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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
3100 Port of Benton Blvd • Richland, WA 99352 • (509) 372-7950

June 21, 2006

Mr. Larry Romine
Richland Operations Office
United States Department of Energy
P.O. Box 550, MSIN: A6-33
Richland, Washington 99352

Re: Review Comments on 200-LW-1 and 200-LW-2 Remedial Investigation Report

Dear Mr. Romine:

Enclosed are the Department of Ecology's review comments on the 200-LW-1 and 200-LW-2 Remedial Investigation Report. These were already sent to you by facsimile.

Ecology, the United States Department of Energy (USDOE), and the United States Environmental Protection Agency have been in preliminary discussions about the M-15 series Tri-Party Agreement milestones. The 200-LW-1 and 200-LW-2 operable units are included in that milestone series. Ecology expects that further discussions may result in a proposal for additional characterization of the 200-LW-1 and 200-LW-2 operable units. Additional characterization should be reported either in a revised Remedial Investigation Report or in a Feasibility Study. Until there are further discussions between the Tri-Parties, we do not expect USDOE to revise and resubmit this Remedial Investigation Report.

Sincerely,

John B. Price
Environmental Restoration Project Manager
Nuclear Waste Program

JBP:lkd
Enclosure

cc w/enc: Craig Cameron, EPA
Mary Todd-Robertson, FH
Stuart Harris, CTUIR
Gabriel Bohnee, NPT
Russell Jim, YN
Todd Martin, HAB
Ken Niles, ODOE
Admin Record: 200-LW-1/200-LW-2
Environmental Portal

Washington State Department of Ecology Comments
Remedial Investigation Report for the 200-LW-1 (300 Area Chemical Laboratory Waste Group) and 200-LW-2 (200 Area Chemical Laboratory Waste Group) Operable Units (DOE/RL-2005-61 Draft A – BR (5/06)

Comment Number	Section/Page	Comment
1	General	The amount of data collected for the representative sites may not be enough to lead the regulatory agencies to a final remedial decision about the waste sites. Therefore, Ecology recommends conducting another DQO process to determine if additional data needs are required, and if so, the extent of the additional data needs.
2	General	The sampling and data analysis approaches preclude a defensible risk assessment. The number of samples and the judgmental nature of samples prevent proper statistical analyses, including the use of a 95% upper confidence level evaluation of data. Also, some sites have not been sampled at all. Several specific comments follow highlighting this issue.
3	General	At this stage in the RI/FS process, none of the contaminants of concern or potential concern given in the RI/FS Work Plan (DOE/RL-2001-66) should be eliminated from further consideration for sampling and risk assessment. Risk Assessment Guidance for Superfund (RAGS, EPA/540/1-89/002; see section 5.8) states that the following chemicals should be considered for inclusion in a risk assessment: (1) Chemicals that were positively detected in at least one sample; (2) chemicals detected at levels significantly greater than levels in blanks; (3) chemicals detected at levels significantly greater than background; (4) chemicals that may be associated with site activities; and (5) transformation products of chemicals. RAGS also states that "further reduction in chemicals should not be done unless computer capability is limited" and that if reduction must be done, the chemicals giving 99% of the risk contribution should be included. Additionally, RAGS states that chemicals associated with ARARs usually are not appropriate for exclusion from a risk assessment. Any laboratory data obtained for the samples taken for this RI should be included in the risk assessment - there is no expense in including available data. Several specific comments related to this issue are included.
4	General	Though the land use is currently planned to be industrial for these sites, for ecological risk assessment, the WAC 173-340 screening levels should be all of the levels in Table 749-3, including those for plants and soil biota. The receptors will not only be wildlife – plants and soil biota will have access as well. Revegetation may be desirable at these sites. Several specific comments are related to this issue.

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5	General	Discussion of the nature and extent of contamination at the representative waste sites is limited to vertical contamination, with little discussion of the nature and extent of lateral contaminant movement. The Work Plan incorporates the possibility of lateral spreading into the conceptual models for the representative sites, and includes data from boreholes adjacent to the sites. Geophysical data within the Work Plan and the RI (i.e. contamination at borehole 299-W14-1, 125 ft southeast of 216-T-28 Crib) indicate that significant lateral spreading has likely occurred. The RI should reflect the lateral extent of contaminant movement, refine the conceptual models, and incorporate discussions throughout the text where necessary.
6	General	It appears that significant efforts were made to obtain geophysical logs of new and existing boreholes within and adjacent to the representative waste sites; however, the results of the geophysical logs are not well incorporated with laboratory data into the refinement of the conceptual model or evaluation of fate and transport. For example, geophysical results are not discussed beyond the Geophysical Logging Summary sections in Chapter 3. Furthermore, when contaminated depth locations were identified with geophysical data, laboratory samples were not always taken at these depths for purposes of confirmation (e.g., shallow samples were not taken at the 216-T-28 Crib despite indications of a high activity zone beginning at 10 ft.). Additionally, similar to the laboratory data, figures and tables to facilitate the interpretation of geophysical results should be included.
7	Executive Summary, page iv, 1st paragraph	Delete the last sentence of the paragraph. Not all contaminants of potential concern in the RI/FS Work Plan (DOE/RL-2001-66) were analyzed and the quantity of data is not sufficient to support evaluation of alternatives.
8	Executive Summary, page iv, 2nd paragraph	Risk assessment will need to be performed with field data for the shallow zone of 216-T-28 crib. Provide a description of how data will be collected to address the risk associated with the shallow zone at 216-T-28.
9	Executive Summary, page iv, 2nd paragraph	Delete the last sentence of the paragraph. Not all contaminants of potential concern in the RI/FS Work Plan (DOE/RL-2001-66) were analyzed and the quantity of data is not sufficient to support evaluation of alternatives.

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10	Executive Summary, page iv, 2nd paragraph	Please delete the statement "In addition, similarities in the 216-T-28 Crib, the 216-S-20 Crib, and the 216-Z-7 Crib construction and inventories suggest that the risk associated with the 216-T-28 Crib is similar to that of the 216-S-20 Crib and the 216-Z-7 Crib." It appears to be in conflict with data given in the RI/FS Work Plan (DOE/RL-2001-66). The data in the Work Plan indicated that Cs-137 is a significant problem at 216-T-28, though not at 216-Z-7. The radiochemical of greatest concern at 216-Z-7 was Co-60. Data in this RI show that the 216-Z-7 crib has uniquely high levels of Am-241 and plutonium, and somewhat less Cs-137 than 216-T-28 crib.
11	Executive Summary, page iv, paragraph 3	The text states that samples were not collected from the shallow zone in the 216-T-28 Crib and that it is anticipated that the major zones of contamination are below the bottom of the crib (15 ft). This statement is unsubstantiated given that geophysical data presented in Chapter 3 indicate a high radionuclide activity zone beginning at 10 ft bgs.
12	Executive Summary, page v, 1st paragraph	This RI can report on the available data. However, data and risk assessment will be needed for all of the waste sites in the OU. Delete the last 3 sentences of this paragraph.
13	Executive Summary, page vi, 3rd paragraph	Delete the last sentence "Further modeling is not deemed necessary for the RI process of these OUs." Additional data is needed to understand these waste sites in this OU; therefore, this statement cannot be made yet.
14	Executive Summary, page v, 2nd bullet	Delete this bullet. The modeling approach (using RESRAD for nonradionuclides and screening on the basis of Kd values) has not been accepted by Ecology.
15	Table ES-1, page vii	Please refer to all comments regarding contaminants of concern and potential concern, and modify this table to be consistent with the changes required elsewhere in the document.
16	Section 1.0, page 1-1, 4th paragraph	Provide the milestone that addresses the RI for 200-LW-1, 2 in the current TPA.
17	Section 1.0, page 1-2, 2nd paragraph	Check to make sure that the 216-U-4 waste sites were moved to LW-1 in April 2004. The 216-U-4 waste sites were included in the focused feasibility study for UW-1 (DOE/RL-2003-23, Draft A) in 2003.
18	Section 1.0 Introduction, page 1-2, paragraph 3	Add statement into the waste site reclassification discussion indicating that the 216-B-58 Trench that was moved into 200-TW-1 OU was identified as a representative waste site in the Work Plan.

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19	Section 1.3.1, General	The number of samples taken for this study at each site is not sufficient for calculating 95 upper confidence levels on the mean, and the sample locations are judgmental. WAC 173-340-740(7)(d)(iii) says the following: "Direct comparison of soil sample concentrations with cleanup levels may be used to evaluate compliance with cleanup levels where selective sampling of soil can be reliably expected to find suspected soil contamination. There must be documented, reliable information that the soil samples have been taken from the appropriate locations. Persons using this method must demonstrate that the basis used for selecting the soil sample locations provides a high probability that any existing areas of soil contamination have been found." This RI does not provide documentation, and demonstrate that the sample locations provide a high probability that any existing areas of soil contamination have been found, especially at unsampled sites. Additional samples are needed and can be obtained using a low-cost tool such as a cone penetrometer.
20	Section 1.3.1, General	In the risk assessment guidance for superfund (EPA/540/1-89/002), the following is stated about judgmental sampling, called purposive sampling in the guidance: "Although areas of concern are established purposively (e.g. with the intention of identifying contamination), the sampling locations within the areas of concern generally should not be sampled purposively if the data are to be used to provide defensible information for a risk assessment". The guidance states that random or systematic sampling should be done within the areas of concern. The judgmental sampling approach used for this RI results in a risk assessment that will be very difficult to defend, especially for any of the sites that are larger than 100 m^2 (an area of concern for a residential gardener/intruder). Please take additional samples at sites exceeding 100 m^2, using a low-cost tool such as cone penetrometer.
21	Section 1.3.2, page 1-7, 1st paragraph after bullets	Residential land use should be evaluated for the time period after 150 y, the institutional control period (the foreseeable future). Native American and intruder scenarios should also be evaluated after the post-institutional control period. During and after the institutional control period concentrations of contaminants in the vadose zone must be maintained below levels that will result in groundwater contamination above cleanup levels for residential groundwater (WAC 173-340-747, residential and WAC 173-340-720).
22	Section 1.3.3, page 1-9, 2nd paragraph	The paragraph mentions groundwater evaluation. However, fate and transport modeling generally models transport through the vadose zone. WAC 173-340-747 is applicable to an evaluation of the pathway to groundwater. Modify the second sentence of the paragraph to "The fate and transport evaluation was based on WAC 173-340-747 requirements and included …."

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23	Section 1.3.3, page 1-9, 2nd paragraph	Include in the fate and transport evaluation the upgradient concentrations of contaminants. It is not clear what is meant by "whether the contamination has already reached groundwater." Does this include sources in addition to the waste sites, or just these waste site sources?
24	Section 1.3.4, page 1-9 – 1-12, General	A residential scenario should be assumed for any ecological evaluations. For nonradionuclides, use WAC 173-340 Table 749-3 values for plants, soil biota, and wildlife for ecological screening of the sites.
25	Section 1.3.4, page 1-11, 1st paragraph	It appears that the waste sites failed the ecological screening. These sites will require remediation.
26	Section 1.3.5, page 1-12	Please add a discussion as to how to address if the representative sites data is not reflective of what is expected per the conceptual site models, the next steps in collecting additional data for the remaining sites.
27	Section 1.3.5, page 1-12, 1st paragraph	Data are needed from all of the waste sites in order to complete risk assessment for all of the waste sites. Collect samples at each of the sites to complete risk assessments for the sites.
28	Table 1-1, page 1-26	Three sites listed in the TPA for LW-1 are not given in this table: 216-B-53A, 216-B-53B, and 216-B-54. Have these sites been reassigned to a different OU?
29	Table 1-2, page 1-28	Sites 231-W Crib and 231-W Trench are not listed in the TPA for LW-1 or LW-2. Add text to the introduction describing these sites, and list them on Table 1-1.
30	Section 2.0, page 2-1, 1st and 2nd paragraphs	The 1st paragraph of the section states, "The objectives identified include collecting data that will be used to define the nature and extent of radiological and chemical contamination …." The 2nd paragraph states "Data were collected to characterize the nature and vertical extent of chemical and radiological contamination …." The RI should report on both horizontal and vertical extent of contamination. Please revise the text accordingly.
31	Section 2.1.1, p 2-2	Please state if there were any variations from the work plan/SAP in collecting samples
32	Tables 2-1, 2-2, and 2-3	Multiple laboratories have been listed for several of the HEIS sample numbers within these tables. It is unclear which laboratory performed which of the specified tests in the eighth column. Please find a way to present the information in such a way that the reader can understand which tests were performed by each laboratory.
33	Section 3.1.2 Geology, page 3-3, paragraph 1	The text includes information on the geology underlying the 200-PW-2 and 200-PW-4 Operable Unit waste sites. It is unclear why this information is present. Please clarify and ensure that all the text pertains to the 200-LW-1 and 200-LW-2 sites.

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34	Section 3.2.1.1, page 3-7	The text states that geophysical logging of four existing boreholes in the vicinity of the 216-T-28 Crib was performed. Please indicate in this discussion the depths to which the existing boreholes were logged.
35	Page 3-7, Section 3.2.1.1, second paragraph	The text states the following for the C4175 borehole at the 216-T-28 Crib: "It is likely that Co-60 exists in the high gamma activity zone between 3.1 and 10.7 m (10 and 35 ft) bgs. The minimum detection level (MDL) for Co-60 is significantly increased at this high activity zone, such that it may not be detected." Were any samples collected from the shallow zone of borehole C4175? Only deep zone data have been presented in the Appendices for borehole C4175. If no shallow zone samples were collected, it needs to be done. Furthermore, it will be problematic if elevated levels of Co-60 do exist in the shallow zone, but are not detectable due to the high activity. What will be done to this high activity zone, since it may be too "hot" to get meaningful data?
36	Page 3-7, Section 3.2.1.1, third paragraph	The text states the following for the C4175 borehole at the 216-T-28 Crib: "It is likely that Eu-154 exists in the high gamma activity zone between 3.1 and 10.7 m (10 and 35 ft) bgs. The minimum detection level (MDL) for Eu-154 is significantly increased at this high activity zone, such that it may not be detected." Were any samples collected from the shallow zone of borehole C4175? Only deep zone data have been presented in the Appendices for borehole C4175. If no shallow zone samples were collected, it needs to be done. Furthermore, it will be problematic if elevated levels of Eu-154 do exist in the shallow zone, but are not detectable due to the high activity. What will be done to this high activity zone, since it may be too "hot" to get meaningful data?
37	Section 3.2.1.1, page 3-8, paragraph 3	Was Sn-126 analyzed for in the laboratory sample? Given its detection in nearby boreholes, this should be an analyte.
38	Section 3.2.1.1, page 3-8, paragraph 4	It is unclear which borehole this paragraph pertains to, please specify.

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39	Page 3-8, fifth paragraph	Please insert the following after the second sentence: "However, the Co-60 results are expected to have been higher in the upper elevations."
40	Section 3.2.1.2, page 3-9, paragraph 1	The Work Plan indicates that samples will be collected at 10-12.5 ft and at 12.5-15 ft. The text explains that no shallow zone soils were sampled due to insufficient sample collected at 12.5-15 ft. Please explain why samples were not collected at 10-12.5 ft.
41	Section 3.2.1.2, page 3-10, paragraph 1	Add text to the end of the paragraph stating that although radioactive contamination is markedly elevated within the 17.5 to 20 ft interval, the distribution of the chemical contamination with depth is more variable.
42	Section 3.2.1.2, page 3-10, paragraph 2	The conceptual model discussed in the Work Plan indicated that some lateral spreading was expected to occur. The discussion in this section does not address the lateral spreading that is evidenced by the contamination found in boreholes logged adjacent to and at some distance from the crib (noting that borehole 299-W14-1 is 125 ft southeast of the crib). Please add discussion on lateral spreading.
43	Page 3-11, Section 3.2.2.1, last paragraph, last sentence	Change the sentence as follows: "The MDL for Co-60 is significantly increased in this high activity zone, such that it may not <u>have been</u> ~~be~~ detected." What will be done to this high activity zone of the 216-S-20 Crib, since it may be too "hot" to get meaningful data?
44	Section 3.2.2.2, page 3-13, paragraph 3	The text states that the only contamination detected in shallow soils (<15 ft) was Eu-155. This statement implies that representative sampling of the shallow zone was done, whereas the only shallow zone sample taken was from 12.5-15 ft. Replace with "The only radioactive contamination detected in the shallow soil sample (12.5-15 ft) …."
45	Section 3.2.2.2, page 3-14	The text states that the contaminant distribution model is well supported by the data. This may be unsubstantiated considering that refinement of the conceptual model is limited by missing radiological data from borehole C4176 as acknowledged by the text on page B-7.

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46	Section 3.2.2.2, page 3-14	The text references DOE/RL-2000-61 for information on the conceptual model. This document is not listed in Section 7.0, References. It appears that text should reference the Work Plan (DOE/RL-2001-66). Please verify the reference.
47	Page 3-14	The text states that in general, the contaminant model is well supported by the data. This statement is not entirely accurate. Refer to Pg B-4, second bullet: "The missing Pu-238 and Pu-239/240 measurements from the 216-S-20 Crib analysis may represent modeling difficulties…" Please edit the text on page 3-14 to reflect this crucial data gap.
48	Section 3.2.3.1	Revise this section to provide a more complete description of the geophysical activities and results at 216-Z-7 Crib, including drilling information for the boreholes and direct-push holes (depth of completion, water table depth, etc.) and specific information on contaminant detection in each direct-push and each borehole (new and existing). This section is incomplete and confusing as written.
49	Section 3.2.3.1, page 3-15, paragraph 3	This paragraph on the subjectivity of geophysical logging is inappropriate in this section. Geophysical logs provide continuous data on borehole characteristics that are necessary to supplement samples taken at discrete locations. This paragraph also appears to be a disclaimer on the results collected via geophysical methods. Please remove or provide explanation for the incorporation of this paragraph.
50	Section 3.2.3.1, page 3-15, paragraph 4	The text states that Cs-137 was detected from just below the surface to 51 ft, with maximum concentrations of up to 100,000 pCi/g at 14.5-19 ft. Please specify the maximum concentration and depth in each push/borehole.
51	Section 3.2.3.1, page 3-15, paragraph 4	Change text of last sentence to, "Because the next sample interval is at 17.5 to 18.3 m (57.5 to 60 ft) bgs, ~~this is consistent with logging~~ contaminated depth intervals appear consistent with logging results; however, geophysical maximum concentrations of Cs-137 are significantly higher than the laboratory data maximum."
52	Section 3.2.3.1, page 3-15, paragraph 5	The text states that Co-60 was detected from 13 to 52.5 ft, with maximum concentrations of up to 35 pCi/g. Please specify the maximum concentration and depth in each push/borehole.

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53	Section 3.2.3.1, page 3-15, paragraph 6	The text states that Eu-154 was detected in push/boreholes from 13 to 47 feet, with maximum concentrations between 9 and 23 ft. This statement is inconsistent. Please verify and correct.
54	Section 3.2.3.1, page 3-15, paragraph 6	The text states that Eu-154 was detected from 13 to 47 ft, with maximum concentrations of up to 60 pCi/g, between 9 and 23 ft. Please specify the maximum concentration and depth in each push/borehole.
55	Section 3.2.3.1, page 3-15, paragraph 7	The text states that Pu-239 was detected in two direct push holes from 13 to 19 ft, with a maximum concentration of 240,000 pCi/g at 16.5 ft. Please specify the maximum concentration and depth in each push/borehole.
56	Section 3.2.3.1, page 3-16, paragraph 3	The text states that the logging results in 7 existing boreholes were not markedly similar to logging results for the direct push holes for Cs-137 and Co-60. Please add a more complete discussion and of these results and specific data for each borehole.
57	Section 3.2.3.2, page 3-18, paragraph 1	The text references DOE/RL-2000-61 for information on the conceptual model. This document is not listed in Section 7.0, References. It appears that text should reference the Work Plan (DOE/RL-2001-66). Please verify the reference.
58	Sections 3.3.1, 3.3.2, and 3.3.3	The text states, "This suggests that effluent may have reached groundwater at this site." Revise to read, "This suggests that effluent is likely to have reached groundwater at this site."
59	Section 3.3.2, page 3-19	The text states that uranium exceeds groundwater protection in the vicinity of the 216-S-20 Crib, but that only nitrate, I-129, and tritium may have been associated with waste disposal practices at the crib. However, the presence of uranium throughout the borehole suggests that uranium was associated with waste disposal practices at the crib. Please discuss in the text.
60	Section 3.3.3	The text states that Tc-99 exceeds groundwater protection in the vicinity of the 216-S-20 Crib, but that only nitrate and tritium may have been associated with waste disposal practices at the crib. However, the presence of Tc-99 in the borehole suggests that Tc-99 was associated with waste disposal practices at the crib. Please discuss in the text.
61	Figures 3-8, 3-11, and 3-14	Please indicate in the title or text that the radionuclide contaminant stratigraphy diagram includes only data collected from laboratory samples and not from geophysical results.

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62	Figure 3-8	Please address in the text why no results (NR) are reported for Sb-125 and Cs-134 below 50 ft.
63	Figure 3-8	Editorial error - ND and NR are repeated in the table legend.
64	Figure 3-9	Please address in the text why no results (NR) are reported for N in NO_2/NO_3 at 17.5-20 ft, Diethyl-phthalate at several depth intervals, and Di-n-butylphthalate at 223.5-226 ft.
65	Figure 3-9, page 3-30	Even though contamination is not anticipated at this site in the shallow zone, data are needed for the shallow zone to demonstrate that contaminants do not exceed groundwater protection, direct contact, and ecological protection values at 216-T-28 crib.
66	Figure 3-9, page 3-30	Based on this figure, the following contaminants exceed the soil standards for protection of groundwater at 216-T-28 crib: • Arsenic (90-92.5 ft) • uranium (22.5-25 ft) • hexavalent chromium (at all depths with data: 27.5-30 ft, 47.5-50 ft, and 90-92.5 ft; see explanation in subsequent comment) • mercury (17.5-30 ft) • fluoride (90-92.5 ft) • nitrate (90.2-200 ft, assuming the reported value is nitrate, not N) • methylene chloride (22.5-25 ft) Not all of the contaminants at this site are shown in the figure – others may exceed as well.
67	Figure 3-9, page 3-30	Hexavalent chromium is of particular concern at Hanford due to its many sources throughout the site. The Kd assigned to hexavalent chromium in much of the modeling done at Hanford is 0 L/kg. This value for Kd is the most frequent value in PNNL-13895, Rev. 1 (Hanford contaminant distribution coefficient database and user's guide, 2003) (see table 10). For this chemical Ecology considers there to be a need to use a site-specific Kd value of 0 L/kg, which gives a soil cleanup level of 0.2 mg/kg using WAC 173-340 Equation 747-1. Ecology is following WAC 173-340-740(1)(c), which states, "The department may require more stringent soil cleanup standards than required by this section where, based on a site-specific evaluation, the department determines that this is necessary to protect human health and the environment."

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68	Figure 3-9, page 3-30	Please explain the high values for phosphate in the 22.5 to 30 ft depth range. Was phosphoric acid disposed at this site, did the phosphate come from disposal of bismuth phosphate, or is it a breakdown product of TBP? What is the pH at this depth?
69	Figure 3-11	Please address in the text why no results (NR) are reported for Pu-238, Pu-239/240, and U -233/234. This sampling depth appears to be crucial to capturing the maximum concentrations of many contaminants.
70	Figure 3-12	Please address in the text why no results (NR) are reported for U, Cr (VI), and N in NO_2/NO_3 at 29.5-32 feet and for Di-n-butylphthalate at several depth intervals.
71	Figure 3-12, page 3-35	The figure indicates that the following elements exceed the soil standards for protection of groundwater at 216-S-20 crib: Arsenic (72-99.5 ft), uranium (32.5-35 ft), hexavalent chromium (at all depths with data: 32.5-42.5 ft, and 90-92.5 ft), and mercury (29.5-32 ft). Since not all of the contaminants at the site are shown on the figure, others may also exceed.
72	Figure 3-12, page 3-35	Lead exceeds 250 mg/kg (Method A direct contact) at a depths of 29.5-32 ft, at crib 216-S-20, indicating that it is a risk to intruders in the crib.
73	Figure 3-14	Please address in the text why no results (NR) are reported for Pu-238 and Pu-239/240 at 27.5-30 ft.
74	Figure 3-15	The table indicates (in bold) that the maximum concentration for CH_2Cl_2 is 4.3 ug/kg, please correct to show 24 ug/kg as the maximum result.
75	Figure 3-15	Please address in the text why no results (NR) are reported for U at 27.5-30 ft, Diethyphthalate at most depth intervals, and Di-n-butylphthalate at most depth intervals.
76	Figure 3-15, page 3-39	This site has oil and grease at 727 mg/kg at a depth of 220-222.5 ft, which is probably right at the water table. Though it does not exceed regulatory levels in the vadose zone, please provide its concentration in the groundwater below this crib.
77	Figure 3-15, page 3-39	The figure indicates that the following elements exceed the soil standards for protection of groundwater at 216-Z-7 crib: Arsenic (12.5-15 ft), uranium (17.5-25 ft), hexavalent chromium (at all depths with data: 17.5-25 ft, and 197.5-222.5 ft), mercury (17.5-20 ft), cyanide (at the only depth with data: 12.5-15 ft), and methylene chloride (22.5-25 ft). Not all of the contaminants at the site are shown on the figure - others may also exceed.

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78	Figure 3-15, page 3-39	The N concentration (2500 µg/kg) at 40-42.5 ft is not consistent with the nitrate value (there are approximately 4458 µg N in 19,744 µg nitrate, so the N concentration at this depth should be 4458 µg/kg or greater if nitrite is present). Please check the nitrate and N values.
79	Figure 3-15, page 3-39	The maximum concentration box for methylene chloride should be moved to one cell below its current location. The highest concentration is 24 µg/kg, rather than 4.3 µg/kg.
80	Figures 3-17, 3-18, 3-19, and 3-20	Please use a more current reference to illustrate the extent of groundwater contamination and the geometry of the plumes. These figures are dated (2001).
81	Sections 4.4.1, 4.4.3, and 4.4.5	The text states that in addition to the WAC 173-340-747 three-phase model, additional screening based on PNNL-11800 was used to evaluate for potential groundwater impacts. The application of this additional screening criterion for the elimination of COPCs is unacceptable. Please revise the text to include the COPCs eliminated by this screening.
82	Section 4.4.1, page 4-8, bullets	Delete the methylene chloride bullet. There are RBC values for methylene chloride: 2.18E-02 mg/kg for soil for protection of groundwater, and 1.33E02 mg/kg for soil direct contact.
83	Section 4.4.1, page 4-8, 3rd paragraph and general	Delete the statement: "An additional screening evaluation for potential groundwater impacts was applied based on the Pacific Northwest National Laboratory report (PNNL-11800) that indicated that a Kd value of 40 L/kg is a reasonable metric for considering transport from the vadose zone to groundwater." If the concentration exceeds the WAC 173-340 values for any contaminant, the contaminant exceeds risk-based levels and must be treated as a contributor to risk. This may mean that remediation is necessary for the contaminant.
84	Section 4.4.1, page 4-9, 1st full paragraph	RESRAD modeling for nonradionuclides should not be used as a basis for adjusting the contaminant of concern list. This model has not been approved by Ecology as a substitute for the 3-phase model in WAC 173-340.
85	Section 4.4.2.1, page 4-10	The text states that Sr-90 data is only available for one data point. Figures 3-8 and 3-10 indicate that data are present for Sr-90 throughout the borehole depth, and it was detected down to the 67.5-70 ft depth interval. Please clarify.
86	Table 4-1, 4-2, 4-3 and 4-4, page 4-20-4-27	Change the Kd for hexavalent chromium to 0 L/kg, based on a previous comment, and change the screening level to 0.2 mg/kg. Also change the last column for this compound to Yes (it exceeds the screening level).

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Comment Number	Section/Page	Comment
87	Tables 4-2, 4-3, and 4-4, page 4-23-4-27	To calculate the soil value for protection of groundwater for fluoride use the RBC value for groundwater (9.6E02 µg/L), rather than the MCL, since the RBC value is lower.
88	Tables 4-2, 4-3, and 4-4, page 4-23-4-27	Change the Arochlor-1254 value for soil for protection of groundwater from 0.49 to 0.066 mg/kg. The maximum value detected for this site exceeds the screening level – change the last column to read Yes.
89	Tables 4-2, 4-3, and 4-4, page 4-23-4-27	Change the reference for the Kd value for lead from CLARC 3.1 to ORNL.
90	Tables 4-2, 4-3, and 4-4, page 4-23-4-27	Correct the Henry's constants for fluoride and lead from 1 to zero.
91	Table 4-2, page 4-24	The values given for nitrate and nitrite are values for N in nitrate and nitrite. Change the chemical names to Nitrate as N and Nitrite as N.
92	Table 4-2, page 4-24	Change the value for protection of groundwater for toluene from 7.27 to 4.65 mg/kg. The reference dose has been updated in IRIS.
93	Table 4-10, page 4-37	The WDOH reference provides a 0.91 value for the evapotranspiration coefficient and cites EPA Region X guidance. Newer information is available and should be used instead. Published references based on Hanford lysimeter data are in: • Gee, G.W., Z.F. Zhang, S.W. Tyler, W.H Albright and M.J. Singleton, 2005, Chloride mass balance: cautions in predicting increased recharge rates, Vadose Zone Journal 4: 72-78 • Gee, G.W., J.M. Keller and A.L. Ward, 2005, Measurement and prediction of deep drainage from bare sediments at a semiarid site, Vadose Zone Journal 4: 32-40. Values in these references range from 0.39 (sandy gravel) to 1.00 (silt loam).
94	Section 5.2.3, page 5-6, general	No elimination of contaminants from further consideration is accepted at this point in the process – retain all of the contaminants until statistically-defensible data have been collected at all of the waste sites. RESRAD and STOMP have not been approved by Ecology as alternate fate and transport models (per WAC 173-340-747(8)).
95	Section 5.2.5.2, page 5-9	Restate the first statement to "Although groundwater beneath the 200 Areas is not likely to be used as a drinking water source, it flows beneath the River Corridor toward the Columbia River; the future land use assumed for the River Corridor is unrestricted. Therefore, contaminants were evaluated for protection of groundwater for decision-making purposes."

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Comment Number	Section/Page	Comment
96	Section 5.2.5.3, page 5-9, last paragraph	The screening level ecological risk assessment (SLERA) should address all pathways listed in DOE/RL-2001-54, Figure 3-1 – external radiation exposure, ingestion, dermal contact, and inhalation. The Central Plateau ecological risk assessment is considering inhalation to some degree. The SLERA should not be less conservative than the site-specific risk assessment for the Central Plateau.
97	Section 5.2.5.4, page 5-10, 1st paragraph	Delete the last two sentences of the paragraph: "The use of maximum detected concentrations … calculated UCL values may exceed the maximum detected concentration (EPA 2002)." Replace the last two sentences with "Sample numbers were insufficient for providing a meaningful 95 UCL." Site maximum values, particularly when only a few samples have been analyzed, can be below site mean values. In these cases, maximum values are not conservative.
98	Section 5.2.5.4, page 5-11, 1st paragraph and 5.3.2.4, page 5-17, last paragraph	Collect data for volatiles at 216-Z-28 crib. Methylene chloride was detected in samples from the deep zone at values exceeding screening levels (Table 3-9).
99	Section 5.3.2.2, page 5-15	Give the databases and hierarchy used for toxicity values.
100	Section 5.3.2.3, page 5-15, 2nd bullet	Similar to carrying contaminants without background values forward in the risk assessment, the organics given in the second bullet should also be carried forward, and not simply compared with screening values. The data are too sparse to eliminate these contaminants at this stage.
101	Section 5.3.2.3, page 5-16, 3rd paragraph	Change the sentence to "The following contaminants…..will be evaluated by comparison to WAC 173-340-745 for direct contact soil screening levels.
102	Section 5.3.2.3, page 5-16, Deep-zone soils	Add methylene chloride for site 216-T-28. Methylene chloride exceeded screening levels.
103	Section 5.3.2.3, page 5-17, Deep-zone soils	Add methylene chloride for site 216-Z-7. Methylene chloride exceeded screening levels.
104	Section 5.3.2.4, page 5-18, bullets	The contaminants listed are not the only detected contaminants at these sites. For instance, methylene chloride was detected and exceeded screening values for site 216-T-28 (see Table 4-2). A number of other contaminants were detected as shown on Table 5-1 (diethylphthalate, di-n-butylphthalate, phenol, pyrene, Arochlor-1254, and others). Include all of the detected contaminants in these bullets.

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Comment Number	Section/Page	Comment
105	Section 5.3.3, page 5-19, 1st paragraph	Delete the sentence: In the model…top of the aquifer. There are no depth distribution assumptions in the 3-phase model – the model only addresses partitioning, and indirectly addresses toxicity.
106	Section 5.3.3, page 5-19, 1st paragraph	Delete the sentence, "In fact, for most of the contaminants, a considerable thickness of vadose zone separates contamination from the aquifer." Data are only available for one borehole at each site.
107	Section 5.3.3, page 5-19, 1st paragraph	Delete the last 2 sentences of the paragraph. Use the available data in the risk assessment for the contaminants listed (lead, mercury, bismuth) – further screening at this stage in the process is not warranted. Assumptions about contaminant fate are not supported with sufficient data and modeling.
108	Section 5.4.4, page 5-26, 3rd paragraph	Delete the second sentence of the paragraph. The use of a maximum in a small data set may actually underestimate the site mean concentration.
109	Section 5.5.1, page 5-27	For ecological risk assessment, data from the shallow zone for all sites are needed. No data for the shallow zone of 216-T-28 Crib are currently available, leaving only data from 216-S-20 Crib and 216-Z-7 Crib. Collect samples from the shallow zone for the SLERA.
110	Section 5.5.6.1, page 5-30, 1st paragraph	For ecological risk assessment, screening for nonradionuclides should be done against all values in WAC 173-340 Table 749-3, for plants, soil biota, and wildlife.
111	Section 5.5.7.1, page 5-33, Bullets	Add arsenic to the bullet for 216-S-20 Crib. Table 5-21 indicates that arsenic exceeds the screening level in the shallow zone.
112	Section 5.5.9, page 5-36, 1st paragraph	Modify the second sentence of the paragraph: The results of Step 2 (ecological risk-based screening) are provided in Table 5-19 through 5-24. Table ES-1 shows many exceedences that are not given in this paragraph.
113	Section 5.5.9.1, page 5-37, general	Delete the first sentence of the section and the second paragraph of the section. This section and Table ES-1 are not consistent.
114	Section 5.5.1.0, page 5-38, Bullets	Delete the 4th bullet and replace it with the following: The ecological risk assessment should continue; data are needed for the shallow zone of 216-T-28 Crib and at all of the LW-1 and LW-2 sites not sampled for this RI. Also, some exceedences of screening values have been observed at 216-S-20 and 216-Z-7 cribs.
115	Section 5.5.1.0, page 5-39, last paragraph of section	Delete the last paragraph of the section.

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Comment Number	Section/Page	Comment
116	Section 5.5.1.1, page 5-39	Modify the second sentence of the section as follows: Missing data from the shallow zone in 216-T-28 Crib and all of the LW-1 and LW-2 sites not sampled for this RI are somewhat problematic, and appropriate sampling and analysis should be considered in the FS.
117	Section 5.5.1.1, page 5-39	Delete the last two sentences of the section.
118	Section 5.6, page 5-40, 2nd set of bullets	Add the following to the bullets: 216-T-28 Crib - mercury, methylene chloride and hexavalent chromium; 216-S-20 Crib – hexavalent chromium; 216-Z-7 crib – cyanide, mercury, methylene chloride, and hexavalent chromium; also, make this list and Table ES-1 consistent.
119	Section 5.6, page 5-40, last paragraph of page	Delete the paragraph. The contaminants exceeding screening levels cannot be eliminated from further consideration based on the reasoning provided. See previous comments.
120	Section 5.6, page 5-41, 1st 4 paragraphs	Delete the first 4 paragraphs on the page. The additional screening at this time is not appropriate without Ecology approval of alternate modeling (WAC 173-340-747(8)).
121	Section 5.6, page 5-42 – 5-43, SLERA	Revise the section on the screening level ecological risk assessment (SLERA) considering all comments made on the SLERA (ex. exceedences of screening levels and insufficient sampling).
122	Figure 5-1, page 5-44	Include a dot in the box for groundwater ingestion. There is a pathway in the years after active institutional controls and downgradient in the River Corridor.
123	Figure 5-2, page 5-45	Do not use this flow chart until additional data are collected. Once data are available, replace "maximum" with 95 UCL.
124	Figure 5-17, page 5-60	Do not use this flow chart until more data are collected; then replace "maximum" with a 95 UCL. Also, change Footnote D to state that plants, soil biota and wildlife values will be used for screening.
125	Table 5-1, page 5-61 – 5-68	This table does not have all of the contaminants from the RI/FS Work Plan. For instance, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, methyl isobutyl ketone, and dodecane are given as COPCs in the RI/FS Work Plan but are not given here. Please explain the omissions.
126	Table 5-1, page 5-62 and 5-63	Using a conversion factor of approximately (3 mg/kg uranium)/(2 pCi/g uranium), total U values in mg/kg should all exceed the U values given in pCi/g; however, the values given in mg/kg are lower than the values given in pCi/g. Please explain.
127	Table 5-1, page 5-63	Metallic U is given at values of 125,000, 818,000 and 27,900 pCi/g at cribs 216-T-28, 216-S-20 and 216-Z-7 cribs. However, no isotope exceeds 250 pCi/g in any of the cribs, and the sum of the isotopes is somewhat less than the values given for metallic U. Are the metallic U values correct?

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Comment Number	Section/Page	Comment
128	Table 5-7, page 5-75	Put an X in the box for methylene chloride, groundwater protection, for 216-T-28 crib. Methylene chloride exceeded screening levels for groundwater protection in this crib.
129	Table 5-7, page 5-75	Remove the * from mercury, lead and bismuth and delete the associated footnote. No chemicals should be screened at this time on the basis of Kd values.
130	Table 5-8, page 5-76	Fill in the blanks on this table.
131	Table 5-9, page 5-77	Correct the arsenic direct exposure screening level to 8.75E01 mg/kg (arsenic is a carcinogen), and the cyanide direct exposure screening level to 7E04 mg/kg.
132	Table 5-12, page 5-86	The risks associated with Tc-99 (4.8 E-06) and tritium (9.0E-04) exceed WAC 173-340 and CERCLA risk ranges, and are projected to be maximal in 4.5 years at 216-T-28 crib. This should be made very clear in the Executive Summary. Some form of groundwater treatment should be pursued to prevent migration of these contaminants to downgradient areas.
133	Table 5-12, page 5-86 and Table 5-157, page 5-87	The risk values associated with uranium at 216-T-28 and 216-S-20 cribs are significant in 6000 y and exceed CERCLA thresholds. This highlights why considering only the next 1000 y is misleading. These long-term risks should be discussed in the executive summary.
134	Table 5-19, page 5-90	Include plant and soil biota screening levels in the table
135	Table 5-21, page 5-94	Change No in the COEC column to Yes. Arsenic exceeds the screening level. Delete the justification, which states "Depth of result precludes exposure". The exceedence was in the top 15 feet, which is above the point of compliance for ecological receptors.
136	Table 5-21, page 5-94	Change the No for cyanide in the COEC box to yes. The background assumed for cyanide would be 0 mg/kg. Delete the justification for cyanide, which is given as "Not detected". The concentration in the top 15 was 3.95 mg/kg according to the table.
137	Section 6.0, page 6-1, 1st paragraph and Section 6.2, page 6-2	Several Ecology comments above address concerns that not enough data had been collected. Therefore, this paragraph regarding the first purpose should be altered.
138	Section 6.0, page 6-1	The text states that samples were not collected from the shallow zone in the 216-T-28 Crib and that it is anticipated that the major zones of contamination are below the bottom of the crib (15 ft). This statement is unsubstantiated given that geophysical data presented in Chapter 3 indicate a high radionuclide activity zone beginning at 10 ft bgs.
139	Section 6.2.1.1, page 6-3	Please address lateral extent of contamination in this section

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Comment Number	Section/Page	Comment
140	Appendix A, General Comment	The issues which Ecology identified for the data tables in the 200-PW-2 RI Report appear to have been taken into consideration when preparing the tables within Appendix A of this report. The issue of the use of multiple analytical methods has been discussed, and the thought process that was used to evaluate the data has been presented.
141	Page A-iii, Appendices	Please identify the pages on which to find each set of borehole data. See the example below: APPENDICES A-1 DATA SUMMARY TABLE- SHALLOW ZONE.....AT-1 Results for Borehole C4176 (216-S-20 Crib).....Pg AT-1 – AT-3 Results for Borehole C4183 (216-Z-7 Crib).....Pg AT-4 – AT-6 etc..... A-2 DATA SUMMARY TABLE- DEEP ZONE.....:AT-7 Results for Borehole C4175 (216-T-28 Crib).....Pg AT-7 – AT-10 etc.....
142	Page AT-1, Table A-1, Total Uranium	Please delete this line of data. The constituent class and units are incorrect. Furthermore, the correct Uranium information is located further down the table in the appropriate 'Metal" section.
143	Table A-1, Sample Depth	The sample depth (ft bgs) has been provided for constituents that were detected above the detection limits. When the maximum value was a nondetect (i.e., <detection limit) this has not been done. It is just as important to know the depth of the samples which resulted in a non-detect value. Please provide this sample depth information for all constituents.
144	Page AT-7, Table A-2, Total Uranium	Please correct the constituent class to METAL instead of RAD.

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Comment Number	Section/Page	Comment
145	Table A-2, Sample Depth	The sample depth (ft bgs) has been provided for constituents that were detected above the detection limits. When the maximum value was a nondetect (i.e., <detection limit) this has not been done. It is just as important to know the depth of the samples which resulted in a non-detect value. Please provide this sample depth information for all constituents.
146	Page AT-11, Table A-2, Total Uranium	Please correct the constituent class to METAL instead of RAD.
147	Page B-1, 1st bullet	The text states that the SAP required a portion of the data to be formally validated. Please state how much of the data actually underwent a formal validation process. (i.e, 20%?)
148	Page B-1, Section B.1.1	As summarized in the table within this section, the data validation process has resulted in the rejection of 48 analytes for this RI Report. Data that have received a Rejected status are not useable, and should not be reported. Please identify the Rejected status of these analytes within Table A-2 of this report. These data are currently shown within Appendix A as if they are useable.
149	Page B-2, first - sixth bullets	Replace the word "loss" with "rejection". The term rejection more clearly depicts what occurred to these data.
150	Page B-2, third bullet	Convert the 35.7-55.4 mg/kg to µg/kg to correspond to the data presented in the tables.
151	Page B-4, second bullet	The text identifies that the missing Pu-238 and Pu-239/240 measurement for the 216-S-20 Crib may represent modeling difficulties. However, no path has been presented on how the data gap will be remedied. Please provide a proposal for this deficiency within the text.
152	Page B-4, third bullet	The text identifies that the lack of U-233/234 measurement for the 216-S-30 Crib may represent modeling difficulties. However, no path has been presented on how the data gap will be remedied. Please provide a proposal for this deficiency within the text. Furthermore, was 216-S-30 mistakenly listed instead of 216-S-20? Since no data have been presented in this report for the 216-S-30 Crib, this may be a typo. Please investigate. Also, if the U-233/234 data gap that is discussed actually applies to the 216-S-20 Crib data, please apply this comment to that site, and address accordingly.
153	Page B-7, second paragraph, editorial comment	Change the word "meet" to "met" to correspond with the past-tense form, which has been used in the rest of the paragraph.

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Comment Number	Section/Page	Comment
154	Page B-7, Section B3.0	The tables referred to within this section (B1-x, B2-x, B3-x) seem to include the laboratory's names where the analyses were performed. Please provide text within this section that identifies that the laboratory information is also listed within the tables.
155	Page B-10, X	The text states that an "X" qualification means that data were manually entered or modified. Please provide additional information on this occurrence. For example, what type of modifications were required and the basis for them.
156	Table B1.1: Sb-125, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Ni-63, H-3, Total Uranium	Multiple laboratories are listed for these analyses. It is unclear which laboratory analyzed which sample number. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by each laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the other.
157	Table B1.2: Sb, As, Ba, Be, Bi, Cd, Cr, Cu, Cr (VI), Pb, Hg, Ni, Se, Ag	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
158	Table B1.3: Cl, Fl, NO_3, NO_2, PO_4, SO_4, SO_3,	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
159	Table B1.4, numerous VOAs	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
160	Table B1.5, several SVOAs	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.

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Comment Number	Section/Page	Comment
161	Table B1.6, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
162	Table B2-1, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
163	Table B2-2, several metals	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
164	Table B2-3, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
165	Table B2-4, several VOAs	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
166	Table B2-5, several SVOAs	Multiple laboratories are listed for the analysis of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
167	Table B2-6, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.

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Comment Number	Section/Page	Comment
168	Table B3-1, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
169	Table B3-2, one constituent	Multiple laboratories are listed for the analysis of this constituent. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
170	Table B3-3, several constituents	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.
171	Table B3-4, several VOAs	Multiple laboratories are listed for the analyses of these constituents. It is unclear which laboratory analyzed which sample numbers. Please find a way to present the data in such a way that the reader can understand which sample numbers were tested by which laboratory. Possibly list the name of the lab that analyzed the majority of the samples, and use a footnote for the others.