 vs. 4-8.			2/10/2021	Discrepancies between both tables have been corrected. It should be noted that Table 3-100 replaced Table 3-20.		5/17/21 Tables 3-100 and 4-8 now agree.Hpwever. Ecology notes that the radionuclide component of cancer risk, as shown in Table 3-99, is quite large and orders of magnitude above the CERCLA 1E-04 upper limit on risk. Regarding Table 3-100, Ecology notes that estimated chromium (assuming hexavalent) at all UPRs, and total uranium at UPR-81 exceed WAC 173-340 Method B 3-phase model values for soil to protect groundwater. Ecology will continue to acknowledge the risk at these large UPRs through the closure process.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-75	3.3.3	3-110	17	DD		4/21/2020	Looks like "Floor Drain" should be "French Drain" (occurs other place too).		Change "Floor Drain" to "French Drain" (if this is so).			2/10/2021	"Floor Drain" have been changed to "French Drain".	8/19/21 Comment Noted: In the next revision of this document, "Floor Drain" will be replaced by "French Drain" in page 5-3.	5/17/21 "Floor drain" remains on p. 5-3. **8/24/21 Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-76	New 3.3.3.1	3-111		BR		4/29/2020	The title needs to indicate that this portion of the risk assessment if for the past tank leaks, rather than other types of releases such as pipeline leaks or tank overfills.	Past tank leaks are generally thought to have occurred near the lower portions of the tanks, which are deeper in the subsurface than pipeline leaks or tank overfills. The pipeline leaks and tank overfills do not have a 20-ft soil cover at this time.	Please change section title to Supplemental Human Health Risk Assessment for Past Tank Leaks			2/10/2021	Title changes have been made as suggested.	8/19/21 Comment Noted. In the next revision of this document, the word "tank" will be inserted within the last sentence of the fifth paragraph.	5/17/21 Change made in Section 3.3.3.1. However, Section 5.3, p. 5-5, for the supplimental ERA, needs to include the modifier of tank as follows: No assessment was performed for six past tank leak locations as leaks occurred at a minimum depth of 20 ft bgs; as a result, the ecological exposure pathway is incomplete. **8/24/21 ECY: Accepted, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-77	3.3.3.1	3-111	7-16	DD		4/22/2020	There is an inconsistency between the rad (industrial scenario) vs. nonrad risk assessment approaches here. With a 20 ft soil cover over past leaks, direct exposure is an incomplete pathway for both rad and nonrad COPCS. Information for the CERCLA indusrial worker is presented in a confusing manner in this section.	Assumptions for soil cover should be consistent for rad vs. nonrad exposure scenarios.	Clarify that the rad industrial scenario evaluates direct exposure, despite a 20 ft soil cover which would typically block direct exposure. Later, text in the final paragraph of section 3.3.3.1 (p 3-113) indicates no risk from this industrial worker scenario. All of this text should be consolidated and made consistent with the nonrad exposure scenario.			2/10/2021	Following changes have been made within Section 3.3.3.1. Text for the first three paragraphs have been revised as follows: "Supplemental human health radiological dose and risk assessments were performed for past leaks from six tanks. The CERCLA construction worker scenario was evaluated because releases from these tanks were at 6.1 m (20 ft) bgs and it assumes that subsurface contamination is brought to the surface from excavation activities Because the releases occurred below 15 ft bgs, there are no complete direct exposure pathways for either radiological or nonradiological contaminants." Last paragraph of this section has been deleted.	8/19/21 Comment Noted. In the next revision of this document, text within the first paragraph of Section 3.3.3.1 will be updated for clarification as follows. "Supplemental human health radiological dose and risk assessments were performed for past leaks from six tanks. Because the releases occurred below 15 ft bgs, both CERCLA industrial worker and CERCLA construction worker will not be exposed to the contaminants present in those releases via direct contact pathways. However, special risk and dose evaluations were performed by assuming that the CERCLA construction worker will be exposed to those subsurface contamination that may be brought to the surface from excavation activities."	5/17/21 Agreed as long as the construction worker is assumed not to be exposed to contamination below 15 ft. The text should be revised to make this clear. **8/24/21 ECY: Accept, pending text revision.**	Open

RPP-RPT-58329, Rev. 2 redline	BRA3-78	New 3.3.3.1	3-111		SVV		4/29/2020	The use of the 'construction worker' and 'industrial worker' exposure scenarios is confusing. Is there a difference between these scenarios? The exposure pathways are stated to be the same.		Clarify.			2/10/2021	"Industrial Worker" and "Construction Worker" scenarios are defined in section 3.1.2.5.1 and 3.1.2.5.3, respectively.	8/19/21 Comment Noted. In the next revision of this document, the following text will be added in Section 3.3. "Two CERCLA receptor scenarios were utilized during the supplemental HHRA – a CERCLA adult industrial worker and a CERCLA construction worker. An adult industrial worker is selected as a receptor to represent potential exposures to soil up to 15 ft bgs for industrial land use similar to that experienced in the Inner Area of the Central Plateau at the Hanford Site. Under reasonably anticipated future land use conditions, construction workers could potentially be exposed to soil up to 15 ft bgs. The construction worker is assumed to have short-term exposure to soil while performing trenching and excavation activities on the Central Plateau."	5/17/21 A brief description of the range of possible activities for the Industrial Worker should be given. **8/24/21 ECY: Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-79	New 3.3.3.1	3-111		SVV		4/29/2020	Discuss differences between RESRAD version 6.5 and 7.0, and discuss how those differences might impact results.					2/10/2021	Following information is provided for informational purpose: The radiological transformation basis (half lives, decay rates, yield and amount of radiation emitted) for RESRAD 6.5 and RESRAD 7.0 are based on ICRP 38 and ICRP 107, respectively. The updated risk coefficients based on ICRP 107 were used during supplemental risk assessments for UPRs. Except for inhalation, risk coefficients based on both ICRPs are the same for all radiological COPCs. Inhalation risk coefficients for most of the radiological COPCs based on ICRP 107 are less as compared to those based on ICRP 38. It should be noted that external gamma pathway contributes 100% of the total risk for all three UPRs. Therefore, the differences will not cause any impact to the total risk.	8/19/21 Comment Noted. In the next revision of this document, the following text will be added at the end of the first paragraph of Section 3.3.2.1. "The radiological transformation basis (half-lives, decay rates, yield and amount of radiation emitted) for RESRAD 6.5 and RESRAD 7.0 are based on ICRP 38 and ICRP 107, respectively. The updated risk coefficients based on ICRP 107 were used during supplemental risk assessments for UPRs. Except for inhalation, risk coefficients based on both ICRPs are the same for all radiological COPCs. Inhalation risk coefficients for most of the radiological COPCs based on ICRP 107 are less as compared to those based on ICRP 38."	5/17/21 The explanation given here is satisfactory, but I think the explanation should be in the text of the document, perhaps with a history of what versions were used in the various assessments. **8/24/21 ECY: Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA3-80	New 3.3.3.1 and 3.3.3.2	3-113, 3-115	Tables 3-25 and 3-26	BR, SVV, DD		4/20/2020	These tables do not have units for the doses and concentrations. Are the radionuclide doses mrem/y?		Please put the units on the tables.			2/10/2021	Unit for dose (mrem/yr) has been included in Table 3-25 (current Table 3-105) and unit for concentration (pCi/g) has been included in Table 3-26 (current Table 3-106).		5/17/21 Units are on the tables.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-81	3.3.3.2	3-113	27-28	DD		4/28/2020	Although it does not change conclusions, correct Hanford soil background concentrations for Fe, Pb, Ni, and U.	DOE/RL-92-24	Revise Hanford background soil concentrations for Fe, Pb, Ni, and U.			2/10/2021	Concur. The background concentrations for iron, lead, nickel and uranium are 32, 600, 10.2, 19.1 and 3.21 mg/kg, respectively. Table 4-3 of RPP-CALC-61128 includes correct background concentrations. However, all text within 2nd paragraph were deleted. The following text was added at the end of 3rd paragraph: "It should be noted that nonradiological COPCs were not identified for the surface contamination or French drain."		5/17/21 Background concentrations have been corrected.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-82	New 3.4.1	3-122		BR		4/20/2020	The text states "Application of two conservative approaches during the selection of COPCs resulted in additional contribution of risks to total risk and thereby, overestimates the actual risks." There is uncertainty in this statement. At best it can only be stated that this may result in an overstimate of risk.	This statement turns an unknown (the validity of the additional risk) into a known (an overestimate of risk).	Please revise the statement to "Application of two conservative approaches during the selection of COPCs resulted in additional contribution of risks to total risk and thereby, may overestimates the actual risks."			2/10/2021	Text changes have been made as suggested.			Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-83	4.0	4-3	2	DD		4/28/2020	Looks like a typo, "RPP-RPT-59397." Should this be RPP-RPT-59379?		Fix the typo (if so).			2/10/2021	See response to the comment no. BRA 3-70.			Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-84	4.6	4-25	40-41	DD		4/28/2020	Although it does not change conclusions, correct Hanford soil background concentrations for Fe, Pb, Ni, and U.	DOE/RL-92-24	Revise Hanford background soil concentrations for Fe, Pb, Ni, and U.			2/10/2021	Concur. The background concentrations for iron, lead, nickel and uranium are 32,600, 10.2, 19.1 and 3.21 mg/kg, respectively. Table 4-3 of RPP-CALC-61128 includes correct background concentrations. Hence, text has been updated to reflect the actual background concentrations.		5/17/21 Background concentrations have been corrected.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-85	4.6	4-25	43	DD		4/28/2020	"Table 3-23" should be "Table 3-26."		Change "Table 3-23" to "Table 3-26."			2/10/2021	Concur. Table number has been revised based on inclusion of additional tables.			Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-86	4.6	4-26	13-16	DD		4/28/2020	Text states, "For nonradiological contaminants, when an HQ value is less than 1, the concentration is below the soil benchmark and the constituent is deemed to pose a negligible risk and is not retained for further evaluation." This is inappropriate if there are nonrads that effect a common target organ (e.g., Pb and U affect kidney in mammals, so HQs are additive). In this case, HI<1 becomes the critical metric (e.g., see ERAGS Highlight 2-2).		Discuss the importance of both HQ and HI for evaluating nonrad COPCs.			2/10/2021	RPP-RPT-58329, Rev. 2 provides a summary of the supplemental risk evaluations that were performed as a part of RPP-RPT-59379. It should b reviewed and approved by Department of Ecology. Hence, no changes have been made in RPP-RPT-58329, Rev 2. It should be noted that the most conservative PRGs were selected during the calculation of HQs. The most conservative Tier 2 PRGs for lead and uranium were derived based on the most sensitive wildlife receptors of killdeer and badger, respectively. Hence, those HQs are not additive. In addition, the methodologies for performing SLERA during the supplemental risk assessment are consistent with the methodologies that were utilized during the BRA.	8/19/21 Comment Noted. Inventory information for arsenic is not available. Therefore, arsenic is not considered as a COPC for this evaluation. Hence, HQs for As and Pb were not summed.	5/17/21 Summing HQs (to calculate HI) is appropriate for COPCs, producing adverse effects with the same toxic mechanisms (e.g., ERAGS Highlight 2-2). For example, in the case of As and Pb ecotoxicity in birds, Tier 2 PRGs are both based on reproduction (CHPRC-01311, R2). As such, corresponding HQs for As and Pb in birds should be summed.	8/24/21 Closed
RPP-RPT-58329, Rev. 2 redline	BRA3-87	4.6	4-28	6-14	DD		4/28/2020	This AUF issue lies in the domain of the ERAGS/SMDP process which Ecology and USDOE agreed to eliminate in this document, due to lack of Ecology/USDOE consensus. Furthermore, no reference is provided for the badger home range (HR) value of 160 ha. The IUCN Red List of Threatened Species (citing data from Sargent and Warner, 1972) specifies a HR range of 2-725 ha for the American badger. Notably, the AUF approach also ignores contaminated waste sites near WMA C which may overlap HR.	http://www.iucnredlist.org/details/41663/0	Delete this paragraph on AUF.			2/10/2021	RPP-RPT-58329, Rev. 2 provides a summary of the supplemental risk evaluations that were performed as a part of RPP-RPT-59379. It should be noted that RPP-RPT-59379 was reviewed and approved by Department of Ecology. Hence, no changes have been made in RPP-RPT-58329, Rev 3. The home range for badger can be obtained from the following website: https://animaldiversity.org/accounts/Taxidea_taxus/.	8/19/21 Comment Noted: Based on Ecology and DOE agreement, all information related to SMDP were deleted for SLERA, performed with Phase 2 soil characterization samples. In the next revision of this document, the following line from fourth paragraph of Section 5.3 will be deleted. "When the HQs for the COPECs are greater than 1, SMDPs were considered before retaining them."	5/17/21 Ecology and USDOE agreed not to use an SMDP approach for this document, as it is not offered in WAC 173-340-7490- 7493, and there is inadequate evidence to support it. Ecology does not acknowledge any SMDP evaluations for this unit. Ecology will use approaches that are consistent with and as protective as those in WAC 173-340-7490 - 7494. **8/24/21 ECY: Accept, assuming text deletion.**	Open
RPP-RPT-58329, Rev. 2 redline	BRA4-29	4.6	4-28	16-21	DD		4/28/2020	Note that future land use is ultimately unknown and that ecological habitat may be restored over time.	Future land use is unknown.	Delete this paragraph on habitat and land use.			2/10/2021	See response to the comment no BRA 3-86. It should be noted that the paragraph provides information related to the existing use of the site and surrounding properties. Information related to the future land use is not provided.		5/17/21 The last sentence in #2 on p.4-29 of Rev. 3 is new "Further, the site is not managed for ecological purposes and there have been no onsite improvements which would create suitable habitat attractive for wildlife receptors." In truth, current day conditions cannot be guaranteed for the long-term. Future land use is uncertain and Ecology is concerned that ecological exposure is a real possibility in the future.	Closed
RPP-RPT-58329, Rev. 2 redline	BRA5-5	5.1	5-1	15-17	DD		4/28/2020	A new sentence was added: "Depending upon the calculation of source-term concentrations for both radiological and nonradiological COPCs, HHRA for WMA C were performed for 10 EAs using a statically based approach and a sample-by-sample approach." This implies that two valid approaches were used to analyze data.	The statistical approach is not valid, given judgmental sampling.	Explain that the valid sample by sample approach followed an invalid statistical approach, as a result of judgmental sampling.			2/10/2021	Text changes have been made as follows: Initially, HHRAs were performed for 10 EAs to addresses potential exposures to industrial worker, construction worker, maintenance/surveillance worker, trespasser, hypothetical onsite residential receptors and two Native American residential receptors. The source-term concentrations for both radiological and nonradiological COPCs were calculated using a statistical-based approach. Because judgmental samples were collected from those EAs, additional HHRAs were performed by utilizing sample-by-sample approach source-term concentrations to address potential exposures to CERCLA residential and industrial scenarios for radiological contaminants, and to WAC residential and industrial scenarios for nonradiological contaminants		5/17/21 Ecology considers the statistical data analysis approach used here invalid and will use results from the sample-by-sample approach.	Closed by IAMIT 2019-006
RPP-RPT-58329, Rev. 2 redline	BRA5-6	5.1	5-2	25-27	DD		4/28/2020	Text states, "For carcinogenic COPCs, the results of HHRA for both the statistically- and sample by sample-based risk assessment approaches identified the same EAs with ELCRs greater than the EPA upper risk threshold of 1 × 10-4 and the same major risk contributors." This statement is not entirely true.	Text and table should match.	Re statistical vs. sample be sample approaches for identifying EAs with exceedences, call out discrepancies for workers at H+I and L1+L2 (Table 3-15).			2/10/2021	Not Concur. Based on the results presented in Table 3-15 (current Table 3-45) for CERCLA industrial worker scenario, the ELCRs for EA H Plus I and EA P based on sample-by-sample approach are more conservative than their corresponding ELCRs based on statistical approach. However, for EA P, the calculated risk using both methods resulted in an unacceptable risk.		5/17/21 OK	Closed

RPP-RPT-58329, Rev. 2 redline	BRAS-7	5.2	5-4	26-28	DD		4/28/2020	Text states, "The results of the data evaluations showed that the EPCs for three COPCs (cadmium, beta-BHC and lindane) exceeded their corresponding three-phase model concentrations and background levels at a number of exposure areas." In addition to these 3 COPCs, the sample by sample approach (direct comparsion method) also identified Cr+6 and Tl as exceedences (see section 3.2.3).					2/10/2021	The following text has been added: "The results of the assessment showed that the individual sample results for five COPCs (arsenic, cadmium, hexavalent chromium, thallium and beta-BHC) exceeded their corresponding soil concentrations protective of groundwater and/or background concentrations. Hexavalent chromium and thallium were not part of the data assessment based on a statistical approach. Hexavalent chromium was not measured during site characterization. The reported sample results for total chromium were assumed to hexavalent chromium during the sample-by-sample approach data evaluation. A screening level soil concentration based on groundwater protection was used for thallium as the reference dose value for screening purposes only."		5/17/21 OK	Closed
RPP-RPT-58329, Rev. 2 redline	BRAS-8	5.3	5-6	1-4	DD		4/28/2020	Test states, "However, this exceedance is considered of little significance for current and future vegetation exposure because the UPR and surrounding areas within and around WMA C are paved and any vegetation is (currently) managed using herbicide applications." Speculation on future land use should be deleted.	Future land use is unknown.	Delete this speculation on future land use.			2/10/2021	The sentences have been revised as follows: "However, this exceedance is considered of little significance for current vegetation exposure because the UPR and surrounding areas within and around WMA C are paved and any vegetation is (currently) managed using herbicide applications."		5/17/21 OK	Closed
RPP-RPT-58329, Rev. 2 redline	BRAF-1	App F and G			DD		4/16/2020	Several discrepancies were observed between Table 3-15 and 3-16 vs. several corresponding tables in appendices. Also, note that summing all HQs for a sample to calculate sample HI represents a worst case, since not all COPCs act by the same toxic mechanism (App G).	Consistency is needed between tables in the main document vs. appendices. Sample HI should be segregated by toxic mechanism.	Resolve the discrepancy for Table 3-15 vs. Table F-3-7. Resolve discrepancies for Table 3-16 vs. several tables in Appendix G (Table G-5-5, Table G-5-8, Table G-5-9, Table G-5-10). Add a note to App G that explains that summing all HQs for a sample to calculate sample HI represents a worst case, since not all COPCs act by the same toxic mechanism.			2/10/2021	Tables 3-15 (current Table 3-45) and 3-16 (current Table 3-96) have been updated to address the discrepancies. A footnote has been added to App G (all tables with Attachment G-4 and Attachment G-5) to state the suggested text.	8/19/21 Comment Noted. In the next revision of this document, the following changes will be made. 1. Using the sample-by-sample method, the range of ELCRs in Table 3-45 for EA L1+L2 for the CERCLA residential receptor will be revised to 4E-7 to 3E-4. 2. HI values for MTCA C (Table 3-96) and "HI sample" (Appendix G, Attachments G-4 and G-5) will be expressed with two significant figures for greater consistency.	5/17/21 This comment involves the direct comparison method of COPC concentrations in soil samples vs. corresponding CULs (i.e., "sample by sample" approach), when samples are collected via judgmental sampling (WAC 173-340-740[7][d][iii]). With this method, each sample should be evaluated individually with no summing (e.g., over depth). Using the sample by sample method, the range of ELCRs in Table 3-45 for EA L1+L2 for the CERCLA residential receptor should be slightly revised to 4E-7 to 3E-4. Other cases noted in the comment have been addressed acceptably. Lastly, HI values for MTCA C (Table 3-96) and "HIsample" (Appendix G, Attachments G-4 and G-5) should be expressed with two significant figures for greater consistency. **8/24/21 ECY: Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRAF-2	Appendix F, Appendix G	Tables F-1-1 through G-5-10		BR		4/20/2020	There are a lot of blanks for contaminants in these tables, suggesting that some results were omitted from the sample-by-sample approach. This may explain why the statistical approach gave some higher results than the sample-by-sample approach.	For example, Am-241, C-14, Pu isotopes, Se-79, Sr-90, and U isotopes have no values reported for sample B2B1L8.	Please explain these blanks. Where data are available to fill in the blanks, please fill in the blanks and recalculate the sample-by-sample values.			2/10/2021	The blank space within those worksheets represent non-availability of sample results for the analytes. A footnote has been added to explain that.	8/19/21 Comment Noted: In the next revision of this document, an additional footnote "NA" will be added to identify analytes with no toxicity value in the appropriate tables. See responses to the comment BRA3-58 for better explanations of the tables.	5/17/21 The tables now have a footnote that says " "—" means either sample results are non-detect or no noncarcinogenic toxicity values are available." The few that lack toxicity information could be given their own footnote. The tables remain confusing because it appears that some results have been summed with results from other samples at the same depth, even for the sample-by-sample analyses. Better explanations for the tables are needed. **8/24/21 ECY: Accept, pending text revision.**	Open
RPP-RPT-58329, Rev. 2 redline	BRAH-1	Appendix H	Table H-1		BR		4/21/2020	The hexavalent chromium concentration soil to protect groundwater value should be changed to 0.2 mg/kg.	Table 3-14 has a value of 192 ug/kg; this is based on a Kd value of 0 mL/g for Hanford, from PNNL-13895.	Please revised the soil to protect groundwater value to 0.2 mg/kg or 192 ug/kg.			2/10/2021	Concur. Appendix H has been updated with the revised soil concentration protective of groundwater value of 0.192 mg/kg for hexavalent chromium.		5/17/21 Appendix H tables have been corrected.	Closed