UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

OCT 0 6 2017

Mr. Paul V. Rosasco
Project Coordinator
Engineering Management Support, Inc.
25923 Gateway Drive
Golden, Colorado 80401

Dear Mr. Rosasco:

The U.S. Environmental Protection Agency has reviewed the August 25, 2017, Revised Draft Final Feasibility Study, West Lake Landfill, Operable Unit 1. This document was developed on behalf of the West Lake Landfill Operable Unit-1 Respondents, Cotter Corporation (N.S.L.), Bridgeton Landfill, LLC, Rock Road Industries, Inc., and the U.S. Department of Energy to support the EPA's final remedy decision for the West Lake Landfill Site, Operable Unit-1, in Bridgeton, Missouri.

The EPA has coordinated its review of this document with the Missouri Department of Natural Resources, the Kansas City and St. Louis Districts of the U.S. Army Corps of Engineers, and the U.S. Geological Survey. In accordance with the Remedial Investigation/Feasibility Study Administrative Settlement Agreement and Order on Consent, Docket No. VII-93-F-0005, and the Abbreviated Work Plan for Remedial Investigation Addendum and Final Feasibility Study dated May 6, 2016, the Respondents shall prepare a revised Final Feasibility Study that incorporates the EPA's comments and requested changes.

The EPA will provide a supplemental comment letter addressing Appendix B, Appendix E and Appendix F.

The EPA requests that the Respondents submit their response to comments no later than October 27, 2017, and plan for a meeting during the week of November 13, 2017. The Respondents' revised FFS should be submitted to the EPA by December 8, 2017. In the meantime, if you have any questions or concerns, please contact me either by phone at (913) 551-7141 or by e-mail at jump.chris@epa.gov.

Sincerely,

For

Christine R. Jump
Remedial Project Manager
Site Remediation Branch
Superfund Division

30324351
Superfund

Enclosure

cc: Mr. Ryan Seabaugh, MDNR

EPA Comments on the Revised Draft Final Feasibility Study,
West Lake Landfill Operable Unit-1
August 25, 2017

General Comments

1. Clearly state in Section 5 or another appropriate location that any designs presented in this study are conceptual and for cost comparison purposes only and that final designs and materials will be approved in the Remedial Design Phase of work. All designs presented and discussed as potential alternatives should be referred to as conceptual designs.
2. The Final Feasibility Study, or FFS, puts too much emphasis on current conditions and rarely discusses scenarios as they relate to potential applicable or relevant and appropriate requirements, or ARARs, extending 200-1000 years out, or protection of health through the entirety of the period where risk exceeds threshold values (greater than 9,000 years to maximum risk). Provide discussion of alternatives in appropriate time frames for threshold criteria.
3. The level of detail when discussing the ARARs in Section 3 is inconsistent. Provide a consistent level of detail of the ARARs in Section 3, and reference the ARARs table wherever possible.
4. When using data or evaluations from draft documents, incorporate sufficient detailed information into this document to evaluate the conclusions being made.
5. Globally delete throughout the document subjective adjectives, such as "numerous," "extensive," "minor," "minimal," "major," etc.
6. Revise the groundwater discussions in this document in accordance with the U.S. Environmental Protection Agency's comments on the second draft remedial investigation addendum, or RIA.
7. When making references to a remedial investigation, or RI, add a date to explain which remedial investigation is being referenced.
8. The FFS should incorporate previous studies as necessary to be a stand-alone document, such that extensive research into previous documents is not necessary to understand relevant details and how they are supported.
9. The FFS is inconsistent in its references to capping alternatives throughout the document, as it does not always identify whether the reference is to the Uranium Mill Tailings Radiation Control Act, or UMTRCA, or the 2008 Record of Decision, or ROD, selected cap. This is true particularly with regard to regulations, ARARs, and descriptions of remedial alternative activities. As an example, in Section 3.1.1.1.1, the last sentence states, "The standards also represent potential performance criteria for the design of the cover system for Areas 1 and 2 that is included in the ROD-selected remedy and the partial excavation alternatives." This statement should also separately address the UMTRCA cover alternative. Check the document to ensure that statements which are made to indicate actions, regulations, or guidance as they apply to capping alternatives are updated to incorporate all pertinent remedial alternatives, including the UMTRCA cover alternative.
10. The Environmental Protection Agency is currently continuing to review Appendices B, E and F, and plans to subsequently provide additional specific input to those appendices. The agency's comments to the materials presented in those appendices will effect related text sections as referenced in the FFS document.
11. The FFS document inappropriately identifies comments from the EPA's Office of Research and Development, or ORD, in a manner that portrays the ORD as separate from other agency input. Revise the text to consistently refer to all the EPA comments as being from the EPA. Replace references to the ORD with the EPA globally, and revise statements that refer specifically to the ORD or other agency programs, as appropriate.

12. Globally throughout the document replace subsurface smoldering reaction, or SSR, with subsurface smoldering event, or SSE. Revise Footnote 3 on Page 28 to state, "The reaction ongoing in Bridgeton Landfill has been alternatively referred to as a subsurface smoldering event (SSE) or an exothermic subsurface reaction (SSR). The exact nature of this event or reaction is the subject of ongoing discussions between the state of Missouri, the lead agency for OU-2, and Bridgeton Landfill, LLC. While the EPA is requiring the use of the SSE terminology to be consistent with the evaluations required in abbreviated Remedial Investigation Addendum and Final Feasibility Study work plan for the FFS, this is not intended to be determinative regarding whether SSR or SSE is a more appropriate description of the current reaction." Subsequent discussions or descriptions of an SSE present in other sections of the FFS should also be revised to be consistent with this comment.
13. Ensure that the Industrial Use scenario included as Appendix L is added into the FFS document appropriately.
14. The EPA considers radioactively impact material, or RIM, volumes presented in this FFS as preliminary until approval of the Estimated Three-Dimensional Extent of RIM report which is Appendix B in this draft of the FFS.
15. When discussing the various alternatives, include discussion or consideration of differences between Area 1 and Area 2 and how those differences could affect implementability or consideration of the other criteria.

Executive Summary

1. ES, General Comment – Revise the summary, as necessary, to ensure consistency with the conceptual site model and resolved comments from the RIA.
2. Page ES-1, first paragraph – Add "and the EPA's clarification letter dated August 4, 2016" to the end of the last sentence.
3. Page ES-1, second and third paragraphs – When discussing waste in general terms, and where co-location with municipal solid waste exclusively has not been substantiated, globally replace "municipal solid waste" with "waste materials." Globally delete "solid" when referencing the entire site or portions of the site where permit requirements or other valid documentation does not exclusively support the descriptor.
4. Page ES-1, third paragraph – Replace the first sentence of this paragraph with "Radiological material historically brought to the site consists of Uranium, Radium, and Thorium isotopes and their daughter products, some of which are out of secular equilibrium. For purposes of this Site, any wastes or soils that have become mixed with or contaminated by this radiological material has been defined as Radiologically Impacted Material (RIM), and is identified by the presence of Uranium, Radium, and Thorium isotopes above site-specific threshold values." Also, ensure that the discussion on this page is consistent with relevant comments provided on the distribution of RIM for the revised Remedial Investigation Addendum.
5. Page ES-2 – Revise the ES to include a list of bullets for the alternatives considered to make the presentation of the alternatives clearer to readers.
6. Page ES-2, third paragraph, 20th line – Provide additional details related to short-term impacts with respect to disposal on-site.
7. Page ES-5, first and third bullet – For consistency with all bullets discussing short-term risks to on-site workers, add the sentence, "However, a properly designed health and safety program can be implemented such that exposures are controlled/limited."
8. Page ES-5, fourth bullet – Please note in the bullet that much of the habitat has already been removed under the non-combustible cover, or NCC, work.
9. Table ES-1, following Page ES-6 – Update Table ES-1, as needed, after responding to the EPA's comments on Appendix H and any subsequent revised risk/dose calculations. In addition, a footnote

should be included to explain that the No Action Alternative was screened out based on not being protective.

Section 1

1. Section 1, Page 20 – The main body of the document should start on Page 1, not Page 20.
2. Section 1, Page 20, first paragraph – Insert "conditionally" prior to "approved by the EPA on May 18, 2016," and add reference to the additional EPA letter dated August 4, 2016.
3. Section 1.1, Page 20, third paragraph on page, last full sentence on – In addition to the Buffer Zone, list Lot 2A2 as an adjacent impacted area.
4. Section 1.2, Page 24, first full paragraph on page – Cite the specific Federal Emergency Management Agency, or FEMA, study or evaluation that states landfilled materials contained within Areas 1 and 2 of West Lake Landfill are located outside of the Missouri River floodplain. Also, reference the figure in this document showing the floodplain boundaries.
5. Sections 1.3, 1.4, and 1.5, Pages 24-31 – It is not clear in Section 1.4 that the FFS addresses all of the applicable National Remedy Review Board, or NRRB, recommendations outlined in Section 1.3. Add text to Sections 1.4 and 1.5 to clarify that the FFS incorporates applicable NRRB recommendations.
6. Section 1.4.1, Page 27, last paragraph of this subsection – Remove the statement, "In addition, no uranium equivalent criteria were identified by the EPA for the partial excavation alternatives." Instead, describe the conservative nature of uranium, and reference the risk-based comparison that is included in 2.2.3, last paragraph.
7. Section 1.4.1 Page 27 – Revise this section to be consistent with comments provided on the revised RIA related to consideration of uranium.

Section 2

1. Section 2.1.2, Page 37, last paragraph of subsection, last sentence – This sentence is misleading to the extent that it indicates the berm controls all run-off from Area 2. Revise the sentence to read as follows, "A berm on the northern portions of Area 2 helps control runoff to the adjacent properties to the north; however, in other portions of Area 2, storm and surface water have been documented to flow through various stormwater outfalls that are monitored during and/or following any storm event that exceeds 0.10 inches."
2. Section 2.1.2, Pages 36-37 – Add Operable Unit 3, or OU-3, to this section.
3. Section 2.1.2, Page 37, first full sentence on page – Delete the statement and replace with "Regulatory authority for the Closed Demolition Landfill and the Bridgeton Landfill has been deferred to the MDNR pursuant to the OU-2 Record of Decision."
4. Section 2.1.4, Page 39, last paragraph of subsection, last sentence – Delete this sentence, as it is redundant.
5. Section 2.1.6, Page 39 – Revise this section to include a reference to Section 3.1.2.1 for more discussion on the impact of flooding on buried radiological material.
6. 2.1.6, Page 39, last line on the page – Insert the word "surface" after the words "landfill property," and delete "including the waste deposits." While the surface of the landfill may lie above the 100-year flood plain, much of the actual landfill material (including some RIM areas) are at elevations that place them within the flood plain.
7. Section 2.1.6, the last paragraph starting on Page 39 and continuing on to Page 40 – the EPA commented on these statements in its last FFS comment letter, yet the Respondents failed to make any changes to address the EPA's comments. The Respondents' response that flooding would not increase leaching of RIM as flood waters will not elevate the groundwater level into the RIM must be supported by facts. Information presented in the RIA suggest RIM is located in native alluvial material within the Missouri River Floodplain.

8. Section 2.1.6, Page 39, last paragraph, last sentence on page – Add "surface of the" before "landfill property," and delete "including the waste deposits in Areas 1 and 2."
9. Section 2.1.6, Page 40, last sentence of Section – Provide or cite a reference for the statements made indicating that the 1993 and 1995 floods were 500 and 300 year events, (e.g., 0.2 and .3 Annual Exceedance Probability (AEP)).
10. Section 2.2.1, Page 40, last sentence, and Page 41, last paragraph, third sentence – If using conclusionary words such as "believed" and "assumed," provide references or examples to support those conclusions. Revise this section in accordance with comments on the RIA.
11. Section 2.2.2, Page 41, last paragraph, first sentence – Replace "The radiologically-impacted materials" with "Radiological material." Apply globally where not discussing RIM by its definition.
12. Section 2.2.2, Pages 41 and 42, last paragraph on Page 41 and continuing on to Page 42 – Replace this paragraph with language from the RIA regarding how the radiologically impacted materials were placed at and have been moved around Areas 1 and 2, once that language has been approved by the EPA.
13. Section 2.2.3, Pages 42 and 43 – Revise this section to be consistent with comments provided on the revised RI Addendum related to consideration of Uranium
14. Section 2.2.5, Pages 45 and 46 – Revise this section and subsequent sections discussing volume of RIM and overburden material as necessary based on revisions made to Appendix B, Geostatistics, in the RIA.
15. Section 2.2.5, Page 45, third paragraph, first sentence – Replace "landfill materials" with "surface and subsurface samples."
16. Section 2.2.5, Page 46, first full paragraph – Figures 2-11 and 2-12 show the extent of RIM based on indicator kriging. The text in this paragraph goes on to state the maximum areal extent of RIM present at the surface or subsurface is 8.2 acres for Area 1 and 24.9 acres for Area 2. Revise the text to state the areal extent, in acres, at the surface for Area 1 and Area 2.
17. Section 2.2.5, Pages 45-46 – A different acronym for S.S. Papadopulos & Assoc., Inc., SSP&A, is used here. Check throughout the document to use the defined acronym of SSPA.
18. Section 2.2.5, Page 46, last sentence in the section – Explain the basis for stating the actual volume of RIM is "likely biased low." Provide specifics wherever possible.
19. Section 2.2.6, Pages 46 and 47 – Ensure that this section is caveated appropriately. Where appropriate, explain the limitations of the data and reference the conceptual site model as needed. Incorporate language from the RIA, once approved by the EPA.
20. Section 2.2.10, Page 50, last paragraph, fourth sentence – Revise this sentence to say, "Because this area was subsequently scrapped graded and covered with rock, the actual volume of soil containing radionuclides on the Buffer Zone and Lot 2A2 is uncertain."
21. Section 2.3.1 Page 53-54 – Revise document to include a figure showing locations of the perimeter and offsite air monitoring stations and add references to those figures in these paragraphs.
22. Section 2.3.1, Page 55, last paragraph of the Section. Revise the date range to "...April 25, 2015 to February 17, 2016."
23. Section 2.3.1, Page 54, Footnote 8 – Delete Footnote 8.
24. Section 2.4, last paragraph on Page 56 continuing onto Page 57 – Replace this paragraph with, "Since completion of the original RI in 2000, improvements to the property, such as the addition of a non-combustible cover and drainage controls along the top of Area 2 have decreased the potential for runoff of surface water to contain impacts from RIM. Therefore, this release mechanism is not expected to result in unacceptable risks to current OU1 receptors."
25. Section 2.4, Page 57. 3rd para., last sentence. Delete and replace the following text from the last sentence: "...did not exceed or even come close...", and replace with "...were below...." Additionally, add a date range or specific dates for the samples collected associated with this discussion.

26. Section 2.4, Page 58, second paragraph after bullets, last sentence – Revise this subsection to be consistent with the stormwater discussion in the RI. This should include a discussion of gross alpha results.
27. Section 2.4, Page 58, Footnote 10 – Either in the footnote or the text in this subsection add an acknowledgement that the source of this silt is most likely from the site and has the potential to be contaminated.
28. Section 2.4, Page 58, Footnote 11 – Delete this footnote.
29. Section 2.5.1, Page 60 – Please add "Mississippian" in parenthesis after "Paleozoic."
30. Section 2.5.1, Page 60, third paragraph of subsection – This paragraph states that the thickness of landfill debris in Areas 1 and 2 ranges from 5 - 56 feet. This statement seems inconsistent with the last paragraph on Page 44 (Section 2.2.4) that states RIM-containing intervals range from 0 to 89 ft. below ground surface, and then specifically mentions that deep RIM in Area 1 was buried beneath additional landfilled waste. Revise the text where appropriate to be accurate.
31. Section 2.5.2, Page 61, third paragraph – The first sentence of this paragraph makes the generalized statement that "The regional direction of groundwater flow is generally northward within the Missouri River alluvial valley..." While not incorrect, it is unclear if the text is describing only groundwater flow within the alluvium, or if this statement also applies to the bedrock, because the two are described separately in the paragraph above it. This statement is best used to describe flow in the alluvium. The Missouri River and its valley are a region drain from groundwater in the bedrock and regional flow in the bedrock is generally toward the river valley but probably not northward. Text on top of Page 62 more correctly describes regional groundwater flow in the bedrock as northwest toward the Missouri River. Make corrections to or clarifications in the text in this subsection where appropriate.
32. Section 2.5.2, Page 61, third paragraph – Revise the second sentence as follows, "Based upon data collected during the RI, the difference existing in the water table surface beneath the site (less than one foot) makes interpretation of the groundwater flow direction based only on water level data difficult."
33. Section 2.5.2, Page 62, first paragraph on page – The third sentence beginning with "Accordingly, the nearest...." is out of place and should be deleted.
34. Section 2.5.2, Page 62, second paragraph on page –
    a. Strike "comprehensive" from the text in this paragraph and elsewhere throughout the document when referring to groundwater work that has taken place in the past.
    b. The Last sentence stating "None of the wells are used...." cannot be verified. One of the alluvial wells identified by USGS and sampled by the EPA was used to provide water to a riding stable. While the well was probably mostly used for livestock or washing, it is possible that the water could be used for drinking. Revise this sentence to indicate that the downgradient wells are used for industrial or commercial purposes; however, it is possible that one of the wells could be used for occasional domestic purposes.
35. Section 2.5.3, Page 62 – Be consistent throughout the document when using 2012-2013 or 2012/2013 in reference to the past sampling events.
36. Section 2.5.3, Page 62, first paragraph in subsection, first sentence – This sentence should be expanded after "FS" to add, "and during 2012-2013."
37. Section 2.5.3, Page 62 – Last sentence of third paragraph in subsection – Delete the entire sentence starting with "However, Ra-226 levels as high as 35 pCi/L and Ra-226 as high as 26 pCi/L...," as this statement is not appropriate in the context of background values. These reported levels are from on-site wells with documented leachate effects and none of the on-site wells are considered to be "away from disposal units". Furthermore, the effects of the on-site leachate collection system on hydraulic gradients has not been determined, thus the use of this terminology is not appropriate.

38. Section 2.5.3, Page 62, last paragraph on page, second sentence – Revise this sentence to be consistent with related comments on background levels of radium-226 provided on the second draft RIA.
39. Section 2.5.4.1, Page 64 –
    a. First thru fourth paragraphs in subsection - Consistently identify the number of detections in groundwater of benzene, chlorobenzene and vinyl chloride greater than their respective MCL (e.g., 11 of 73 samples).
    b. Last paragraph in subsection – Delete the first sentence. While the occurrence of individual volatile organic compounds, or VOCs, might appear to be isolated, grouping together the field-related VOCs (benzene, toluene, ethyl benzene, xylene, etc.) and chlorinated VOCs, the distribution does not lend itself to the description of "isolated". It seems 39 of the 83 wells for which data is available have >5 ug/L total VOCs (nearly 1/2 of the wells onsite) and at least 60 of the wells have some detection.
40. Section 2.5.4.3, Page 65 –
    a. Delete "Most of the" at the beginning of the first sentence of the paragraph.
    b. Reference, where possible, the Nephelometric Turbidity Unit, or NTU, measurements supporting the colloidal hypothesis in this paragraph.
41. Section 2.5.4.3.2 and Section 2.5.4.3.3, Pages 65 and 66 – Provide redox values to support the statements that the occurrences of iron and manganese in groundwater are consistent with the presence of reducing conditions. Also state whether the municipal solid waste, or MSW, decomposition would be beyond the reducing stage at this point in time.
42. Section 2.5.4.3.3, Page 65 – In addition to referencing the secondary maximum contaminant level, or MCL, for manganese, include, if possible, an analysis against a manganese health based number and whether it exceeds a hazard quotient of 1.
43. Section 2.5.4.4.2, Page 67, first paragraph - Verify that the number of wells with chloride detections in excess of the standard is correct. Revise section , as appropriate. Clarify in the text whether the numbers provided includes all "well" types, such as leachate risers (LR-105).
44. Section 2.5.5, Page 67, general comment – The summary discussion in this section is incomplete. The summary from the 2014 United States Geological Survey, or USGS, report indicates that there is insufficient data to provide a definitive conclusion from the 4 possible hypothesis. Revise to add the following two sentences at the end of this Section: "In conclusion, the USGS 2014 groundwater study could not rule out RIM as the origin for radium identified in seven of the thirteen groundwater wells that had average combined radium levels in excess of the MCL. Additionally, of the 83 on-site groundwater wells included in the USGS 2014 study, 47 wells were identified to have landfill leachate effects."
45. Section 2.5.5, Page 67, last paragraph on page — Delete the conclusion that "... there are no VOC impacts to groundwater beneath or immediately downgradient of Areas 1 and 2."
46. Section 2.6.3, Page 71, first paragraph in section, third sentence – Replace this sentence with, "These future risks hypothetically assume that the landfill will not have a cover and no remediation will occur, which is consistent with the EPA baseline risk assessment process (EPA 1989, Page 1-4)." Add this reference to Section 8, References.

Section 3

1. Section 3, General Comment – The level of detail when discussing ARARs in this section is inconsistent. Some ARARs are not discussed, while some topics categorized as neither ARARs nor

"To Be Considered", or TBCs, are discussed at length. Provide a consistent level of detail of ARARs in Section 3 and reference the ARARs table wherever possible.

2. Section 3.1.1.1.1, Page 74, last paragraph – Insert the following language at the beginning of the first sentence, "While habitable buildings are not expected to be constructed on Area 1 or Area 2,"
3. Section 3.1.1.1.1, Page 74 – Delete the last sentence in footnote 14.
4. Section 3.1.1.1.2, Page 75 and 76, paragraph that spans both pages – Upon review and consideration of ARARs determinations made at other Superfund sites related to the cleanup standards specified in Title 40 of the Code of Federal Regulations, or 40 CFR, 192.12 and to ensure consistency nationally, the EPA is providing the following revisions to comment number 68 provided in the comment letter on the previous draft of the Final Feasibility Study:

   "The definition of a disposal site as described in 40 CFR 192.00 (d) is as follows: "Disposal site means the region within the smallest perimeter of residual radioactive materials (excluding cover materials) following completion of control". Control is further defined in 40 CFR 192.00 (c) as "any remedial action intended to stabilize, inhibit future misuse of, or reduce emissions or effluents from residual radioactive materials." Neither the presence of MSW in OU1 nor the use of OU1 Areas 1 and 2 as solid waste disposal units qualifies these areas as disposal sites. Therefore, 40 CFR 192.12 standards should be evaluated for potential relevance to the Buffer Zone/Lot 2A2 property portion of OU1, as well as, to Areas 1 and 2. Because RIM (defined by specific levels of Radium, Thorium, and Uranium) has been determined to be present either currently, or at some point in the past, in portions of Area 1, Area 2, the Buffer Zone, and Lot 2A2; and because the concentrations of Thorium-230 are out of equilibrium, which will cause the Radium-226 concentrations to increase in the future, the EPA has determined that the residual radioactive materials considered in 40 CFR 192.12 are similar to the RIM present in OU1 of the site. The EPA notes that OSWER directive 9200.4-25 states, "The purpose of these standards was to limit the risk from inhalation of radon decay products in houses built on land contaminated with tailings, and to limit gamma radiation exposure of people using contaminated land (see 48 FR 600)." The EPA agrees that the probability of residential land use on Areas 1 and 2 is unlikely, and therefore, is not an anticipated future land use.

   However, because RIM is similar to residual radioactive materials considered in 40 CFR 192.12, the EPA has concluded that the cleanup standards in 40 CFR 192.12 are relevant and appropriate for all of OU-1, except for the areas covered by an engineered cap compliant with standards in UMTRCA Subpart A. In accordance with OSWER Directive 9200.4-25, areas not covered by such an engineered cap require a site-specific determination of risk demonstrating protectiveness under the Comprehensive Environmental Response, Compensation, and Liability Act, or CERCLA. The EPA also notes that these standards include concentrations for both surface and sub-surface soils as discussed further in OSWER directive 9200.4-25.

   Revise this section to reflect that the standards in 40 CFR 192.12 are relevant and appropriate for OU-1, as stated above. In addition, list OSWER directive 9200.4-25 as a TBC because this directive provides guidance on the use of soil cleanup criteria in 40 CFR Part 192 as remediation goals for CERCLA sites."

   Revise the paragraph that spans Pages 75 and 76 to be consistent with the EPA's revised comment immediately above.

5. Section 3.1.1.1.2, Page 76, second and third paragraphs – Replace the term "CERCLA UMTRCA guidance" with the appropriate references to the specific applicable Office of Solid Waste and

Emergency Response, or OSWER, (currently named Office of Land and Emergency Management) directive or guidance documents. Revise the last sentence on Page 76 as follows, "Overland gamma surveys and surface soil sampling of land adjacent to Area 2 have indicated that soil containing radioactive material is present on the surface of the Buffer Zone and a portion of the Crossroads Industrial Park due to erosion from the surface of Area 2." Revise the first sentence on Page 77 as follows, "Subsequent site development of the Crossroads Industrial Park resulted in regrading of the surface soil located on Lot 2A2, which is owned by Crossroad Properties, LLC. These regrading activities included placement of a portion of the surface soil from Lot 2A2 onto the Buffer Zone." Further revise the last two sentences of the first paragraph on Page 77 as follows, "Any RIM determined, during subsequent investigations or confirmation sampling events, to be present on land outside of Area 1 and Area 2, including the Buffer Zone and Lot 2A2, could potentially represent conditions that are similar to "vicinity" sites as defined by the UMTRCA regulations. Therefore, the standards established pursuant to 40 CFR § 192.12(a) represent relevant and appropriate requirements for remedial actions taken to address radionuclides in soil at these locations, except for the areas covered by an engineered cap compliant with standards in UMTRCA Subpart A. In accordance with OSWER Directive 9200.4-25, areas not covered by such an engineered cap require a site-specific determination of risk demonstrating protectiveness under CERCLA."

6. Section 3.1.1.1.2, Page 77, second paragraph – Revise this paragraph as follows, "The Buffer Zone previously was not owned by or part of the landfill property but subsequently was purchased by Rock Road Industries, Inc. and became part of the landfill property. This area is fenced and access to this area is restricted to remedial action workers trained in health and safety procedures at hazardous waste and radioactive sites. This parcel is zoned M3 – Planned Manufacturing District, consistent with the zoning for the rest of the Crossroads Industrial Park. For these reasons, current and anticipated land use for this parcel does not include residential. A portion of the Buffer Zone was recently used for construction of a rock buttress as part of the placement of a non-combustible cover over RIM occurrences at the ground surface in Area 2. Implementation of some of the remedy alternatives evaluated in this feasibility study could require utilizing a portion of the Buffer Zone for extension of the toe of the Area 2 landfill to achieve the maximum slope angles. In those instances, other standards may be relevant and appropriate for these portions of the Buffer Zone, including those in 40 CFR 192.02. As stated above, the UMTRCA cleanup standards in 40 CFR 192.12 are relevant and appropriate for all of OU-1 except for the areas which may be covered by an engineered cap compliant with standards in UMTRCA subpart A. In accordance with OSWER Directive 9200.4-25, such areas not covered by such an engineered cap require a site-specific determination of risk demonstrating these cleanup levels are protective under CERCLA."
7. Section 3.1.1.1.2, Page 77, last paragraph – Revise this paragraph by including a discussion of 40 CFR 192.22 (a) which states that remedial action alternatives must come as close to meeting the otherwise applicable standard under 40 CFR 192.02(c)(3) as is reasonably achievable. Include in this discussion, include the following statement, "Should the site-specific factors which were the basis for the development of a supplemental standard change at any point in the future, remediation may be required to the otherwise applicable standard."
8. Section 3.1.1.1.3, Page 78, first paragraph in the section – Delete the first sentence of this section, and delete the reference to 40 CFR 192.03 in the second sentence as this is a procedural, not substantive, requirements.
9. Section 3.1.1.2, Page 79, the last paragraph in the section – Revise the sentence that starts with "Because the cleanup standards in..." as follows, "Because the cleanup standards in 40 CFR

192.12(a) are relevant and appropriate for OU-1, as stated in section 3.1.1.1.2, the Criterion 6(6) rule is potentially relevant and appropriate as well." Include a similar reference in Table 3 to Criterion 6(6) as potentially relevant and appropriate.

Also, delete the last two sentences of this subsection. The EPA notes that OSWER Directive 9200.4-35P also states that "Site-Specific application of the Criterion 6(6) rule as a RAR will involve both a dose assessment to establish potential cleanup levels for the residual radionuclides as well as a determination of whether the dose assessment developed under the rule is protective enough to establish cleanup levels under CERCLA." This directive as well as OSWER Directive 9285.6-20 (which was suggested in a previous EPA comment letter (Comment 70) provide further guidance on how to determine whether the dose assessment developed under the rule is protective. When evaluating the non-carcinogenic risks posed by uranium, the December 21, 2016, EPA memo titled, "Considering a Noncancer Oral Reference Dose for Uranium for Superfund Human Health Risk Assessments" provides updated guidance on toxicity values. In particular, Page 4 of the memo states, "OSRTI, therefore, recommends the use of the ATSDR intermediate MRL for soluble uranium without further adjustment, in lieu of the RfD currently published in IRIS, for assessment of chronic exposures also."

Revise this paragraph as noted above to conclude that the Criterion 6(6) rule is relevant and appropriate. Include a statement in this section that acknowledges the December 21, 2016 memorandum is a TBC and reference the section where the details of the memorandum are summarized. In addition, OSWER directives 9200.4-35P and 9285.6-20, should be utilized to perform the required dose assessment. Include the details of this dose assessment and a summary of the findings in Section 3.3 where appropriate.

10. Section 3.1.1.2, Page 79, second full paragraph – add the acronym "RARs" to the List of Acronyms.
11. Section 3.1.1.3, Page 79, first paragraph in the section – Add to this paragraph a short summary of the more detailed discussion provided in 3.1.1.5.1 regarding OSWER Directive 9283.1-14 (with a reference to the appropriate page in the FFS where the evaluation of this directive is presented). Include identification of radionuclides at the site that have exceeded their MCL.
12. Section 3.1.2.2, Page 99 -
13. Section 3.1.3.3, Page 101. Paragraph located at the top of Page 101. 2nd to last sentence. Revise the text that begins, "EPA (1988b) has indicated...." to state: "Subtitle C covers are generally not considered appropriate for MSW landfills because of assumed lower toxicity waste; however, this is not the case at Operable Unit 1 of the West Lake Landfill due to the presence RIM at concentrations that exceed unacceptable risks."
14. Section 3.1.1.4, general comment – Add a subsection to this section that discusses 40 CFR Part 61 Subpart H which is summarized in Table 3-1.
15. 3.1.1.4.1, Pages 80 – 81 – Reconcile the regulatory citations in the text of this section (which primarily references 40 CFR Part 61.223) with the reference in Table 3 (which only references 40 CFR Part 61.222).
16. Section 3.1.1.4.2, Page 81, general comment – The first paragraph of this section concludes that all of 10 CFR Part 20 is not applicable to the site. However, the last paragraph on the page that discusses Subpart C includes the following sentence, "In such a case, various protective measures required by Part 20 and NRC guidance may also apply, such as establishment of radiation

monitoring and protection programs to control occupational doses within limits." Resolve the apparent conflict between these two statements. In addition, the paragraphs that discuss Subparts C and D in general conclude that certain standards are not relevant and appropriate but could be viewed as relevant and appropriate during certain circumstances. Further revise this section to include an evaluation of pertinent specific 10 CFR Subpart 20 standards. Include in this evaluation the guidance provided in OSWER Directives 9200.4-18 and 9285.6-20. Provide a final determination as to whether any dose standards established in 10 CFR Part 20 are relevant and appropriate for the site and if so, for which remedial alternatives.

17. Section 3.1.1.4.2, Page 81, first paragraph in the section – Add the following sentence to the end of this paragraph, "This dose is less than the ARAR protectiveness criteria evaluation recommendation of 12 mrem/yr specified in OSWER directive 9285.6-20 (See section 3.1.1.5.1)."
18. Section 3.1.1.4.4, Page 82, second paragraph in the section – Add a discussion to this paragraph that considers whether the Missouri maximum contaminant levels may be relevant and appropriate for discharges of storm water from the site. The EPA notes that 40 CFR 122.26 establishes the need for stormwater permits for landfills and open dumps, while 10 CSR 20-6.200 establishes the substantive requirements of such discharges. Further, 10 CSR 20-7.031(5)(1), with cross-reference to 10 CSR 60-4.060, establishes the state regulation for water quality standards which include the specific criteria for radioactive materials. This specific criteria is specified as the state and federal limits for drinking water supply which are equivalent to the standards specified in 40 CFR 141.66 for radionuclides.
19. Section 3.1.1.5, Pages 83 through 86, general comment – The discussion of the specific guidance documents often does not include a final determination as to whether the guidance documents represent a TBC for the site. Revise each subsection to clearly indicate which guidance documents, as well as which specific elements contained in those documents, are TBCs. In addition, FUSRAP uranium cleanup levels are not guidance documents and were determined site specifically using ARARs and other guidance determined to be relevant and appropriate for each specific FUSRAP site. This subsection therefore does not belong in the evaluation of ARARs for OU-1 of the site and should be deleted unless portions of the discussion presented in this subsection are pertinent to the evaluation of a regulation or guidance being considered for the site. In those cases, the specific information that is determined to be pertinent should be added to the appropriate evaluation of the specific ARAR or TBC in this section.
20. Section 3.1.1.5.1, Page 83, last paragraph on the page – Revise the last sentence of the paragraph as follows, "OSWER Directive 9200.4-18 states that overall the EPA finds that a 15 mrem/yr effective dose equivalent level (with a risk of 3×10^{-4}) is at the upper end of the remediation levels that have generally been selected at radioactively contaminated CERCLA sites." Add the following sentence, "This level has been subsequently lowered as specified in OSWER directive 9285.6-20 presented later on in this section."
21. Section 3.1.1.5.1, Page 84, first paragraph – Revise this paragraph to be consistent with section 3.1.1.1.2 after responding to the EPA comments provided to for this section. This should include recognition that the cleanup standards establish in UMTRCA subpart B are relevant and appropriate for all portions of OU-1 under specific remedial alternatives or circumstances. The second paragraph appears to be redundant and should be deleted. Consistent with previous comments replace the term "CERCLA UMTRCA guidance" with the specific reference to a particular guidance.

22. Section 3.1.1.5.1, OSWER Directive 9200.4-25 – Please add the following sentence at the end of the paragraph: "Under CERCLA the risk posed based on the reasonably anticipated future use should be considered in determining if additional controls such as institutional controls may be warranted."
23. Section 3.1.1.5.1, Page 85, paragraph that discusses OSWER Directive 9200.4-35P – Revise this section to be consistent with section 3.1.1.2 and the associated EPA comments. This subsection should include a summary of the information provided in the guidance that pertains to conducting the required dose assessment.
24. Section 3.1.2.1, Page 87 – Please accurately state throughout this section that portions of the site are included within the 0.2-percent annual chance (500-year) floodplain. Also, provide an introductory discussion that recognizes that all conclusions and statements in this subsection describe current conditions. Then discuss the length of time for which some remedies may need to be designed in order to meet certain ARARs or be protective of human health. Also, address the uncertainty involved with possible conditions far into the future. For example, acknowledge the fact that the river may move within its geomorphic flood plain during the time period where toxicity of the remaining RIM remains Finally, state that long-term uncertainties such as these will be evaluated for each alternative.
25. Section 3.1.2.1., Page 87, first paragraph – Review whether Executive Order 11,988 and the Missouri Governor's Order 82-19 are more appropriately identified as TBCs.
26. Section 3.1.2.1, Page 87, first paragraph in subsection, second sentence – Replace this sentence with "All of OU-1 is located within the geomorphic floodplain of the Missouri River."
27. Section 3.1.2.1, Page 87, first paragraph in subsection, fourth sentence – This statement is not supported by data or Figure 2-9. Revise the statement to be accurate.
28. Section 3.1.2.1, Page 88, first sentence on page – Replace "reach" with "inundate" and delete the footnote.
29. Section 3.1.2.1, Page 88, second sentence – Add "current" after "Due to the."
30. Section 3.1.2.4, Page 89, second paragraph, last sentence – Cite the document that discusses the "extensive geologic mapping of the quarry walls" or delete the statement.
31. Section 3.1.2.6, Page 89 – Administrative requirements are not considered to be ARARs. Revise this subsection accordingly.
32. Section 3.1.2.8, Page 90 – Identify the specific provisions in the Federal Aviation Administration, or FAA, Advisory Circular 150/5200-33B and FAA ROD that are potential TBCs.
33. Section 3.1.2.8, Page 91 – While the EPA appreciates the importance of issues associated with the nearby airport, the details of the FAA ROD are not needed in this section of the document. Delete language on this page starting with, "The FAA decision documents states..." down through "(FAA ROD, September 30, 1998, pp 42-43)."
34. Section 3.1.2.9, Page 94, second, third and fourth paragraphs – Delete these paragraphs or present a balanced summary of all pertinent communications between the Respondents, the city, the Missouri Department of Natural Resources, or MDNR, and the EPA.
35. ~~Section 3.1.2.9, Page 94, end of this subsection~~ – Add to this subsection a discussion from Appendix D of the October 20, 2014 Isolation Barrier Alternatives Analysis West Lake Landfill Superfund Site, which concludes that an effective bird mitigation plan could be prepared to address excavated waste containing edible organic material.
36. Section 3.1.3.1., Page 96, first full paragraph – Delete the paragraph and replace with, "The fact that the RIM materials account for the majority of the risk posed by the site, which include exposure to gamma radiation and radon, as well as, the potential for RIM to leach, indicate the cap design should focus on the performance standards of UMTRCA. Additional measures as specified by any RCRA closure criteria should supplement the design of the capping system to ensure it is protective for all materials present at the site."

37. Section 3.1.3.1, Page 97 – Please indicate that the alternate concentration limit in 40 CFR 192.02(c)(3) is not an ARAR for the OU1 remedial action.
38. Section 3.1.3.2, Page 98, second sentence of the subsection – Revise to state, "Because these areas contain solid wastes, the RCRA Subtitle D regulations and the MDNR Solid Waste Management Regulations must be considered in addition to UMTRCA performance standards for design and implementation of a containment remedy."
39. Section 3.1.3.2, Page 99, first paragraph of subsection - Address Missouri Hazardous Waste Management Law (RSMo 260) and Regulation 10 CSR 25-7.268. Land disposal restrictions of hazardous substances generated during remediation in this subsection.
40. Section 3.1.3.3, Page 100, last paragraph – Delete portions of this paragraph from the 6th line through the 13th line, beginning with, "Because the waste materials in Areas 1 and 2 are primarily MSW..." and ending with, "RCRA Subtitle C regulations."
41. Section 3.1.3.3, Page 100 – For the sentence beginning with "In any event..." revise to clearly explain the differences in permeability, and therefore protection from the possibility of leaching, for each of the two capping designs presented in the FFS.
42. Section 3.1.3.3, Page 101 – Delete the first full sentence and the last sentence in this paragraph. Add at the end of the paragraph, "One important difference between a Subtitle D and Subtitle C landfill cover is the permeability of the capping materials, 10-5 cm/sec and 10-7 cm/sec, respectively. Due to the west lake contaminant's toxicity, longevity, potential to leach, and the contaminants location at depth near the water table, a cap meeting the standards describe in the Subtitle C cap guidance would be more likely to achieve the groundwater protectiveness standard of the UMTRCA regulations (40 CFR 192.02(c)(3)). Also, in this subsection clearly identify the cap design criteria found in the two RCRA Subtitle C cap guidance documents as a TBC.
43. Section 3.1.4, Page 101, general comment – Include in this section a description of the rationale and basic requirements of the analysis described in the June 26, 2000, letter from the EPA's Office of Air and Radiation and Office of Solid Waste and Emergency Response to Idaho State Senate Minority Leader, Clint Stennett, regarding the unregulated disposal of radioactive by product waste generated before 1978. This evaluation is commonly referred to as a "Stennett Analysis." The EPA previously provided multiple examples of such an analysis to the Respondents. The discussion in this section should specify that this analysis must be performed prior to disposal of any radioactive materials at any disposal facility that does not have a license from the NRC or from an agreement state.
44. Section 3.2, Pages 108 and 109, general comment – Upon further consideration of appropriate remedial action objectives (RAOs) for the site, the EPA is providing the following revisions to the RAOs:
    a. Prevent direct contact to contaminated media (including waste material, fill, stormwater, sediments, leachate and groundwater) located on or emanating from OU-1.
    b. Prevent exposure by inhalation and external radiation from contaminated media (including waste material, fill, leachate, and gas emissions) located on or emanating from OU-1 that exceed the more stringent of a 10-4 to 10-6 risk (or a Hazard Index of 1 for non-carcinogenic risk) or other health-based standards identified in the ARARs.
    c. Minimize infiltration to prevent contaminants from leaching to groundwater in excess of MCLs, or if there is no MCL, other standards identified by the ARARs.
    d. Control and manage leachate to ensure that groundwater and surface water are protective of reasonably anticipated use.
    e. Control and treat landfill gas from OU-1, including radon to ensure that there is no residential exposure off-site or to site workers and trespasser.
    f. Additional RAO for Crossroads Lot 2A2 – Remediate soils to the extent necessary to ensure no unacceptable residential exposures in this area.

45. Section 3.3.1, Page 109, first paragraph in the section – Add the words "to the portions of the site that are covered." to the end of the first sentence. Delete the second sentence. Revise the last sentence as follows, "Any engineered landfill cover that would be installed under either of these alternatives will extend as necessary to comply with all ARARs." Revise the second paragraph as follows, "Any portions of OU-1 that are not expected to receive an engineered cover and that are determined to be impacted by radioactive materials from the site, such as Lot 2A2, will require cleanup levels consistent with the ARARs and TBCs determined for the site so long as a Site specific evaluation of risk demonstrates the cleanup level is protective under CERCLA."
46. Section 3.3.2, Page 110, first full sentence on the page – Replace this sentence with "Although the UMTRCA standards are not applicable, they are relevant and appropriate for OU-1 and represent standards that have been established by the EPA for remediating radionuclide occurrences to allow for unrestricted use so long as a site-specific evaluation of risk demonstrates these levels are protective."
47. Section 3.3.2, Page 110, first paragraph – Revise the sentence that beings with "The standards established pursuant..." as follows, "The standards established pursuant to 40 CFR Part 192 Subpart B are intended to allow for unrestricted use of land relative to radionuclide occurrences at so called "Title I" sites. In addition, revise the last sentence as follows, "The Site would still contain MSW and other wastes even if RIM were removed at levels above the UMTRCA standard. Therefore, the remaining wastes would still be subject to the solid waste regulation requirements including installation of an engineered landfill cover and institutional controls that prohibit residential land use (although the engineered cover would not have the same requirements as those specified in UMTRCA Subpart A)."
48. Section 3.3.2, Page 110, second paragraph – Revise the portion of this paragraph that describes establishing cleanup levels for Uranium to be consistent with the EPA comments provided for the revised Remedial Investigation Addendum and comments related to criterion 6(6) from 10 CFR 40 appendix A.
49. Section 3.3.2, Page 110, third paragraph – Delete the last sentence of this paragraph.
50. Section 3.3.2, Page 112, last paragraph – Revise this paragraph as necessary to be consistent with the EPA provided comments on this discussion in the RIA.
51. Section 3.3.2, Page 113, last paragraph – Revise this paragraph to be consistent comments provided for section 3.3.1 related to determining the extent of any engineered cover and any other portions of the site that will not receive an engineered cover. In addition, revise the discussion about uranium cleanup levels by including the details of the criterion 6(6) evaluation.
52. Section 3.3.3, Page 115, first paragraph – Delete the second sentence that begins with "It is also the risk-based level..."
53. Section 3.3.3, Page 115, first two paragraphs, last sentences – Replace "protectiveness level" with "calculated risk of approximately 10E-6, within the EPA's acceptable risk range. "
54. Section 3.3.3, Page 115, second paragraph – Delete the sentence that starts with "However, EPA did not provide" as this is not relevant to the discussion in this section and because Respondents agreed to following language contained in the final RI Addendum and Final Feasibility Study workplan, "The SOW indicates that the Respondents have the ability to propose in the Work Plan for the RI Addendum and Final FS a different depth to be used for this alternative. However, given that the additional characterization work is ongoing, it is premature to propose an alternative depth at this time. In the event that an alternative depth interval reflective of the actual site data is identified during evaluation of the data during preparation of the RI Addendum and FFS reports, the Respondents will contact EPA to discuss any proposed alternative depth and obtain EPA approval for such a proposal at that time." In addition, the EPA was not provided the data and information to consider evaluating an alternative depth for partial excavation until the recent submittal of the RIA

and FFS. Add a sentence in this paragraph that states whether the respondents intend to propose an alternative depth. Finally, insert the following sentence before the last sentence in this paragraph, "The EPA's guide to Principal Threat and Low Level Threat Wastes states that while there is no "threshold level" of toxicity/risk that has been established to equate to "principal threat," treatment alternatives should be evaluated where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater."

Section 4

1. Section 4.3.2.1, Page 124, last sentence on the page – Add "service life" as an influencing factor.
2. Section 4.3.3.6, Page 133, last paragraph – Delete "Neither of these radionuclides has been detected in dissolved-phase groundwater at levels above background." since background levels in groundwater have not been established.
3. Section 4.3.3.6, Page 134, last paragraph of the sub section, second sentence – Delete the ending of this sentence, "which in the case of Areas 1 and 2 have been shown to be in generally unsaturated conditions (EMSI, 2017a and EMSI, 2000)."
4. Section 4.3.2.4.3, Page 151, last paragraph – Add discussion to this paragraph regarding possible methods to address concerns about driving piling through RIM.
5. Section 4.4.1.1, Page 152-154 – The EPA disagrees with the Respondents' conclusion that this temporary structure technology should be eliminated at this point in time from consideration for excavation areas. Whether or not this technology is appropriate for this site could depend on the remedial alternative selected and excavation depths (if an excavation remedy is selected). Respondents also need to provide further justification regarding concerns about the geotechnical properties, since many of the excavation areas contain older, more compacted waste. Revise this subsection accordingly.
6. Section 4.5, Page 156, 2nd paragraph – Delete this paragraph.
7. Section 4.5, Page 157, last paragraph – Revise this paragraph to include the process options listed in a bulleted format for clarity and emphasis.
8. Section 4.5, Page 157, last paragraph – Revise to include new text to clearly indicate which process options/technologies discussed were or were not included in the cost estimates (Appendix K). This new text should also include any technologies identified in the referenced FS Report (EMSI, 2006).

Section 5

1. Section 5.1.1, Page 159, partial paragraph, top of the page – delete the word significantly from the last line.
2. Section 5.1.1, Page 160, second paragraph, first sentence – Delete "presumed historic erosion of the landfill berm along the west side of Area 2 and the resultant."
3. Section 5.1.2, Page 161, first paragraph – The appropriate reference to the letter being discussed should be (EPA, 2010a). There is no EPA, 2010 listed in Section 8. Perform a global search and revise all references to EPA, 2010 to either EPA, 2010a or EPA, 2010b , as appropriate.
4. Section 5.1.3, Page 162, last paragraph – Revise 2006 to 2016.
5. Section 5.1.3, Page 162, first paragraph after the numbered list of remedy alternatives – This sections lists the remedy alternatives being evaluated in this feasibility study as required by the EPA's statement of work. Add a discussion in the paragraphs that follow the numbered list of remedy alternatives that includes the following: (1) Consistent with the findings in the RI Addendum and the revised baseline risk assessment, the radionuclides that account for the majority of the risk are radium and thorium, (2) therefore these radionuclides are suitable for guiding remedial alternative evaluation and implementation, (3) however, any further sampling to complete remedial design or final status survey sampling should include isotopic uranium analysis to ensure remaining concentrations do not exceed the EPA acceptable risk range.

6. Section 5.1.3, Page 162, last paragraph continuing on to Page 163 – UMTRCA requirements are performance based, and do not prescribe a specific design. Acknowledge in this paragraph that the description of the cap design is conceptual and the UMTRCA cap must be designed to ARARs and TBCs.
   Section 5.3, Page 163 – Add a bullet to list of major components of the ROD-Selected remedy for identification and confirmation of the precise area the caps need to cover (this is also pertinent to the UMTRCA Cap).
7. Section 5.3, Page 164, last paragraph, third sentence – Delete the sentence.
8. Section 5.3, Page 164, Footnote 27 – The buffer zone and Lot 2A2, where the lateral extent of the cap could extend, is not outside the 500-year flood plain. The surface elevation may be above the current designated 500-year flood level, however, portions of Operable Unit 1 are within the geomorphic flood plain. Replace "outside" with "above" and replace "plain" with "level."
9. Section 5.3, General Comment – The EPA previously requested that this section reflect the use of UMTRCA as the primary standard for the capping alternative. The PRP's response was that this section describes the major components of the ROD-selected remedy as described in the ROD. However, subsequent subsections of Section 5.3 (e.g., 5.3.1.1 regarding use of a starter berm) incorporate changes to the ROD-selected remedy. Revise this section to discuss the ROD-selected remedy only. Other proposed deviations from the ROD-selected remedy should be identified as such and presented together in a separate sub-section.
10. Section 5.3.1, Page 166, first bullet – Add the words "Placement of inert fill and" to the beginning of the first bullet.
11. Section 5.3.1.1, Page 167, first paragraph – Clarify in this paragraph that because the design of a cap must ensure that risks from exposure to gamma radiation and radon not exceed the EPA acceptable risk range, and must be minimized to the extent necessary to comply with ARARs, the design of the outer slope and toe areas of the cap must demonstrate a similar level of protection.
12. Section 5.3.1.1, Page 168 – Delete the first full paragraph on the page, starting with, "Based on the results of the SFS evaluations...," and remove from this section the description of cutting off the toes of the landfill and constructing a "starter berm". The 2008 ROD anticipated bringing the landfill surface up to grade through placement of inert fill and regrading and extending the toe of the landfill. As indicated in the text, use of a "starter berm" was developed in the 2011 SFS and should therefore be included in the UMTRCA cover alternative, not the 2008 ROD alternative. Most of Section 5.3.1.1 should be moved to Section 5.4.
13. Section 5.3.1.2, the paragraph in the section that spans Pages 168 and 169 – This paragraph describes in general the management of waste materials during the implementations of a capping remedy. It concludes that temporary stock-piling of waste materials would not be required. Not discussed in this paragraph is how the final placement of the cap will demonstrate compliance with ARARs and prevent unacceptable risks both now and in the future from gamma radiation and radon exposure, after the regrading process. Revise this paragraph to include a discussion that considers the potential effects of regrading on the distribution of RIM and how to ensure the placement of any cap remains protective.
14. Section 5.3.1.2, Page 170, second paragraph – Delete all but the first and last sentences of this paragraph.
15. Section 5.3.1.3, Page 170, first paragraph in this subsection, fourth sentence – Delete unless this was the intent of the ROD-selected remedy, in which case, replace "This" with "Under the Rod-selected remedy, this."
16. Section 5.3.1.3, Page 170, all three paragraphs in this section – Revise these paragraphs by including the unrestricted use PRGs that will be used for removal of radiologically impacted soil that may be present anywhere outside of Area 1 and Area 2. This PRG should be established site specifically and consistent with the methodologies and conclusions in the baseline risk assessment. PRGs should be

established at a minimum for Radium-226, Radium-228, Thorium-230, Thorium-232, Uranium-234, Uranium-235, and Uranium-238. A site specific evaluation of risk must demonstrate that the clean-up goals established in 40 CFR 192 subpart B will not result in unacceptable risks before they could be established as unrestricted use PRGs. This section should be consistent with the changes made to Section 3.1.1.1.2 as a result of the EPA's comments on that subsection.

17. Section 5.3.1.3, Page 171, last paragraph in the section – Similar to the comments provided for section 5.3.1.2, revise this paragraph to include a discussion of how placement of a final cap will be protective after consolidation of impacted soils from outside of Area 1 and Area 2, which could alter the distribution of RIM.
18. Section 5.3.1.3 Page 171. Last paragraph. Except for the first and last sentences of this paragraph the statements made are not supported by any approved documents. Revise paragraph to delete these statements or provide reference to approved documents that support these conclusions.
19. Section 5.3.1.4, Page 171 – At the beginning of the subsection, insert "The following conceptual design was used for purposes of cost analysis for the ROD-selected remedy. Ultimately, any engineered landfill cover will need to meet all required performance standards and design criteria of ARARs."
20. Section 5.3.1.4, Page 172, footnote 32 – Revise this footnote by including the exposure time for the receptor that has been determined to receive the reasonable maximum exposure according to the baseline risk assessment. Compare the resulting annual effective dose calculated from the dose rate specified in UMTRCA and this exposure time to the EPA's ARAR protectiveness criteria 12 mrem/yr provided in OSWER directive 9285.6-20. If the calculated dose is higher than the ARAR protectiveness criteria, than cleanup levels and cap designs should be determined by what is necessary to be protective under CERCLA, e.g. levels which will not result in risks greater than 10^{-6} to 10^{-4}.
21. Section 5.3.1.4, Page 173, first paragraph, second sentence – Replace this statement with "Cover design will be performed during the RD phase to ensure the cover complies with applicable and relevant and appropriate requirements, including longevity requirements."
22. Section 5.3.1.5, Page 174, second, third and fourth sentences – Replace the sentences with, "These areas are currently protected by the presence of the 500-year levee and supporting flood control system of the Earth City Levee District. In a scenario where the levee fails or ceases to exist, current evaluation of a 500-year flood event may cause approximately two feet of flood waters to contact the toe of Area 2. Because the site is currently located more than 1.3 miles from the Missouri River, no high-energy water flows are expected if flood waters reached the site in the near term. Since design considerations need to account for ARARs projecting 200 – 1000 years into the future, in addition to protecting public health through the maximum potential toxicity which is 9000 years into the future, the geologic and anthropogenic uncertainties associated with longer time intervals should be considered."
23. Section 5.3.1.6, Page 174, first paragraph – Qualify throughout the subsection that these descriptions of stormwater management/surface water runoff as being for cost comparison purposes only.
24. Section 5.3.1.7, Page 176-177 –There is no mention of the potential need to monitor radon in addition to other land fill gasses. Add discussion of radon monitoring as necessary.
25. Section 5.3.1.8, Page 177 – Include discussion in this subsection about how the seep in Area 2 will be managed during construction of this or any of the alternatives. Inspection of the seep in the last year or so identified that it was still flowing even though perched water was not encountered.
26. Section 5.3.1.10, Page 178, last paragraph, first sentence. Remove the word "likely" from the sentence.
27. Section 5.3.1.11, Page 180, second full paragraph – Post-construction site inspections may initially be required more frequently than annually. Remove the word "annually" and add a sentence that

states: "The frequency of inspections and monitoring activities will be established in the OM&M plan."

28. Section 5.3.1.11, Page 180, last paragraph in the section – Revise this paragraph by specifying the four types of radiological surveys that are expected to be conducted to guide the implementation of any capping remedy as described in appendix G. Remove the word minor from the first sentence in this paragraph. The EPA notes that in general these surveys should include scoping surveys, remediation support surveys and sampling, and final status surveys and necessary sampling or the equivalent.
29. Section 5.3.2.1, Page 181 – In keeping with the layered approach discussed in the text, a request should be made by the property owners to the city to re-zone the property to exclude residential use and other inappropriate uses.
30. Section 5.4, Page 183, footnote 33 – Add to the end of this footnote that radon flux testing and/or air monitoring may be necessary periodically to evaluate protectiveness of the remedy.
31. Section 5.4, Page 183, footnote 34 – Revise this footnote to specify that Area 1 and Area 2 should be considered separately for purposes of averaging release rates.
32. Section 5.4, Page 186, first full paragraph – Revise this paragraph to indicate that the "UMTRCA Cover" alternative also includes excavating approximately 112,000 cubic yards of material from some margins of Areas 1 and 2 and installing a "starter berm" in these perimeter areas.
33. Section 5.4, Page 187, third paragraph – The cover also has to be designed to last 200 – 1000 years, which this section does not address. Discuss the longevity standard in terms of cover life.
34. Section 5.4, Page 187, top of page, end of sentence – Add a sentence that states, "Inclusion of the rock mulch will be further evaluated during the remedial design."
35. Section 5.5, Pages 187 – 189 – The section does not discuss diminished cover design and monitoring requirements due to UMTRCA no longer being the overriding ARAR for full excavation. Nor does it detail how institutional controls could be reduced for the excavation alternative. Include these discussions. Additionally, state each component that is not being discussed and provide adequate reasoning as to why it is considered the same or substantially similar to components of the ROD-selected remedy.
36. Section 5.5, Page 188, second full paragraph, sixth line – Remove the words, "to the degree feasible."
37. Section 5.5, Page 188, second bullet – Revise this bullet by replacing "RIM" with "material."
38. Section 5.5, Page 188, fourth bullet – Clarify whether the "impacted soil" referred to in this bullet refers to soil containing radionuclides below the definition of RIM. If not, delete" and impacted soil" from the sentence.
39. Section 5.5.1, Pages 190 and 191 – Revise the discussion on these pages regarding limitations associated with extent and volumes of RIM to clarify whether these data and calculations are sufficient for purposes of the FFS.
40. Section 5.5.1, Page 190, last full paragraph – Move the first sentence of the paragraph, starting with, "This site characterization information ... " and place it before the last sentence in the paragraph. Delete the reference to EMSI et al., 2011.
41. Section 5.5.1, Page 191, second full paragraph – Revise the language starting on the eighth line so that it reads, "... analysis performed in 2015 for the purposes of providing additional data for the evaluation of potential partial excavation remedial alternatives and to support updated calculations of the volume of RIM at the site (EPA, 2015c), the data are still not definitive, nor could they ever be."
42. Section 5.5.1, Page 191, second full paragraph – Delete last sentence.
43. Section 5.5.1, Pages 192-193 – These pages contain a discussion regarding the uncertainty associated with using the 50% probability of RIM extent and suggests that a 25% probability may be

a more accurate reflection of RIM to be excavated. Present the 25% and 75% probability volumes for sensitivity comparison.

44. Section 5.5.2.1, Page 193 –This section provides a description of the excavation process and the associated RIM staging and loading building. However, insufficient detail is provided on the activities that are expected to occur between the excavation process depicted on figure 5-7 and the segregation process depicted on figure 5-8 inside of Bay 1. Revise this section and the associated subsections by including more details about the expected RIM segregation process.
45. Section 5.5.2.1, Page 194, second paragraph on the page – Add the following statements after the second sentence in this paragraph, "Further characterization of areas where RIM is not expected will be needed to confirm that these materials do not contain RIM. The design and scope of this characterization will be developed as part of the remedial design. This characterization is expected to include alpha and gamma surveys and to the extent necessary analytical sampling to confirm RIM is not present in these areas."
46. Section 5.5.2.1, Page 194, second paragraph – Revise the final sentence in this paragraph as follows, "Sufficient quality control procedures must be designed and implemented to ensure that the distance from the surface scans will be performed, the speed of the scans, and scan MDAs will identify RIM at or below appropriate PRGs."
47. Section 5.5.2.1, Page 194, third paragraph on the page – Revise this paragraph by including some discussion of how analytical sampling will be utilized in conjunction with the HP technicians surveys due to the presence of elevated thorium-230 and the limitations of handheld scanning equipment.
48. Section 5.5.2.1, Page 194, fourth paragraph on the page – Surveys of excavators and other equipment, otherwise known as remedial action support surveys, will be needed as often as necessary to ensure cross contamination does not occur between survey units. These surveys should include handheld scanning and swipe sampling. Revise this paragraph by including a discussion of these details.
49. Section 5.5.2.1, Page 195, paragraph that spans Page 194 and Page 195 – Add the following sentence to the end of this paragraph, "The quality assurance and quality control procedures that will be followed by any on-site laboratory developed during remedial design to ensure analyses are conducted appropriately."
50. Section 5.5.2.1, Page 195, second paragraph – Add the following sentences to the end of this paragraph, "Evaluations as part of the remedial design are expected to include optimizations related to the presence of and associated characteristics of thorium-230. These optimizations may include development of procedures to perform specific characterization surveys and targeted removal of RIM that is characterized primarily by the presence of thorium-230."
51. Section 5.5.2.2, Page 196, last paragraph, second sentence – Globally replace "radiologically-impacted material" with "radiological material" , as appropriate.
52. Section 5.5.2.2, Page 196, bullet list – A fourth bullet should be added for RIM, anything in the landfill that has been radiologically impacted above the RIM definition.
53. Section 5.5.2.5, Page 199, third paragraph – Revise the last sentence of this paragraph as follows, "Daily cover placed over the RIM excavation areas could mix with and become part of the volume of RIM, therefore increasing the volume and mass of RIM that would be sent for off-site disposal." Add the following statement after the revised sentence, "Therefore, remedial design will include evaluation of potential best management practices or BMPs that could be developed to minimize or prevent the placement of soil cover from mixing with RIM and the use of materials other than soil as daily cover. This evaluation will include an optimization analysis that accounts for any differences in costs, schedule, and short term risks that may be required in order to implement any identified BMPs or with the use of materials other soil for daily cover."

54. Section 5.5.2.7, Page 200, last paragraph in section – The base of the RIM in some areas is close enough to the water table that encountering groundwater during the full excavation alternative cannot be completely discounted. Contingencies will have to be included for managing potential groundwater and also the seep in area 2
55. Section 5.5.2.7, Page 200, second paragraph in subsection – This statement cannot be supported since groundwater characterization beneath the site is not complete. Delete the sentence/paragraph or replace with a supported statement.
56. Section 5.5.4, Page 204, second paragraph – The exceptions stated for stormwater management difference between the ROD-selected remedy and full excavation are fairly significant and should be addressed further in this section or section 6.
57. Section 5.5.4, Page 205, paragraph that spans Pages 204 and 205 – No discussion of radon monitoring to be performed within the RIM staging and loading building or as related to the operation of the associated air emissions controls have been included in either this section or the previous. Include in the appropriate section a discussion of activities that are expected related to radon monitoring for both remediation worker safety and the operation of the associated emission controls for the RIM staging and loading building.
58. Section 5.5.5, Page 205, first paragraph in subsection, second sentence – Replace this statement with "Regrading and construction of a final cover would be performed for Areas 1 and 2 in compliance with ARARs. Since RIM would be removed, performance requirements of the UMTRCA cap would no longer be relevant and appropriate and therefore performance and design requirements of state solid waste regulations would control design of the cover. For purposes of cost estimation, the conceptual design for the cap differs from the ROD-selected cover by [insert estimated $ differences]"
59. Section 5.5.6, Page 206, last bullet on the page – Revise to clarify that a 5-year review needs to be included as part of this alternative.
60. Section 5.6, Page 207, second paragraph – Delete the second half of the first sentence, beginning with, "; however, when the workplan...." Respondents could have proposed an alternative depth based on any criteria they chose, or they could have asked the EPA for an explanation of the 52.9 criteria at any time. Also, remove "EPA" from the second sentence. The EPA was not aware of an obvious depth break in the data; however, the EPA did not have the data and information to consider evaluating an alternative depth for partial excavation until the recent submittal of the RIA and FFS.
61. Section 5.6 and 5.7 – Add discussion in the partial excavation scenarios regarding preparing the land surface for installation of a cap (i.e., backfilling, regrading, radiation surveys, testing).
62. Section 5.6.1, Page 209, last full paragraph – include information about the depth of RIM in the borings listed or in the vicinity of the transfer station. Figure 5-10a only depicts RIM >52.9 from 0 to 10 feet flow the surface and it is not clear from the figure whether the RIM in the vicinity of the transfer building is deeper than 16 feet.
63. Section 5.8, Page 214, first full paragraph, last line – Replace "work" with "worker."

Section 6

1. Last paragraph of Section 6.2.5.3.4 and elsewhere in Section 6 states: "Due to the significantly greater age and degree of decomposition of the waste materials in Areas 1 and 2, the potential for occurrence of a subsurface heating event in these materials is believed to be highly unlikely. Furthermore, the waste materials in Areas 1 and 2 are relatively thin compared to the thicker nature of the waste materials in the deeper quarry landfill, which provide a significant insulating effect that allows for sustained increases in temperature. The thinner nature of the waste materials in Areas 1 and 2 would result in reduced insulation by the waste material and an increased potential for heat loss along boundary conditions (ground surface at the top and alluvium at the base). The lower degree of insulation and higher degree of heat loss associated with thinner waste materials would

limit the degree to which temperatures could increase within the Area 1 and 2 waste masses. Replace this text in this Section and all other instances of this text with the following:

> "Due to the age and degree of decomposition of the waste materials located in Areas 1 and 2, the potential for occurrence of a subsurface heating event in these materials is believed to be less likely. Furthermore, the waste materials located in Areas 1 and 2 are relatively thin compared to the thicker landfills such as those located in the deeper quarry landfill, which provides a significant insulating effect that allows for sustained increases in temperature. The thinner nature of the waste materials in Areas 1 and 2 would likely result in reduced insulation by the waste material and an increased potential for heat loss along boundary conditions (ground surface at the top and rock/alluvium at the base). The lower degree of insulation and higher degree of heat loss associated with thinner waste materials would limit the degree to which temperatures could increase within the Area 1 and 2 waste masses."

2. Section 6.1.7.2, Page 227, first bullet – delete the last sentence. Also, this bullet refers to "various interpolation techniques." State what interpolation technique(s) was used besides interval kriging.
3. Section 6.1.7.3, Page 229, footnote 43 – With regards to disposal facilities, this footnote states that "there is no way to ensure that these facilities would still have sufficient capacity for such material or that such material would meet the waste acceptance criteria; however, in Section 6.2.5.6.7 on Page 371 the text states that, "all four of the identified facilities have available capacity to accept the estimated volume of RIM." Disposal of RIM is a fundamental aspect of the excavation alternatives being evaluated and there should be some level of confidence that any remedy proposed could actually be implemented. Identify which statement is accurate with regards to waste disposal and revise all other similar statements throughout the document as necessary.
4. Section 6.2.1, Page 231, first paragraph in this subsection which continues on Page 232 – This paragraph contains contradictory statements regarding the need for future maintenance. (i.e., text states no maintenance, yet assumes fencing and access controls still in place in 200 years) Clearly state what the no action alternative assumes with regard to future maintenance.
5. Section 6.2.1.1, Page 232, first paragraph in the section – Include the calculated baseline risks determined for the future groundskeepers working in Areas 1 and 2 and the Buffer Zone.
6. Section 6.2.1.2, Page 233, first paragraph – This paragraph only discusses current radon emissions. Include discussion of radon emissions in the future based on ingrowth calculations.
7. Section 6.2.1.2, Page 233, first paragraph of subsection, fourth sentence beginning with, "Although individual groundwater..." – Replace with "Limited groundwater testing for OU-1 has shown occurrences of chemical and radiological constituents above UMTRCA groundwater protection standards along with state and federal MCLs."
8. Section 6.2.1.2, Page 233, first paragraph of subsection, last sentence – Delete the sentence or replace it with a supported discussion.
9. Section 6.2.1.2, Page 233, next to last paragraph on page, beginning with, "The No Action alternative is expected..." – Floodplain protection is reliant on current geomorphology and flood control measures. ARARs for the no-action alternative would not be met when maintenance or protection is needed for the toe of the landfill to protect from flooding or scouring.
10. Section 6.2.2, Page 236, first paragraph, last two sentences – Replace with the actual ROD language: "Prior to construction of the landfill cover, the areas will be brought up to grade using placement of inert fill and regrading of existing material as determined in the RD. Final grades will achieve a minimum slope of two percent. The landfill berm around Area 2 will be regraded through placement of additional clean fill prior to placement of the landfill cover resulting in an estimated 100 lateral feet of additional material between the current landfill toe and the toe at completion of the RA." Globally replace any other language that is not consistent with the ROD-selected remedy as stated in the ROD.

11. Section 6.2.2.1, Page 239, second paragraph, first sentence – Replace with "The ROD-selected remedy also requires monitoring of groundwater quality to ensure that groundwater quality meets ARARs (see Tables 3-1 through 3-4)[46]
12. Section 6.2.2.3, Page 246, second paragraph, first sentence – Replace with "The conceptual design ... was a hybrid cap ... to address some aspects of UMTRCA standards." And delete everything in parentheses. Then discuss how the cover design will be required to last at least 200 years with minimal maintenance required.
13. Section 6.2.2.3, Page 246, third paragraph – Replace with "Robust and Durable Long-term site management plans and institutional controls would be required. Long term monitoring under the ROD-selected remedy requires [insert required monitoring]."
14. Section 6.2.2.3, Page 246 – Provide some detail on difficulties and uncertainties that may be associated with long-term operation, for example uncertainties with meeting longevity requirements under conditions such as: being located in the geomorphic floodplain of a major river; being dependent on external controls such as the Earth City levee; Potential for additional settlement and consolidation of landfilled materials; etc. Discuss any potential need for replacement of technical components. Discuss the magnitude of the threats or risks should the ROD-selected remedy need replacement. Discuss uncertainties with private ownership of the site.
15. Section 6.2.2.3.1, Page 247, bullets – Include the calculated risk is at 9,000 years when peak radium/radon values are expected to occur.
16. Section 6.2.2.3.1, Page 247, third paragraph – revise the first sentence to say that the risk levels are below and within the EPA's target risk range ....
17. Section 6.2.2.3.2, Page 249, top paragraph – The current covenants are presumably based on real estate law and therefore maybe subject to the marketable titles act which could make the restrictions difficult to identify in the future. Therefore, it should be assumed that appropriate restrictions under the MO Environmental Covenants Act will need to be filed for all impacted property.
18. Section 6.2.2.3.3, Page 251, second full paragraph, 3rd line – Delete the parenthetical statement (which does not contain waste materials) or cite evidence to support this statement.
19. Section 6.2.2.3.3, Page 251, second full paragraph – Include discussion on how the Earth City Industrial Park engineered levee stormwater and flood control system works (i.e. since there is a stormwater/flood control canal adjacent to the site, could this act to channel flood waters to the property?) Also, remove the starter berm discussion regarding flood water from the ROD-selected alternative. This language may be included in the UMTRCA Cap section.
20. Section 6.2.2.3.4, Page 253, second paragraph – The third sentence states in regard to ORD – "... that agreed with some of the conclusions," Delete this statement from the third sentence of the second paragraph. Also, see General Comment and replace the ORD with the EPA.
21. Section 6.2.2.3.4, Page 253, third paragraph, first sentence – Revise the word "addressed" to "considered." This section will need to be updated in response to Appendix E comments as referenced in the General Comments.
22. Section 6.2.2.3.4, Page 253, Footnote 51 – Delete footnote 51.
23. Section 6.2.2.3.4, Page 254
    a. Second bullet – Delete this entire bullet pending comments on Appendix E (see related General Comment). Also, the Auxier and EMSI, 2016e document has not been approved; therefore, if you are using information in the document to draw conclusions, that information must be summarized.
    b. Third bullet – Delete the second, third, and fifth sentences of this bullet pending comments on Appendix E (see related General Comment).
    c. Fourth and fifth bullet – Delete this bullet pending comments on Appendix E (see related General comment)

d. Sixth bullet– Delete this bullet.

24. Section 6.2.2.3.4, Paragraph split between 255-256 – Delete this paragraph pending comments on Appendix E (see related General Comment).
25. Section 6.2.2.3.4, Page 257, first full paragraph – Delete "(if any)" from the third sentence.
26. Section 6.2.2.3.4, Page 257, first full paragraph – Delete this paragraph pending comments on Appendix E (see related General Comment).
27. 6.2.2.3.4, Page 257 footnote – Delete the word "very" from the first sentence of the footnote. Also, delete the entire last sentence of the bullet starting with "These assumptions..."
28. Section 6.2.2.3.4, Page 258, first paragraph– Delete the word "only" from the second sentence.
29. Section 6.2.2.3.4, Page 258, last paragraph – Please cite a reference for these conclusions.
30. Section 6.2.2.3.5, Page 259, First full paragraph, second sentence – Delete the word "Extensive."
31. Section 6.2.2.3.5, Page 259 – Delete the last paragraph.
32. Section 6.2.3.3.2, Page 287, last paragraph – Add the cited reference, National Research Council, 2007 to Section 8.
33. 6.2.3.3.2, Page 287, last paragraph – Include the cost difference between a GCL and a geocomposite clay liner in the cost estimates.
34. Section 6.2.3.3.4, Page 293 – Delete the first full paragraph of this section pending comments on Appendix E (see related General Comment).
35. Section 6.2.3.5, Page 296, last paragraph, first sentence – Please clearly state that greater than 100,000 cubic yards of waste is expected to be cut, regraded, re-contoured or otherwise moved under this remedial alternative. Please also describe the impacts associated with excavating, regrading, re-contouring or otherwise moving that amount of waste material in sections of the alternative analysis. The document should consider the potential impacts of this materials handling on remedy analysis.
36. Section 6.2.3, Page 275, last paragraph – Clarify the discrepancy in the third sentence of this paragraph that "...well-graded rock or concrete/asphaltic rubble will be installed immediately above the clay layer..." with the statement in Section 5.4 indicating that a 6-inch drainage layer will be installed above the clay liner.
37. Section 6.2.4.3.2, Page 313, bottom of page – This section and footnote 43 in section 6.1.7.3 both speak to uncertainties whether the four potential disposal facilities identified have capacity to accept the waste
38. Section 6.2.4.3.4, Page 317 — Revise to state:

    "Because it is presumed that all radionuclides above unrestricted use levels would be removed from the site under the full excavation of RIM alternative, radionuclide-related impacts would not be expected to occur if a subsurface heating event (SSE) were to occur in Areas 1 or 2. Odor emissions, ground settlement, disruption of an engineered cover, and other potential impacts associated with a heating event could potentially still occur under the full excavation of RIM alternative. These would be addressed as part of OM&M activities including activities such as placement of additional soil to fill areas of subsidence, repair and/or enhancements to the landfill cover system, and efforts to manage, control and reduce odor emissions."
39. Section 6.2.4.3.5, Page 317— Revise to state:

    "Because it is presumed that all of the radionuclides above unrestricted levels would be removed under the full excavation of RIM alternative, there would be no need for installation of an isolation barrier system. If an isolation barrier system were installed prior to implementation of a full excavation of RIM alternative, large portions of the barrier system may need to be removed to gain access to RIM in the vicinity of a barrier."
40. Section 6.2.4.7, Page 341, first paragraph – The cost of a full-scale pilot test for solids separation equipment should be included in the costs for any alternative which includes separation of RIM.

41. Section 6.2.5.3.4, Page 351, first paragraph of section — Delete the last two sentences of this paragraph.
42. Section 6.2.5.3.5, Pages 354-353, first paragraph of section — Delete the first three sentences of this paragraph pending comments on Appendix E (see related General Comment).
43. Section 6.2.6.3.4, Page 384, first paragraph of section — Delete the last two sentences of the first paragraph pending comments on Appendix E (see related General Comment).
44. Section 6.2.6.3.5, Page 385, first paragraph of section — Delete the first three sentences of the first paragraph pending comments on Appendix E (see related General Comment).

Section 7

1. Section 7, General Comment – The comparative analysis of alternatives is largely reiterating information already presented in the detailed analysis or other sections of the document, or generally comparing capping alternatives vs excavation alternatives without differentiating and comparing the pros and cons of each alternative. As written, the analysis does not do a good job of illustrating the primary distinctions among the alternatives and should be rewritten to focus on this objective.
2. Section 7, General Comment – Revise this section after addressing comments on earlier sections.
3. Section 7, Page 408 – Add a general statement to this section stating that all design elements and materials discussed are based on conceptual designs and are presented for cost estimating purposes.
4. Section 7.1.2.2, Page 410, first paragraph – Revise this paragraph to state that 1) the northwest corner of Area 2 (buffer zone and Lot 2A2) are not outside of the 500-year floodplain and do contain contamination and 2) therefore the No Action Alternative does not meet location-specific ARARs.
5. Section 7.1.2.3, Page 411, second paragraph, 4th line – add the word "conceptual" in front of the word design in the fourth line.
6. Section 7.2.1.1, Page 413 – This section states that the long term risks associated with each of the alternatives are essentially the same; however, this is an over simplification and does not compare the specifics of each alternative to the others. State the estimated residual risk for each of the six alternatives separately instead of generalizing that they all fall below or within the EPA's target risk range. Also evaluate each alternatives risk range at the present, at 200 years, at 1000 years and at 9,000 years, the approximate peak of radium activity. Also include these risk ranges in Table 7-1.
7. Section 7.2.1.2, Page 414, fourth paragraph – Delete the last two sentences of this paragraph, starting with, "The currently available data...."
8. Section 7.2.1.2, Pages 413-415 – The discussion in this section is over generalized and lumps all of the partial excavation alternatives together. The pros and cons of each alternative should be discussed with regards to the adequacy and reliability of controls and this discussion should be summarized in Table 7-1. For example, some partial excavation alternatives remove more RIM volume which would leave less material to leach or experience in-growth. Other partial excavations result in RIM located farther from the land surface and would therefore be for protective if erosion were to occur or someone dug there in the future. These examples are not the only differences and their ramifications that should be discussed. Revise this section and Table 7-1 accordingly.
9. Section 7.2.1.3, Page 415-416, third paragraph in section – Delete the sentence near the bottom of the page that starts, "Such impacts are not considered to be significant...." This statement is inaccurate and must be removed. Radium is much more soluble than thorium; therefore, the risk of infiltration and impacts to ground water increase over time through ingrowth.
10. Section 7.2.1.3, Page 417, first full paragraph, lines 5, 6 and 7 - Revise this section of the paragraph to clearly state that the Buffer zone/Crossroads Lot 2A2 properties are within the 500 year flood plain and do contain RIM. They are potentially subject to flooding if the levee system is overtopped or breached due to increased heavy precipitation events.

11. Section 7.2.1.3, Page 417, lines 8, 9 and 10 – Discussion of the starter berm was not included in the ROD (and ROD-selected remedy) but was documented in the 2011 SFS. Therefore, discussion of the starter berm and excavation of the toes of the landfill berms should only be included in the UMTRCA alternative, not the ROD selected remedy. Revise this paragraph/section.
12. Section 7.2.1.3, Pages 416-417 – Add a paragraph to this section that discusses the potential impacts of increased heavy precipitation on river migration and course changes over 200 to 9000 years. The landfill is located on the geomorphic floodplain and Significant river channel changes can, and have occurred within historic times (e.g. steamboat Arabia that sank in 1846 located 0.5 miles from the Missouri river).
13. Section 7.2.1.4, Page 419 – Delete and revise all statements in these bullets per previous Section 6 comments and ending comments on Appendix E (see related General Comments).
14. Section 7.2.1.4, Pages 418-419 — The conclusions cited in the bullets should only reference evaluations performed in Appendix E. The referenced Auxier and EMSI, 2016 documents have not been approved by the EPA. In addition, the EPA provided a comment on the last draft of the RI Addendum specifying that these documents should be utilized to perform updated evaluations consistent with the updated baseline risk assessment in this document. These draft documents should only be used to explain what evaluations were performed in Appendix E.
15. Section 7.2.1.4, Pages 418-419 – The bullets in this section refer to "increased temperatures." Clarify whether the term increased temperatures is intended to be equivalent to a SSE. If so, state this clearly.
16. Section 7.2.1.4, Page 418, second bullet, lase sentence – Delete the last sentence of this bullet or provide additional information from the cited document (Auxier and EMSI, 2016e) that has not been approved by the EPA, to support any conclusions drawn.
17. Section 7.2.1.4, Page 419, 4th and 5th bullets – It is unrealistic to assume additional leachate will not be created from an SSE. Delete all statements indicating additional leachate is not expected to be created from an SSE from this bullet and all other places in the document.
18. Section 7.2.1.5, Page 421, Summary of Long-term Effectiveness and Permanence – Add discussion to the section regarding the reduction of RIM from partial (and full) excavations which would result in less leachable material left on-site. Therefore, the more material removed, the better the long term effectiveness for protection of groundwater.
19. Section 7.2.1.5, Page 421, Summary of Long-term Effectiveness and Permanence – Add discussion regarding the fact that the land fill is on the geomorphic flood plain and is potentially subject to river migration or catastrophic river course changes over long periods of time. Full excavation and partial excavations in areas closer to the river (Area 2) would potentially result in longer term effectiveness.
20. Section 7.2.1.5, Page 422, First Full paragraph— Revise to state:
"If an SSE were to extend into Operable Unit 1, specific engineering controls, if implemented appropriately, are predicted to manage potential effects such that unacceptable risks are expected to be avoided. A predicted impact would be a temporary increase in radon emissions. An isolation barrier installed before implementation of a remedial alternative, particularly the full or partial excavation alternatives, would likely be affected by the implementation of any remedial actions. Conversely, installation of an isolation barrier after implementation of the remedy could, depending upon the nature and design of such a barrier, impact the remedy alternative."
21. Section 7.2.3.1, Page 426, first full paragraph – The EPA does not consider relocation of 112,000 bcu of waste regrading as described in the 2008 ROD. Revise first sentence to differentiate the ROD-selected remedy and the UMTRCA cover alternative as requested in previous comments.
22. Section 7.2.3.5, Page 430, third paragraph, last sentence – Appendix G assumes a 50% reduction in excavation production. Explain the specific differences in the reduction in excavation production assumed in Appendix G and the delays discussed in this paragraph.
23. Section 7.2.3.5, Page 432 – Revise this paragraph in accordance with the comments on Appendix H.

24. Section 7.2.4, Page 433, second full paragraph – Delete the paragraph starting with, "In addition, under the full excavation of RIM...."
25. Section 7.2.4, Page 434, second bullet – Add discussion regarding the frequency that the proposed disposal facilities have been out of compliance.
26. Section 7.2.4, Page 434, last paragraph – The 2008 Rod-selected remedy did not fully consider the concerns described in this paragraph and the two capping alternatives must be differentiated to indicate this. Specifically, the ROD selected remedy said, "Prior to construction of the landfill cover, the areas will be brought up to grade using placement of inert fill and regrading existing material as determined in the RD, "and "The landfill berm around Area 2 will be regraded through placement of additional clean fill prior to placement of the landfill cover resulting in an estimated 100 lateral feet of additional material between the current landfill toe and the toe at the completion of the RA."
27. Section 7.2.4, Page 437, summary paragraph – In general, this section does not sufficiently evaluate the implementability (pros and cons) of each alternative being considered. Instead, it discusses all the difficulties of excavation without differentiating the 3 partial excavation alternatives. For example, consideration should be given to whether the 1000 piC/g partial excavation alternative is less implementable due to the depth of excavation and amount of overburden to handle as compared to the 52.9 piC/g partial excavation alternative. Consider whether RIM separation/sorting is more implementable for the 1000 piC/g partial excavation alternative because thorium concentrations of concern can be more readily correlated with radium at higher concentrations or whether potentially acquiring more property and clean fill makes the 2008 ROD more or less implementable than the UMTRCA cap alternative. Note, these are just examples and the respondents should do a thorough comparison of implementability issues.

Tables 2

1. Table 2-1 – Appendix L summary sheets are not comprehensive. Please ensure that the reader is directed to the appropriate section for all included data.
2. Tables 2-8, and 2-18 – These tables do not include footnotes describing the included lab qualifiers/symbols. Revise to include the descriptions.
3. Table 2-14 and 2-15 – The footnotes that appear at the bottom of the page do not appear to be annotations used within the table. Revise the footnotes to be notes or include annotations in the tables.
4. Titles for Tables 2-16, and 2-18, and 6-2 and Section 3 tables – These tables do not match the titles listed in the Table of Contents. Change the titles in either location so that they match.
5. Table 2-17 and 2-19 – Add footnotes describing the included lab qualifiers and symbols. Also include a footnote explaining empty data cells (i.e. no sample taken, data was not collected, etc.). For Table 2-17 specifically, correct the cell for OU-1-010 under Uranium (Eberline) CSU.
6. Table 2-18 – "tormwater" should be "Stormwater" in the title.

Table 3-1

1. Please revise all of Table 3 in accordance with the comments made to the revised FFS and this Table 3-1.
2. Please ensure that procedural requirements and non-health based standards are not identified as potential ARARs.
3. For documents that are identified as TBC specify what provisions are to be complied with as TBC.
4. For organizational purposes please format all of Table 3 to clearly and consistently identify ARARs and TBCs, as well as the related categories of information. Also identify off-site applicable requirements in a separate table. Lastly, specify how each identified requirement or standard relates to the remedial alternatives.

5. If Missouri statutes and regulations are identified as ARAR or TBC please specify whether the Missouri requirement is more stringent than the federal requirement.
6. This table provides conflicting information regarding whether a citation is or isn't a potential ARAR. Additionally, "N/A" is not an appropriate designation. Create tables that clearly state the potential for ARAR or TBC.
7. Citation for 10 CSR 20-7.031 (5)(I) is applicable to off-site discharges to Fee Fee Creek and Missouri River water sheds, correct the designation as a potential ARAR.
8. Citation 10 CSR 20-7.031 contains water quality standards which stated purpose is to identify "uses of waters of the state, criteria to protect those uses, and defines the anti-degradation policy. It is developed in response to the Missouri Clean Water Law and the federal Clean Water Act, Section 303(c)(1) and (2), ... These revisions are pursuant to the national goal of protection of fish, shellfish, and wildlife and recreation in and on the water as outlined in Section 101(a)(2) of the Act." Further, 10 CSR 20-7.031 (5) outlines specific criteria applying to waters contained in Tables G and H of the rule (which includes Fee Fee Creek watershed and Missouri River, that are not exclusive to drinking water uses – neither is Table A). This is a potential ARAR for surface water discharges from the site. Correct the inaccurate statements.

Table 7-1

1. Most of the table entries either lump all remedies together or lump both capping alternatives and all excavation alternatives together. Instead, the differences of each alternative should be discussed in relation to each criteria and sub-criteria to present a comparative analysis.
2. Magnitude of Residual Risks Row – For each alternative column, list the calculated risk in the present, in 200 years, in 1,000 years and in 9,000 years.
3. Page 4 — Replace the "Impacts from a Subsurface Heating Event" statement with the following: "Predicted impacts associated with subsurface heating include: (1) potential waste consolidation resulting in subsidence (2) an increase in leachate production, and (3) a localized increase in radon emissions associated with potential damage to the cover."
4. Page 4, Thermal Isolation Barrier Interaction, Row 1— Pending comments on Appendix E, revise statement to state, "If an SSE were to extend into Operable Unit 1, specific engineering controls, if implemented appropriately, are predicted to manage potential effects such that unacceptable risks are expected to be avoided"
5. Page 4, Thermal Isolation Barrier Interaction, Row 2— Pending comments on Appendix E, revise statement to state, "The engineering controls needed and associated with the installation of an IB system put in place subsequent to construction of any of the remedial alternatives are not expected to impact the over-all performance of the remedy." In addition, provide an evaluation of whether any of the excavation alternatives could impact an existing IB system.
6. Page 4, Impacts from Subsurface Heating Event Row –For the full excavation of RIM remedial alternative, a subsurface heating event would not result in an increase in radon. Partial excavation alternatives that create more space between the RIM and receptors (52.9 to 16 feet and Industrial Use partial excavations) would potentially be more protective.
7. Add a long term effectiveness summary row.
8. Add a row to summarize impacts of an extreme weather event summary row.

Figures

1. Figure 2-7 – Orange polygons are included in the figure, but not in the legend. Include these in the legend or delete from the figure.
2. Figure 2-9 – Not all yellow labels are visible. Change the label color to red so that they are visible and match the color of the corresponding polygons.

3. Figure 2-11, 2-12, 5-5, 5-6, 5-10, 5-11, 5-12, 5-13 – These figures list multiple symbols for soil boring and surface soil borings. Either distinguish between the different symbols or only use one symbol
4. Figure 2-11 a and b, 5-5 a and b, 5-10 a, and 5-12 a and b – Include the OU-1 Area 1 or boundary as appropriate in these figures.
5. Figure 2-17 – Correct the figure to read "Stormwater Retention Pond" and either include the thin blue line in the legend or remove from figure.
6. Figure 2-34 – Include the small triangles over each symbol in the legend or remove from the figure.
7. Figure 4-2 – The cross section for the UMTRCA cover shown in this figure should mirror that discussed in the text of the FFS.
8. Figure 5-1 – Replace the title of the figure with "Conceptual Extent of Cap-in-Place Alternatives."

Appendix D

1. D-1 Shoring, Page 1 – Delete the last paragraph on this page.
2. D-1 Shoring, Page 2– Revise discussion to briefly explain possible techniques to be used to prevent drag-down of RIM during the beam installation for the lagging installed near the transfer station.
3. D-1 Shoring, Page 3 – Revise text to state if the cost estimate provided of $144,000 for the lagging system discussed is "turn-key" and includes estimated cost for the following items: system design, engineering management, quality control, geotechnical testing, and design stamped by a professional engineer, OR if it includes construction cost (i.e. materials and labor only).
4. D-2 Appetite/Phosphate Treatment, Section 2, Page 5, last paragraph, last sentence – Include a citation for the discussion with DOE personnel at the Hanford Superfund Site.
5. D-3 Temporary Structure, General Comment – Delete subjective language such as "extensive," "significantly," "greatly," etc. from this appendix. Temporary Structures have been utilized for various remedial projects and this technology should be further evaluated in remedial design, if warranted.
6. D-3 Temporary Structure, General Comment – This appendix includes a narrative summary that discusses potential technical limitations, cost effects, and schedule effects related to the potential use of temporary structures. Add discussion to note that only one vendor was used to develop the evaluation and that if needed, multiple vendors would be consulted during the RD to develop reliable design and costs to support the use of temporary structures.
7. D-3 Temporary Structure, Page 1, first paragraph, last two sentences and list of numbered bullets – Delete this sentence and all of the numbered bullets as they are subjective statements.
8. D-3 Temporary Structure, Page 1 and 2, third paragraph last two sentences – Delete the last two sentences of this paragraph.
9. D-3 Temporary Structure, Page 2 –Add statements or a new paragraph to include any current implemented or required efforts in Area 1 and Area 2 related to monitoring for and controlling methane. If there are currently no monitoring or engineering controls in place, provide an explanation regarding why no controls are necessary. This discussion should include consideration of any issues that may arise due to methane generated from the waste in the portion of North Quarry overlying Area 1.
10. D-3 Temporary Structure, Page 2, first full paragraph –Delete this entire paragraph and replace with the following: "Due to age of the waste methane may not be a significant issue for most portions of Operable Unit 1. However, decomposing municipal refuse with organic material generates methane as part of the degradation process, thus engineering controls such as a temporary blower skid and horizontal temporary gas well collectors or other methane mitigation technology may be needed

before a temporary structure is erected to help manage/control methane. Additionally, the venting of air into a temporary structure could be used to help mitigate methane. Technical evaluations regarding the extent of potential methane monitoring and, as needed, methane mitigation technologies, will be evaluated in detail as a part of remedial design evaluations for temporary structures, if appropriate."

11. D-3 Temporary Structure, Page 3, first full paragraph and list of bullets discussing sheet piling limitations – This paragraph and subsequent bullets discuss shoring limitations and are repeated verbatim from Appendix D-1. Delete the entire repeated statements/paragraph and all of the repeated bullets. As needed reference readers to Appendix D-1 for this information.
12. D-3 Temporary Structure, Page 3, last paragraph – Revise this paragraph to clarify that the assumptions related to the number/length of gas collection piping for the temporary structures are only estimates and that additional technical evaluations regarding the extent of potential gas collection systems will be evaluated in detail as a part of remedial design for temporary structures, if appropriate.
13. D-3 Temporary Structure, Page 4, last two paragraphs – See comments on Section 4.4.1.1 and revise accordingly.
14. D-3 Temporary Structure, Page 5, Bullet 1 – Revise to split this bullet into two bullets (1) to include cost per sq. ft. and (2) to include number of uses/moves a single structure is estimated to withstand. Add a footnote to clarify the source(s) of information included in the bullets instead of including directly in the listed bullet(s).
15. D-3 Temporary Structure, Page 5, last paragraph located at bottom of Page 5 after the cost estimate summary table – Delete this entire subjective paragraph that starts with; "In summary, this expanded analysis...."

Appendix G

1. General Comment – Revise this appendix to incorporate the industrial risk based partial excavation alternative.
2. General Comment – Sections are provided to briefly discuss air, soil and waste sampling/analysis; however, there are no sections discussing stormwater or leachate sampling/analysis. Revise to include any assumptions made for the remedial alternatives regarding stormwater and leachate and adjust the costing where appropriate. In addition, if appropriate, add any considerations for costing due to the need to test, monitor, sample, handle, and dispose of landfill leachate that may be encountered.
3. Section 1, Page 1 – The first paragraph refers to the Buffer Zone/Crossroads property; however, this area is referred to as Lot 2A2 in other sections of the FFS. Be consistent in how this area is referred to throughout the document.
4. Section 1, Page 2 – Revise the description of the UMTRCA Cover Remedy to be a cap with lower permeability than the ROD-selected cap. Add discussion of the starter berm and excavation of the toes of the current berm in Areas 1 and 2 along St Charles/Rock road and the north and north west portions of Area 2 since those were not specified in the 2008 ROD.
5. Section 1, Page 2, last paragraph, fourth line – Replace "alternative design effort" with "remedial design for the selected alternative."
6. Section 2, Page 5, second paragraph, end of first line – Replace "using" with "in accordance with."
7. Section 3.1, Page 6, last paragraph, last two lines – Replace "minimal" with "less than for excavation scenarios" and replace "significant" with "greater."

8. Section 3.1, bottom of Page 6 and top of Page 7 – The degree of exposure for each of the three partial excavation alternatives could be significantly different and should be discussed separately, highlighting the differences.
9. Section 3.1.1, Page 7 – Cut and fill activities were not discussed as part of the selected ROD remedy, and this action is more likely to disturb more RIM material. Rewrite this section to differentiate the ROD-selected remedy and the UMTRCA Cover remedy by specifying that the UMTRCA Cover alternative will include removal of the "toes" of the landfill berms and construction of the starter berm.
10. Section 3.1.1, Page 7, last paragraph, last sentence – Replace the term "minimal" with an estimation of the amount of RIM that is estimated to be disturbed for each of the capping remedies under discussion. Also, the discussion should note that for the UMTRCA alternative the toes of the berms adjacent to offsite areas will be excavated, but that this is not included for the ROD Selected Remedy. It is not appropriate to assume there will not be measurable airborne exposure levels of dust. Replace the last sentence at the end of 1st paragraph with the following: "Air monitoring and the proper management of fugitive dust are assumed for these remedies and specific detailed plans for minimizing fugitive dust during alternative implementation will be generated during remedial design."
11. Section 3.1.1, Page 8, first paragraph – Provide a figure to indicate where RIM in Areas 1 and 2 might be exposed during construction of the ROD and UMTRCA alternatives since assumptions regarding these areas are made in this paragraph. Also, differentiate between the two capping alternatives the areas where RIM might be disturbed.
12. Section 3.1.1, Page 8, first paragraph – for clarity, move the sentence starting with, "Airborne radiological and chemical constituent..." and place it before the sentence starting with, "Specific detailed plans...." The reason exposures are anticipated to be transient and small should come before the statement.
13. Section 3.1.1, Page 9, first full paragraph – Add a statement that the existing Radiation Safety Plan for Invasive Subsurface Activities dated 2013 will be required to be updated during the RD phase of work.
14. Section 3.1.1, Page 9, first paragraph, last sentence – In this sentence, and in other locations in this document where the text indicates that "In some cases" an action will be taken (e.g., Section 3.1.2.1, 2nd paragraph), clearly state the basis for the criteria for deciding to take that action.
15. Section 3.1.2.1, Page 10, first paragraph, last sentence – If monitoring of radiation safety workers is to be used as a surrogate for monitoring less exposed individuals, as suggested in this sentence, add a statement that says the difference in acceptable exposure criteria for different exposure scenarios will be accounted for (i.e., residential vs. onsite worker vs. rad worker).
16. Section 3.2, Page 11 – Indicate whether the document, "West Lake Radiation Safety Plan" is an existing document or a document to be developed during the RD phase. If it is an existing document, it should be reviewed and updated, if necessary, based on the specific work being proposed.
17. Section 3.2.1, Page 11 – Differentiate between the ROD-selected alternative and the UMTRCA alternative as requested previously. Specifically, the last sentence of this paragraph states that no RIM would be excavated and relocated except for that on the Buffer Zone/Crossroads Lot 2A2. This in not accurate for the UMTRCA alternative since RIM in the toes of certain berms of the landfill will be excavated and relocated. Revise as required.
18. Section 3.2.1, Page 11 – Replace the word "minimal" with "an estimate" of the volume of RIM expected to be disturbed for each of the ROD and the UMTRCA alternatives.
19. Section 3.2.1.1, Page 11, first sentence – Delete the work "minor."

20. Section 3.2.1.1, Page 11, bullets – Indicate whether there will be a survey of the prepared surface prior to placement of the cap. If so, add a bullet. If not, explain why it is unnecessary. This type of survey will be expected for all of the excavation alternatives.
21. Section 3.2.1.1, Page 12, first paragraph – This paragraph does not include discussion of cuts or excavation except with regards to the Buffer Zone/Crossroads Lot 2A2 property. Re-write this survey section to separate the ROD-selected and the UMTRCA cap alternatives and include discussion of the cutting from the toes of the landfill proposed for the UMTRCA alternative. Also, include RIM sample number estimates for each cap alternative. Presumably they would be different based on the additional cuts required for the UMTRCA alternative.
22. Section 3.2.1.1, Page 12, QC walkover surveys conducted after final cover grading and capping - As indicated above, add a discussion of a walkover survey to be conducted after the final grading and surface preparation but before installation of the designed cap. This type of survey would evaluate the RIM concentrations and guide regrading or placement of excavated material so as not to allow an increase in concentration of RIM at the prepared surface.
23. Section 3.2.1.1, Page 12, Footnote 3 – Revise or delete this footnote. Remediation goals will be established in the ROD, not in the remedy design and planning phase. Sufficient detail must be presented in the FFS for the EPA to identify/develop the remediation goals.
24. Section 3.2.1.2, Page 12, Footnote 4 – Delete this footnote. The numerical criteria for the final surveys will be established in the ROD not the remedy design phase.
25. Section 3.2.1.3, Page 13 – Do not use the word minimal when referring to RIM disturbance associated with the UMTRCA capping alternative. Also, this paragraph is incorrect regarding excavation associated with the UMTRCA alternative. Add discussion of the potential for RIM disturbance while excavating up to 112, 000 cy of material from berms around the site and an estimate of the number of samples that may be required for costing purposes.
26. Section 3.2.2, Page 14, 4th line – Insert the word "designated" between the words "all" and "RIM" at the beginning of the fourth line.
27. Section 3.2.2, Page 14, first paragraph, last sentence – This is written only for the full excavation scenario. Add the words "in accordance with the selected alternative" at the end of the fifth line after the words "excavate RIM." Also delete the word "non-impacted" and replace with "only allowable levels of."
28. Section 3.2.2.1, Page 14, the third and fifth bullet – Clarify how and when surveys of the excavated areas will be conducted to determine that specific excavation goals for the remedy have been met, and indicate whether this is related to the third bullet. Discuss when surveys of the prepared surface will be conducted to determine the surface meets all required criteria for that alternative prior to construction of a cap. Discuss how or whether a survey of the prepared surface is related to the fifth bullet or whether a new bullet needs to be added.
29. Section 3.2.2.1, Page 14, Last paragraph – Add an explanation of the complexity of surveying unconsolidated material at the surface. Also, it is not clear whether the surficial surveys described in this paragraph will be conducted prior to the initiation of the excavation activities or after excavation and grading is complete. Please note, surveys identifying RIM at or close to the surface have been conducted and presented in the RIA and FFS documents and it is unlikely this information will change significantly prior to implementation of the remedy. Re-write this paragraph to clarify the intent of these surveys.

30. Section 3.2.2.1, Page 15, first full paragraph – For costing purposes, clarify how many samples of RIM and surrounding material are estimated to be collected for each alternative and provide the rational for when and where a sample will be collected.
31. Section 3.2.2.1, Page 15, second full paragraph – Briefly explain how these surveys will be conducted at depth, estimate the number of samples needed for each alternative for this purpose, and discuss the rational for selecting soil samples.
32. Section 3.2.2.1, Page 15-16, paragraph at the bottom and top of the pages – Clarify whether this survey is for the prepared surface prior to placement of the cap or if it is of the capped surface. Add a survey for the prepared surface prior to the cap, if it is not addressed here or elsewhere.
33. Section 3.2.2.1, Page 15, Footnote 5 – Remediation goals will be established in the ROD, not during remedy design and planning stages. Revise or delete this footnote.
34. Section 3.3, Page 17, second paragraph, third line – Remove the phrase, "a minor amount of RIM, if any" and replace it with an estimated volume of RIM. Also differentiate the ROD selected cap from the UMTRCA Cap with regards to RIM disturbance.
35. Section 3.3.4, Page 19 – Due to the need for well-sealed samples and strict holding times, it is not acceptable to analyze for VOCs after non-destructive radiological analysis has been run on the same sample.
36. Section 4.1.2, Page 21, first full paragraph – The figure referenced should be Figure 3, not Figure 4. This change should also be made in Section 4.2.
37. Section 4.1.2, Page 21 – Clarify why there are no gas monitoring wells proposed along the south sides of Area 1 or Area 2, and add them if appropriate.
38. Section 5, Long Term Monitoring, Page 22, first paragraph, first sentence – This sentence mentions that surface water will be a part of long-term monitoring, however no mention of assumptions or other details related to these efforts are provided in the narrative. Revise to include new text that explains the assumptions related to for long term monitoring efforts of storm water/surface water at the site.
39. Section 5, Page 22, first paragraph – Revise the 4th line to read, "Long-term air monitoring for certain radionuclides may not be necessary...."
40. Section 5, Page 22, second paragraph – Revise the fourth line of the paragraph to state that there are 6 alternatives under consideration rather than four.
41. Section 5.1.2, Page 23, first paragraph, last sentence – Delete the word "shallow".
42. Section 5.1.2, Page 23, second paragraph – Delete the second sentence and replace it with, "The groundwater monitoring program will be designed so that it can determine whether the cap is preventing contaminants from leaching to groundwater in excess of MCLs, or if there is no MCL, other standards identified by the ARARS. The OU-3 RI will be designed to determine whether contaminants from the site have migrated across the waste management unit boundary in concentrations that exceed the MCLs, and if so, to delineate the associated contaminant plume.
43. Section 5.1.2, Page 23, third paragraph – Delete this paragraph in its entirety. It is not necessary for estimating costs.
44. Section 5.1.2, Page 23, fourth paragraph, first sentence – delete "the point of compliance" from the first line.
45. Section 5.1.2, Page 23, fourth paragraph, last sentence – Revise this sentence to state, "For cost estimating purposes, assume the wells would be sampled quarterly the first 2 years to characterize baseline conditions, semi-annually the next three years, and annually thereafter, subject to request and the EPA's approval."

46. Section 5.1.2, fifth paragraph, first sentence – Add, "For cost estimating purposes," to the beginning of the first sentence.
47. Section 5.1.3, Page 24, first paragraph in sections – Revise this paragraph to state that cover inspections will be conducted quarterly the first year, semiannually the second, and annually thereafter, upon the EPA's approval. Additional inspections may be required after extreme weather events such as tornados, flooding, or 25-year rain events.
48. Section 5.1.3, Page 24, second paragraph – Revise this section to indicate that monitoring and inspection results will also be submitted to the EPA in semi-annual monitoring reports. The reporting frequency is subject to change based on the EPA's approval. This revision should also be applied to Section 5.2.3.
49. Table 5 – This table does not appear to address environmental monitoring for stormwater during remedial construction. Explain why the stormwater monitoring is not included in the table, or add provisions for sampling stormwater during remedy implementation.

Appendix H

1. General Comment – Consistent with comments provided on the baseline risk assessment, include as attachments to this appendix a table of the data used to calculate exposure point concentrations, or EPCs, for each contaminant being considered, the ProUCL or other software output used to calculate the EPC and one representative example of the inputs and outputs from PRG and RSL calculators for each exposure scenario evaluated to allow review and confirmation of EPCs and calculated risks. In addition, provide the inputs and outputs from AERMOD and MicroShield used in the evaluations contained in this appendix.
2. General Comment – Per RAGS Part C, Page 20 states "It is important to note, however, that factors not associated directly with hazards particular to a given site (e.g., risk of accidents during offsite motor vehicle transport) are not usually considered during the FS, but instead should be addressed prior to remediation in the site health and safety plan." Based on this, delete all sections and references in the FFS discussing risks of injury or fatalities from industrial and construction accidents including traffic accidents.
3. General Comment – Section 2.2.4.1 states that dust suppression measures and a properly managed health and safety monitoring program will serve to reduce dust emissions within the working areas. The EPA notes that the implementation of an appropriate health and safety plan for remediation workers will involve the use of PPE, other Best Management Practices (BMPs) and measures to prevent any unacceptable exposures to dust. Therefore, the short-term effectiveness pathways presented in this appendix causing risks to remediation workers that can be prevented or significantly minimized through use of PPE, and by following an appropriate health and safety program, should be presented only to discuss the need for such a program. The final evaluation of risk associated with short-term effectiveness for on-site and off-site receptors for each alternative should include only those risks which cannot be readily prevented or minimized by a health and safety program, e.g., direct radiation from soil, inhalation of radon, and direct radiation from submersion in air. Therefore, the risk calculations presented for risk to workers are overly conservative. The risks determined from the remaining pathways should only be used to discuss what work practices and PPE would be a necessary part of the associated Health and Safety Program. Any requirements that could significantly alter the cost or schedule of implementing a remedy should be estimated and incorporated into the overall evaluation of that remedy.
4. General Comment – EPCs presented in this attachment, as provided in Appendix B of the FFS, cannot be confirmed by the EPA as the associated data inputs and proUCL outputs were not provided. There appear to be inaccuracies associated with the provided EPCs. As an example, table 4-1 on Page 30 includes footnote "a" which states, "Based on maximum concentrations of excavated

material in Areas 1 and 2." This appears to imply that the EPCs provided for this alternative are based on the maximum soil concentrations contained within Areas 1 and 2. The EPA does not agree that this is appropriate and the concentration provided in table 4-1 for Thorium-230 (56,900 picocuries per gram, or pCi/g) appears to exceed the maximum Thorium-230 concentration provided in the RI Addendum (45,100 pCi/g). Ensure that EPCs are calculated based on the 95% UCL of the mean of the data associated with each alternative, consistent with guidance provided by the EPA with comments to the updated Baseline Risk Assessment. Recalculate any EPC's as necessary.

5. General Comment – Add footnotes to Tables 4-3, 5-3, 6-3, 8-3 and Attachment A, Table A-2 that provide explanation(s) for the Slab size as presented on these tables.
6. General Comment – There are inconsistent references in this appendix to the separate appendix that includes the discussion of the determination of the 95% UCLs of the mean. Appendix L is sometimes referenced for methods used to calculate these UCLs while Appendix B appears to contain this information. Correct any inaccurate references throughout this appendix.
7. General Comment – The sections of this appendix that present the long-term risks often reference scatter plots for each contaminant of potential concern, or COPC, and equations used to calculate each COPC associated with the direct radiation from soil pathway. Include these scatter plots as an attachment to this appendix and reference this attachment in the text. In addition, clarify why these types of scatter plots and associated evaluations are not needed for the short-term risk evaluations. Finally, provide a rationale for why MicroShield software was utilized for the determination of remediation worker doses instead of the EPA's Dose Compliance Concentration for Radionuclides (DCC) calculator (https://epa-dccs.ornl.gov/cgi-bin/dose_search).
8. General Comment — A consistent definition of the term COC is needed that applies across the main text/tables and Appendices of the FFS. The acronym list for the Revised Draft FFS text defines "COPC" as "Constituent of Potential Concern"; however, the acronym "COC" is defined as "Chemicals of Concern". It appears that the only use of the latter in the main text of the Revised Draft FFS is in the third bullet under Section 1.4.2.1. Appendix H in the Revised Draft FFS indicates the first mention of COC(s) to be in Section 3.5.1, in the next to last paragraph on Page 24. However here, COC is defined as "contaminants of concern" rather than "chemicals of concern".
9. Executive Summary, Page xiii, first paragraph – This paragraph compares the "overall risk" determined in this appendix for the various remedial alternatives. It appears that the overall risk is determined by addition of the "short-term and long-term risks" for each alternative. The EPA notes that risks to remediation workers to implement a remedy relate to short term effectiveness, a balancing criteria, while potential risks to future receptors relate to protection of human health and the environment, a primary criteria. Revise this paragraph of the executive summary by presenting the estimated risks associated with short term effectiveness separately from the estimated risks associated with the protection of human health. In addition, remove the word "well" from the last sentence.
10. Executive Summary, Page xiv, first paragraph of ES2 – Delete the sentence that states, "The EPA has previously determined that exposures resulting in an incremental cancer risk of no more than one instance in ten thousand – that is, 10^{-4}, or a 0.01% chance increase – to the hypothetical receptor are acceptable for purposes of CERCLA risk assessment."
11. Executive Summary, Page xv, first paragraph – Revise the sentence that starts with "This evaluation is designed..." as follows, "This evaluation is designed to be conservative."
12. Section 1, Page 2, third full paragraph – This paragraph lists the nine criteria set forth in the NCP. Revise the last sentence in this paragraph as follows, "In support of evaluating short-term effectiveness and protectiveness of human health and the environment, this appendix contains evaluations of the potential short-term risks to remediation workers and long-term risks to future receptors associated with soil and air for each remedial alternative and the methods used to identify and quantify those risks."

13. Section 2.2.1.1, Page 6, Table 2-2 – Add the RSL value for chromium using Cr (VI) to this table.
14. Section 2.2.1.1, Page 5, Table 2-1. Table 2-2 on Page 6 includes footnote 'a' to denote that screening concentrations are the "maximum detected concentrations." Please add the same footnote to Table 2-1.
15. Section 2.2.1.1, Page 5-6, Table 2-1 and 2-2. Add a new footnote to define that the term "Pass" indicating that the radionuclide or chemical IS identified as a COPC.
16. Section 2.2.3.1, Page 7, first paragraph in the section – The last sentence states that the ROD/UMTRCA remedies are not anticipated to involve shipping waste for off-site disposal, and therefore are not expected to involve excavating RIM among other activities. This does not appear to be consistent with the respondents' evaluation of the ROD/UMTRCA remedies which involve the excavation of more than 100,000 cubic yards of waste, some of which may contain RIM, in order to regrade the surface of Area 1 and Area 2. Revise this paragraph and the sections in this appendix that evaluate the short-term risks associated with the ROD/UMTRCA remedies to include estimates of risks to remediation workers that may be excavating RIM.
17. Section 2.2.4.1, Page 9, first paragraph – Include the input and output used in REACOM to determine the short-term radon flux associated with each alternative in this appendix and reference it in this paragraph. Include in Table 2-3 the 95% UCL for Radium-226 used in the RAECOM evaluation in this paragraph. Include a description of the data that was used to calculate this UCL, e.g. surface soil samples from Area 1, Area 2, and the Buffer Zone/Crossroads properties. Finally, clarify what is meant by, "Importantly, these exposure point concentrations were modeled from soil concentrations without consideration of vertical or horizontal distribution. Hence, while these estimates may be useful for comparing alternatives, they lack the discretization necessary to develop a partial excavation scenario (i.e., to target the highest areas of risk)."
18. Section 2.2.1, Page 10, second paragraph in the section – Replace this paragraph with the following sentence, "Release mechanisms and exposure pathways related to groundwater will be further investigated as part of the remedial investigation work for OU3."
19. Section 2.2.2.1, Page 13, fourth paragraph – Reference where appropriate in this section the December 22, 2016 OLEM Directive 9200.2-167.
20. Section 2.2.2.1, Page 13, footnote 4 – Reference the latest version of the Adult Lead Methodology, dated 6/14/2017.
21. Section 2.2.3, Page 15, second paragraph – Revise the sentence that begins with "The post-construction surface..." as follows, "The post-construction surface of OU1 for all five of the remedial alternatives will be covered by landfill cover designed to comply with the ARARs appropriate for each remedy alternative."
22. Section 3, Page 19, first paragraph after the bullets – Revise the text to clarify if the On-Site RadCon Tech working in with RIM in the "Transfer Station" is referring to the receptor at the RIM staging and loading building depicted on figure 2-1.
23. Section 3.1, Page 19, first bullet – Clarify whether moving RIM from the Buffer Zone/Lot 2A2 onto Area 2 is an anticipated activity for the full excavation remedial alternative.
24. Section 3.1, Page 19, second and third bullets – It is unclear why excavation and movement of RIM within Areas 1 and 2 is not applicable to the ROD-selected remedy. Section 5.3.1.1 of the FFS currently describes that the ROD-Selected remedy will involve excavation of 112,000 yards of waste including a total of approximately 35,000 yards to be cut to regrade inert fill (e.g., concrete rubble) piles; approximately 4,000 yards to be cut to achieve the minimum surface slope and promote drainage from the surfaces of Areas 1; and 2, 12,000 yards to be cut to create space for construction of the starter berms; approximately 39,000 yards to be cut to reduce existing perimeter slopes to below 25; and approximately 23,000 yards to be cut to create space for construction of a surface water detention basin in Area 1. Unless the respondents have determined that these excavation projects will not encounter RIM, appropriate risk estimates for exposures to RIM for remediation

workers should be included in this appendix. These risks should also be estimated for the UMTRCA remedy alternative as section 5.4 of the FFS references section 5.3.1.1 as being applicable to this alternative.

25. Section 3.1, Page 19, bullet 5 – Clarify whether respondents expect that all remedies including the ROD/UMTRCA Remedies will involve mixing lower and higher activity RIM to meet disposal site waste acceptance criteria.
26. Section 3.3, Page 21, first bullet on the page – It is unclear whether "Nearby Workers" are being considered as on-site or off-site receptors. The text in the bullet states that workers would be located at businesses near the site and as such appear to be off-site receptors. Clarify in the text the classification of the "Nearby Worker" receptor, the receptor location utilized for the qualitative evaluation, and the rationale for not quantitatively evaluating this receptor. The EPA notes that there are currently businesses located adjacent to the north boundary of Area 2 and the south east boundaries of Area 1 that appear to be off-site. Because distance from the site is expected to effect the estimated concentrations of contaminated particulate and radon emanating from the site during implementation of a remedy, the rationale for not quantitatively evaluating these receptors should include more than just a comparison of intake rates and exposure times.
27. Section 3.5, Pages 23 through 25, general comment – This section lists the exposure pathways considered to be complete for the various short-term receptors evaluated in this appendix. Not included in the bulleted list is the receptor considered for the accident scenario. Further, section 3.5.1 which presents the exposure pathway assessment only appears to present the assessment for the receptor associated with the accident assessment. Revise this section by including the exposure pathway assessment for all of the short-term receptors. In addition, Section 3.5.1 appears to exceed the scope of an exposure pathway assessment as it presents the total estimated risk to an accident scenario receptor. Move the full risk evaluation for an accident scenario receptor into an appropriate section (e.g., consider changing sections 3.4 and 3.5, presenting the full exposure pathway evaluation in section 3.4 and presenting the full risk evaluation of the accident scenario receptor in section 3.5).
28. Section 3.5.1, Page 24, 4th full paragraph – Reference the specific table from the BRA that the 95% UCL of the mean in column 2 of Table 3-2 were copied from.
29. Section 3.5.1, Page 26, Table 3-2 – Revise the table by including footnotes with specific references that clearly identify the source of the concentrations in the first four columns of this table.
30. Section 4.1, Page 29, first paragraph – Revise the first sentence as follows, "In this remedial alternative, RIM will be excavated and temporarily stored in the on-site transfer station to the extent necessary in order to ship all RIM with activity levels above 1,000 pCi/g to an approved out-of-state disposal facility.
31. Section 4.2.1, Page 29, first paragraph in the section – The reference to section 2.2.1.1 appears to be erroneous as it is titled "Radionuclides of Potential Concern." The referenced section does not discuss determination of the 95% UCL concentrations.
32. Section 4.1, Page 30, table 4-1 – This table presents the exposure point concentrations for the "Partial Excavation to 1,000 pCi/g" Alternative according to the text on Page 29. Footnote "a" and the concentrations provided as exposure point concentrations in column 1 of this table appear to be inconsistent with the previous page. The maximum concentration of RIM expected to be excavated from either Area 1 or Area 2 should not be used as an exposure point concentration for this alternative. Revise Table 4-1 and the subsequent risk evaluation, as appropriate, utilizing appropriate 95% UCL of the mean exposure point concentrations.
33. Section 4.2.2, Page 31, first paragraph – Revise sentence two by specifying which measured values the radon concentrations are derived from and reference the specific section or table in the updated BRA where the values were copied from. Finally, the reference to the Figure 2-1 in the last sentence appears to be erroneous and should be corrected.

34. Section 4, Page 33, Table 4-3 – Add a footnote that provides the rationale for the selection of 2000 square meters as the area correction factor. In addition, specify in the note below the table which receptor type was chosen in the PRG and RSL calculators so that it is clear which default values are being referenced.
35. Section 6.2.4.1, Page 69, last paragraph in the section – The paragraph states that the calculated lifetime risk to the RadCon Tech for the full excavation alternative is of 5.9×10^{-1} but this does not match the risk of 5.94×10^{-4} presented in the associated Table 6-4. Revise the text to be consistent with Table 6-4.
36. Section 8.1, Page 76, first paragraph in the section – Revise the first sentence as follows, "In both the ROD-Selected Remedy and the UMTRCA Cover alternative, the RIM will remain or be consolidated in Area 1 and Area 2 with Site improvements in accordance with the RAOs."
37. Section 8.2.4.1, Page 81, general comment – The text does not clearly explain how the risk to a RadCon Tech during the ROD and UMTRCA remedies is being evaluated differently from the full and partial excavation alternatives. Specifically, there is no mention or accounting for the lack of a RIM staging and loading building. Clarify in the text how the exposure scenario and receptor locations are different from the full and partial excavation alternatives.
38. Section 9.2.1, Page 93, last paragraph. It is unclear why exposure point concentrations in soil are being estimated at 1 year and 1,000 years in the future to estimate "long-term" risk. Expand this paragraph by providing an explanation.
39. Section 14, General Comment – The EPA notes that revisions may be needed to this section based on subsequent EPA comments to appendix F.
40. Section 15 – Due to the significance of the comments provided in this letter on Appendix H which may affect the pathways considered in the short term risk comparison, the exposure point concentrations, and the specific receptor scenarios that are being evaluated, the EPA does not feel Section 15 is appropriate to review at this time. The EPA will review Section 15 after the comments on this appendix have been addressed and the revised appendix has been submitted.
41. Correct any inaccurate or duplicative section title numbers (e.g., Section 2.2.1 on pg. 4 and Section 2.2.1 on pg. 10).

Appendix H, Attachment A

1. The first table presented in the attachment (Short-Term Input Parameter and Risk Summary Table, Residual), which is identified as Table A-6, should be Table A-1.
2. Add footnote to Attachment A, Table A-2 that provides explanation for the Slab size as presented on the table.

Appendix J

1. General Comment – The schedule presentation in Appendix J is hard to follow and has limited explanations regarding task dependency logic, the critical path method, etc. The final schedule presentations would be better if only one designated color scheme is used to show the overall critical path (e.g., red throughout), then use another color to show longest durations activities within a task that do not have an impact on the critical path, and another color(s) to show those activities within Tasks that are just shown for information or accountability that have little or no impact on the critical path. Legends should be provided on detailed project schedule illustrations to better define the importance of the color scheme used.
2. General Comment – Although a brief explanation of the method used to determine durations was provided, an example to demonstrate how cost information was used to provide activity durations would allow reviewers to better understand how activity durations were attained (e.g., from cost

estimates: durations=quantities (project specific inputs)/daily construction rates (as defined by reference source RS Means)). Provide an example.

3. The estimated length of construction durations listed for the ROD-Selected Remedy cap and the UMTRCA cap provided in the project schedules in Appendix J (1.8 years) are slightly higher than those defined and used in the Cost Estimates in Appendix K (1.7 years). Confirm which duration is accurate or justify the difference. For consistency, only one duration should be used for both assessments.
4. Rod-Selected Cap Alternative – The logic displayed within the schedule appears to suggest that the clay layer material acquisition and staging cannot begin until the bio-intrusion layer construction has been completed. It also appears as if the acquisition of the clay layer material is weather constrained. Because of these factors, construction appears to be halted for 5+ months when clay acquisition is not possible, and delayed an additional two months while it is delivered. This duration contributes to the overall scenario duration and is likely mitigated by better material planning, storage, and staging. A similar condition exists within the schedule for the bio-intrusion layer, yet is less impactful – one month. The issue for the bio-intrusion layer is carried through many of the alternatives. Please provide justification for these apparent delays or make corrections.
5. Rod-Selected Cap Alternative – In the detailed schedules, cleaning frac tanks (activity IDS 44, 122, and 132) appear to be shown as critical activities, due to the red color. Clarify and justify whether this activity should be designated as critical, or revise the schedule and provide additional information about interpreting the schedule. This issue appears in many of the alternatives.
6. Full Excavation Alternative – There are large periods of duration within the detailed version of the schedule where no activities are displayed as critical. This is the case between mid-2019 to early 2022, mid-2022 to mid-2025, and mid-2026 to early 2029. Driving activities occur during these times, but are not logically tied in a way that would ensure critical path logic is correct and can be traced and verified. Evaluate the schedule for accuracy and revise or explain the rationale for the current schedule.
7. Full Excavation Alternative – Budgeted weather days (dewatering and lack of productivity) should be scheduled on the critical path as a contingency layer for the overall duration of the scenario. These activities should be based on NOAA weather data and should be driven by overall project duration more so than cubic area of disturbed land. This activity appears as if it may be a driving activity, yet logic is incomplete and the activity is not marked as critical. Clarify in the report the logic and methodology used for how this duration was calculated.

Appendix K

1. General Comment – Using RS Means assumes following: unit cost rates for labor are fully burdened; 100% productivity; total costs includes contractor overhead and profit of 10% on materials plus sales tax, 15% on labor plus burden, and 10% on equipment. Bridgeton taxes of 7.4% are applied to all work. This appears to be a duplication in costs since sales tax is already included on unit cost items obtained from RS Means (i.e., materials costs). Revise accordingly.
2. General Comment – There appears to be some duplication of construction management costs since construction management personnel are included in the itemized Temporary Construction Facilities/Utilities/Personnel and then applied as a percentage to the overall Construction Costs. Clarify or correct as necessary.
3. General Comment – For present worth costs, not only are annual and periodic operations, maintenance, and monitoring (OM&M) costs discounted, but capital costs were also discounted for proposed implementation durations. Although this seems to be an appropriate approach, it is

assumed that the durations within the construction cost calculations were somehow used to proportion these costs out. Provide clarification on the method used to provide these breakdowns.

4. ROD-Selected Alternative – In Appendix K-2, for clarification with other task-subject construction costs, add a note to storm water monitoring and inspection and air monitoring costs that the applicable number of quarters needs to be applied to these quarterly unit costs. This also applies to all of the other alternatives.
5. ROD-Selected Alternative – Although costs were provided in the estimate in Appendix K for storm water monitoring during construction, no details were provided in the descriptions in Appendix G that define or discuss the need for these activities. Add a description of this monitoring to Appendix G. This also applies to all of the other alternatives.
6. ROD-Selected Alternative – The number of groundwater wells (24 wells, 12 new and 12 existing wells) and landfill gas wells (31 wells) to be installed and monitored match between the text in Appendix G and the Appendix K cost estimate, but do not match the number listed in the summary table (Table 5) in Appendix G. Correct the number of groundwater wells and gas wells in Table 5. This also applies to all the other alternatives.
7. UMTRCA Cap Alternative – The cost discussion in Section 6.2.3.7 (Page 306) of the FFS refers to the ROD selected remedy rather than UTMCRA alternative for shipping/handling costs. Correct the reference.
8. Full Excavation Alternative – The description of Post-Construction landfill gas monitoring provided in Appendix G states that only landfill gas monitoring for radon would be provided for this alternative. However, the cost estimate for this alternative also includes costs for a radon flux ($27,000). Remove the radon flux analysis from the post-construction costs for this alternative. Appendix K-2, Page 8 – Replacement costs for monitoring wells has not been included in the costs of each alternative. Add costs for the replacement of monitoring wells approximately every 30 years for each alternative except the full excavation.

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart A, Standards for the Control of Residual Radioactive Material from Inactive Uranium Processing Sites	Radon-222	Air	The annual average release rate of radon-222 to the atmosphere applied over the entire surface of a disposal site should not exceed 20 pCi/m2-s, and the annual average concentration of radon-222 in air at or above any location outside the disposal site should not be increased by more than 0.5 pCi/L.	Not applicable but potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. The radiologically impacted materials at the Site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at the Site are not similar to uranium mill tailings. These regulations are applicable to uncontrolled areas, whereas the current and future uses of Areas 1 and 2 are restricted. As these regulations address radon emissions, which is a concern for OU-1, they are considered potentially relevant and appropriate to the ROD-selected remedy and the partial excavation alternatives.
40 C.F.R. 192.02			Protection standards also include the requirement that the control of the radioactive materials be designed to be effective for up to 1,000 years, as far as reasonably achievable, but at a minimum, 200 years. 40 C.F.R. 192.02.		
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart A, Standards for the Control of Residual Radioactive Material from Inactive Uranium Processing Sites 40 C.F.R. 192.03-192.04, and Table 1 to Subpart A	Radium, Uranium, and trace metals	Ground-water	Establishes maximum concentration for groundwater protection. Maximum constituent concentration: Combined Ra_{226} and Ra_{228} 5 pCi/L Combined U_{234} and U_{238} 30 pCi/L Gross alpha (excluding radon & uranium) 15 pCi/L Arsenic 0.05 mg/L Barium 1.0 mg/L Cadmium 0.01 mg/L Chromium 0.05 mg/L Lead 0.05 mg/L Mercury 0.002 mg/L Selenium 0.01 mg/L Silver 0.05 mg/L Nitrate (as N) 10 mg/L Molybdenum 0.1 mg/L Monitoring standards are substantially more general and merely provide that a groundwater monitoring plan be implemented and carried out over a period of time adequate to demonstrate that the future performance of the disposal system can be expected to be in accordance with certain design requirements. 40 C.F.R. 192.03.	Not applicable but potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. As potential leaching of radionuclides and trace metals from the radiologically impacted materials at the Site is a possible issue of concern, these standards are potentially relevant and appropriate to the ROD-selected remedy and the partial excavation alternatives.

Commented [A1]: Delete this sentence throughout Table 3.

Commented [A2]: Delete this sentence throughout Table 3.

Commented [A3]: Add specific references to 192.02(a) and (b).

Commented [A4]: Procedural/administrative requirements such as a monitoring plan are not ARARs.

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart B, Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites 40 C.F.R. 192.12(a) 40 C.F.R. 192.12(b)	Radium-226 (Radium-228)	Soil	Residual concentrations of radium-226 in soil at a designated uranium processing site should not exceed background by more than 5 pCi/g in the top 15 cm of soil or 15 pCi/g in each 15 cm layer below the top layer, averaged over an area of 100 m^2. (Similar limits are indirectly indicated for radium-228 in Subpart E, which addresses thorium by-product material.) 40 C.F.R. 192.12(a). That in any occupied or habitable building: (1) The objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration shall not exceed 0.03 WL, and (2) The level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour. 40 C.F.R. 192.12(b).	Neither applicable nor relevant and appropriate to Areas 1, 2 and the Buffer Zone Potentially relevant and appropriate for radiologically impacted soil on the Crossroads Lot 2A2 Property	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore this requirement would not be applicable. The radiologically impacted materials at the Site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at the Site are not similar to uranium mill tailings. These regulations are applicable to uncontrolled areas whereas current and future uses of Areas 1 and 2 are restricted. Consequently, these regulations are not relevant and appropriate to Areas 1 and 2 (including the Buffer Zone). They are potentially relevant and appropriate for impacted soil on the Crossroads Lot 2A2 property.
40 C.F.R. 192 Subpart C (Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 C.F.R. 192, Subpart C - Implementation)) 40 C.F.R. § 192.21(c)	Radium, Uranium, and trace metals	Soil	40 C.F.R. 192.21(c) comes into play when the estimated cost of remedial action to satisfy § 192.12(a) at a "vicinity" site (described under section 101(6)(B) of the Act) is unreasaonbly high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard. The likelihood that buildings will be erected or that people will spend long periods of time at such a "vicinity" site should be considered in evaluating this hazard. Remedial action will generally not be necessary where residual radioactive materials have been placed semi-permanently in a location where site-specific factors limit their hazard and from which they are costly or difficult to remove, or where only minor quantities of residual radioactive materials are involved. Examples are residual radioactive materials under hard surface public roads and sidewalks, around public sewer lines, or in fence post foundations. Supplemental standards should not be applied at such sites, however, if individuals are likely to be exposed for long periods of time to radiation from such materials at levels above those that would prevail under § 192.12(a).	Not applicable but potentially relevant and appropriate	40 C.F.R. 192 Subparts A and B would not be applicable. Given that Subpart C purports to guide the implementation of Subparts A and B where applied to a site, Subpart C is inapplicable as well. However, given that Subparts A and B may be relevant and potentially appropriate, the implementation standards of Subpart C may have bearing on any remedy that considers or is based off of the standards in Subparts A and B. In particular, this could apply if inaccessible RIM is identified during the course of the Remedial Design (particularly on "vicinity" properties).
Health and Environmental Protection Standards for Uranium and Thorium Mill	Radiation	Any	Processing operations during and prior to the end of the closure period at a facility managing uranium and thorium by-product materials should be conducted in a manner that	Neither applicable but potentially	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable.

Commented [A5]: 192.12(a) and (b) are relevant and appropriate for OU1 (see EPA comment to Section 3.1.1.1.2, Page 75 and 76 of the revised FFS).

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Tailings (40 CFR 192), Subpart D, Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as amended; Subpart E, Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as amended 40 C.F.R. § 192.32 40 C.F.R. § 192.41			provides reasonable assurance that the annual dose equivalent does not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive material to the general environment (excluding radon-222, radon-220, and their decay products). Subpart E applies the standards of 40 C.F.R. 192 Subpart D to thorium byproduct materials, save for the provisions of § 192.32(a)(4) (setting forth monitoring standards following placement of permanent radon barrier).	relevant and appropriate	The radiologically impacted materials at the Site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at the Site are not similar to uranium mill tailings. As alpha and gamma radiation is a potential exposure route for OU-1, these regaulations are considered to be potentially relevant and appropriate. However, these subparts may be relevant and appropriate to the extent that they identify performance standards for disposal areas, specifically mandating that a design must be effective for 1,000 years, to the extent reasaonbly achievable, and, in any case, 200 years, and limit releases of radon-222 into the atmosphere from disposal areas exceeding an average release rate of 20 pCi/(m^2-sec).
National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), Subpart T, National Emissions Standards for Radon Emissions from disposal of Uranium Mill Tailings 40 C.F.R. § 61.222(a)	Radon-222	Air	Radon-222 emissions to ambient air from uranium mill tailings piles that are no longer operational should not exceed 20 pCi/(m^2-sec) (1.9 pCi/(ft^2-sec)) of radon-222. 40 C.F.R. § 61.222(a).	Potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated uranium mill tailings site, so this requirement would not be applicable; however it could be considered relevant and appropriate because a portion of the waste materials at the Site do emit radon. 40 C.F.R. § 61.222(a)'s limit of 20 pCi/(m^2-sec) (1.9 pCi/(ft^2-sec)) of radon-222 may be potentially relevant and appropriate to the capping and partial excavation alternatives.

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
National Primary Drinking Water Regulations 40 CFR Part 141	Various	Water	Establishes standards including maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) for public drinking water systems	Potentially relevant and appropriate	These standards are only applicable topublic drinking water systems; however, MCLs and non-zero MCLGs may potentially be relevent and appropriate standards for groundwater.

Contaminant	MCLG (mg/L)	MCL (mg/L)
Trace metals		
Antimony	0.006	0.006
Asbestos	7 x 10^6 fibers/liter	7 mfl
Barium	2	2
Beryllium	0.004	0.004
Cadmium	0.005	0.005
Chromium (total)	0.1	0.1
Copper	1.3	1.3
Cyanide	0.2	0.2
Fluoride	4.0	4.0
Lead	0.015	zero
Mercury (inorganic)	0.002	0.002
Nitrate (as N)	10	10
Nitrite (as N)	1	1
Selenium	0.05	0.05
Thallium	0.0005	0.002
Organic Chemicals		
Alachlor	zero	0.002
Atrazine	0.003	0.003
Benzene	zero	0.005
Benzo(a)pyrene (PAHs)	zero	0.0002
Carbofuran	0.04	0.04
Carbon tetrachloride	zero	0.005
Chlordane	zero	0.002
Chlorobenzene	0.1	0.1
2,4-D	0.07	0.07
Dalapon	0.2	0.2
1,2-Dibromo-3-chloropropane	zero	0.0002
o-Dichlorobenzene	0.6	0.6
p-Dichlorobenzene	0.075	0.075
1,2-Dichloroethane	zero	0.005
1,1-Dichloroethylene	0.007	0.007

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement		Preliminary Determination	Remarks
National Primary Drinking Water Regulations 40 CFR Part 141 (cont.)		cis-1,2-Dichloroethene	0.07	0.07	
		trans-1,2-Dichloroethene	0.1	0.1	
		Dichloromethane	zero	0.005	
		1,2-Dichloropropane	zero	0.005	
		Di(2-ethylhexyl) adipate	0.4	0.4	
		Di(2-ethylhexyl) phthalate	zero	0.006	
		Dinoseb	0.007	0.007	
		Dioxin (2,3,7,8-TCDD)	zero	0.00000003	
		Diquat	0.02	0.02	
		Endothall	0.1	0.1	
		Endrin	0.002	0.002	
		Ethylbenzene	0.7	0.7	
		Ethylene dibromide	zero	0.00005	
		Glyphosate	0.7	0.7	
		Heptachlor	zero	0.0004	
		Heptachlor epoxide	zero	0.0002	
		Hexachlorobenzene	zero	0.001	
		Hexachlorocyclopentadiene	0.05	0.05	
		Lindane	0.0002	0.0002	
		Methoxychlor	0.04	0.04	
		Oxamyl (Vydate)	0.2	0.2	
		PCBs	zero	0.0005	
		Pentachlorophenol	zero	0.001	
		Picloram	0.5	0.5	
		Simazine	0.004	0.004	
		Styrene	0.1	0.1	
		Tetrachloroethylene	zero	0.005	
		Toluene	1	1	
		Toxaphene	zero	0.003	
		2,4,5-TP (Silvex)	0.05	0.05	
		1,2,4-Trichlorobenzene	0.07	0.07	
		1,1,1-Trichloroethane	0.2	0.2	
		1,1,2-Trichloroethane	0.003	0.005	
		Trichloroethylene	zero	0.005	
		Vinyl chloride	zero	0.002	
		Xylenes (total)	10	10	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement			Preliminary Determination	Remarks
National Primary Drinking Water Regulations 40 CFR Part 141 (cont.)			Radionuclides (picocuries per liter [pCi/L])				
			Alpha particles	zero	15		
			Beta particles and photon emitters (millirems per year)	zero	4		
			Radium 226 and Radium 228 (combined)		5		
			Uranium (ug/L)	zero	30		
NRC Standards for Protection Against Ionizing Radiation (10 CFR 20 Subpart C), Maximum Permissible Exposure Limits 10 C.F.R. 20.1201(a)	Radiation	Any	For persons inside a controlled area, the maximum permissible whole-body dose due to all external sources of radiation within a controlled area is limited to 5 rems/year or the sum of the deep-dose equivalent and the committed dose equivalent to any indvidual organ or tissue other than the lens of the eye being equal to 50 rems. The annual limits to the lens of the eye , to the skin of the whole body, and the skin of the extremities are a lends dose equivalent of 15 rems and a shallow-dose equivalent of 50 rem to the skin of the whole body or to the skin of any extremity. (Note: a controlled area is an area that requires control of access, occupancy, and working conditions for radiation protection purposes.)			Potentially relevant and appropriate	Because the site is not licensed by NRC, these requirements are not applicable. As these regulations address sources of ionizing radiation, they are potentially relevant and appropriate as they provide standards for protection from radiation for workers inside Areas 1 and 2 during any remedial actions that maybe undertaken.
NRC Standards for Protection Against Ionizing Radiation (10 CFR 20 Subpart D), Maximum Permissible Exposure Limits 10 C.F.R. 20.1301(a)	Radiation	Any	For persons outside a controlled area, the maximum permissible whole-body dose due to sources in or migrating from the controlled area is limited to 0.002 rem in any 1 hour, and 0.1 rem in any one hour. (Notes: a controlled area is an area that requires control of access, occupancy, and working conditions for radiation protection purposes; 0.5 rem =500 mrem.)			Potentially relevant and appropriate	Because the site is not licensed by NRC, these requirements are not applicable. As these regulations address sources of ionizing radiation, they are potentially relevant and appropriate of workers and the public outside of Areas 1 and 2 during any remedial actions that may be taken. (Note: 10 C.F.R. 20.1301 was the only section from 10 C.F.R. 20 specifically listed as an "Other Potential Federal ARARs for Consideration".)

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
NRC Standards for Protection Against Ionizing Radiation (10 CFR 20 Appendix B) Annual Limits on Intake (ALIs) Derived Air Concentrations (DACs) Effluent Concentrations (Tables 1 and 2)	Specific radionuclides (see table)	Air	The concentrations above natural background of radionuclides in air ouside a controlled area, averaged over any calendar quarter, should not exceed the following limits: Effluent Concentration Limit (uCi/mL) Isotope / Air / Water Actinium-227: 1 x 10-15 / 5 x 10-9 Lead-210: 6 x 10-13 / 1 x 10-8 Protactinium-231: 8 x 10-15 / 6 x 10-9 Radium-226: 9 x 10-13 / 6 x 10-8 Radium-228: 2 x 10-12 / 6 x 10-8 Radon-222: 1 x 10-8 / NA Thorium-230: 3 x 10-14 / 1 x 10-7 Thorium-232: 6 x 10-15 / 3 x 10-8 Uranium-234: 5 x 10-14 / 3 x 10-7 Uranium-235: 6 x 10-14 / 3 x 10-7 Uranium-238: 6 x 10-14 / 3 x 10-7 NA = not applicable because radon-222 is a gas.	Potentially relevant and appropriate	Because the site is not licensed by NRC, these requirements are not applicable. These requirements would be potentially relevant and appropriate to protection of the public during implementation of any remedial action. Specifically, these regulations potentially may require perimeter monitoring to be undertaken during any activities that may expose or disturb the radiologically-impacted materials at the Site.
10 C.F.R. 40 Appendix A, Criterion 6(6): Criteria for Disposal of Wastes from Processing Source Material	Uranium processing waste material (Radon, radium, thorium, etc.)	Soil	Criterion 6(6) addresses the lack of remediation standards for residual radionuclides, other than radium in soil, for decomissioning of lands and structures (excluding radon) at uranium recovery facilities. Criterion 6(6) uses the existing soil radium standard (5 pCi/g surface and 15 pCi/g subsurface) to derive a dose criterion (benchmark approach) for cleaning up byproduct material, and for cleanup of surface activity on structures to be released for unrestricted use. The radium dose benchmark approach of the Criterion 6(6) rule requires licensees subject to the rule to calculate the potential peak effective dose equivalent (excluding radon) to an individual at the Site within 1,000 years from exposure to the residual levels allowed under the radium soil standard.	Not applicable: Potentially relevant and appropriate for Lot 2A2. Potentially relevant, but not appropriate for Areas 1 and 2 or the Buffer Zone.	Because this Site is not licensed in conjunction with uranium and thorium milling, nor is it a site where milling operations generated byproduct material, these requirements are not applicable. Because the cleanup standards in 40 C.F.R. 192.12 are relevant, but not appropriate for Areas 1 and 2 or the Buffer Zone, Criterion 6(6) is not an ARAR for these areas. However, depending on the results of future testing on the Crossroads Lot 2A2 Property, if 40 C.F.R. Part 192.12(a) is found to be relevant and appropriate for that property, then Criterion 6(6) could potentially be relevant and appropriate for the cleanup of that area.
Missouri Water Quality Standards 10 CSR 20-7.031(5)	Inorganics Trace metals Organics Pesticides Man-made Volatiles PAHs Phthalates	Ground-water	Water contaminants shall not cause or contribute to an exceedance of the following (Table A) standards: Inorganics (mg/L) Fluoride: 4 Nitrate: 10 Trace metals (ug/L)		These standards are only applicable to public drinking water systems; however, these standards may potentially be relevent and appropriate standards for groundwater.

Commented [A6]: Please revise in accordance with EPA's comment to Sec. Section 3.1.1-2, Page 79 of the revised FFS.

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement		Preliminary Determination	Remarks
	Others		Antimony	6		
			Arsenic	50		
			Barium	2,000		
			Beryllium	4		
			Boron	2,000		
			Cadmium	5		
			Chromium III	100		
			Cobalt	1,000		
			Copper	1,300		
			Iron	300		
			Lead	15		

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement		Preliminary Determination	Remarks
Missouri Water Quality Standards 10 CSR 20-7.031(5) (cont.)			Manganese	50	
			Mercury	2	
			Nickel	100	
			Selenium	50	
			Silver	50	
			Thallium	2	
			Zinc	5,000	
			Organics (ug/L)		
			Acrolein	320	
			Bis-2-chloroisopropyl ether	1,400	
			2, chlorophenol	0.1	
			2,4-dichlorophenol	93	
			2,4-dinitrophenol	70	
			2,4-dimethylphenol	540	
			2,4,5-trichlorophenol	2,600	
			2,4,6-trichlorophenol	2	
			2-methyl-4,6-dinitrophenol	13	
			Ethylbenzene	700	
			Hexachlorocyclopentadiene	50	
			Isophorone	36	
			Nitrobenzene	17	
			Phenol	300	
			Dichloropropene	87	
			Para(1,4)-dichlorobenzene	75	
			Other Dichlorobenzenes	600	
			1,2,4-trichlorobenzene	70	
			1,2,4,5-tetrachlorobenzene	2.3	
			pentachlorobenzene	3.5	
			1,1,1-trichloroethane	200	
			1,1,2-trichloroethane	0.04	
			2,4-dinitrotoluene	0.04	
			1,2-diphenylhydrazine	0.04	
			di (2-ethylhexyl) adipate	400	
			Pesticides (ug/L)		
			2,4-D	70	
			2,4,5-TP	50	
			Alachlor	2	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement	Preliminary Determination	Remarks
Missouri Water Quality Standards 10 CSR 20-7.031(5) (cont.)		Atrazine	3	
		Carbofuran	40	
		Dalapon	200	
		Dibromochloropropane	0.2	
		Dinoseb	7	
		Diquat	20	
		Endothall	100	
		Ethylene dibromide	0.05	
		Oxamyl (vydate)	200	
		Picloram	500	
		Simazine	4	
		Glyphosate	700	
		Bioaccumulatie Anthropogenic Toxics (ug/L)		
		PCBs	0.000045	
		DDT	0.00059	
		DDE	0.00059	
		DDD	0.00083	
		Endrin	2	
		Endrin aldehyde	0.75	
		Aldrin	0.00013	
		Dieldrin	0.00014	
		Heptachlor	0.4	
		Heptachlor epoxide	0.2	
		Methoxychlor	40	
		Toxaphene	3	
		Lindane (gamma-BHC)	0.2	
		Alpha,beta,delta-BHC	0.0022	
		Chlordane	2	
		Benzidine	0.00012	
		2,3,7,8-TCDD (dioxin)	0.000000013	
		Pentachlorophenol	1	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement	Preliminary Determination	Remarks
Missouri Water Quality Standards 10 CSR 20-7.031(5) (cont.)		Anthropogenic Carcinogens (ug/L)		
		Acrylonitrile	0.058	
		Hexachlorobenzene	1	
		Bis (2-chloroethyl) ether	0.03	
		Bis (chloromethyl) ether	0.00013	
		Hexachloroethane	1.9	
		3,3'-dichlorobenzidine	0.04	
		Hexachlorobutadiene	0.456	
		n-nitrosodimethylamine	0.0007	
		Volatile Organic Compounds (ug/L)		
		Chlorobenzene	100	
		Carbon Tetrachloride	5	
		Trihalomethanes	80	
		Bromoform	4.3	
		Chlorodibromomethane	0.41	
		Dichlorobromomethane	0.56	
		Chloroform	5.7	
		Methyl Bromide	48	
		Methyl Chloride	5	
		Methylene Chloride	4.7	
		1,2-dichloroethane	5	
		1,1,2,2-tetrachloroethane	0.17	
		1,1-dichloroethylene	7	
		1,2-trans-dichloroethylene	100	
		1,2-cis-dichloroethylene	70	
		Trichloroethylene	5	
		Tetrachloroethylene	0.8	
		Benzene	5	
		Toluene	1,000	
		Xylenes (total)	10,000	
		Vinyl chloride	2	
		Styrene	100	
		1,2-dichloropropane	0.52	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement		Preliminary Determination	Remarks
Missouri Water Quality Standards 10 CSR 20-7.031(5) (cont.)		Polynuclear Aromatic Hydrocarbons (ug/L)			
			Anthracene	9,600	
			Fluoranthene	300	
			Fluorene	1,300	
			Pyrene	960	
			Benzo(a)pyrene	0.2	
			Other polynuclear aromatic hydrocarbons	0.0044	
			Acenaphthene	1,200	
		Phthalate Esters (ug/L)			
			Bis(2-ethylhexyl) phthalate	6	
			Butylbenzyl phthalate	3,000	
			Diethyl phthalate	23,000	
			Dimethyl phthalate	313,000	
			Di-n-butyl phthalate	2,700	
		Health Advisory Levels (ug/L)			
			Ametryn	60	
			Baygon	3	
			Bentazon	20	
			Bis-2-chloroisopropyl ether	300	
			Bromacil	90	
			Bromochloromethane	90	
			Bromomethane	10	
			Butylate	350	
			Carbaryl	700	
			Carboxin	700	
			Chloramben	100	
			o-chlorotoluene	100	
			p-chlorotoluene	100	
			Chlorpyrifos	20	
			DCPA (dacthal)	4,000	
			Diazinon	0.6	
			Dicamba	200	
			Diisopropyl methylphosphonate	600	
			Dimethyl methylphosphonate	100	
			1,3-dinitrobenzene	1	
			Diphenamid	200	
			Diphenylamine	200	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement	Preliminary Determination	Remarks
Missouri Water Quality Standards 10 CSR 20-7.031(5) (cont.)		Disulfoton	0.3	
		1,4-dithiane	80	
		Diuron	10	
		Fenamiphos	2	
		Fluometron	90	
		Fluorotrichloromethane	2,000	
		Fonofos	10	
		Hexazinone	200	
		Malathion	200	
		Maleic hydrazide	4,000	
		MCPA	10	
		Methyl parathion	2	
		Metolachlor	70	
		Metribuzin	100	
		Naphthalene	20	
		Nitroguanidine	700	
		p-nitrophenol	60	
		Paraquat	30	
		Pronamide	50	
		Propachlor	90	
		Propazine	10	
		Propham	100	
		2,4,5-T	70	
		Tebuthiuron	500	
		Terbacil	90	
		Terbufos	0.9	
		1,1,1,2-Tetrachloroethane	70	
		1,2,3-trichloropropane	40	
		Trifluralin	5	
		Trinitroglycerol	5	
		Trinitrotoluene	2	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement		Preliminary Determination	Remarks
Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4)	Inorganics, Synthetic Organic Compounds, Radionuclides, Secondary Contaminants, and Volatile Organic Compounds	Maximum contaminant levels for public water systems.		Not applicable Potentially relevant and appropriate	These standards apply to public water systems and therefore are not applicable to the West Lake Landfill OU-1 Site. As these standards provide for maximum concentrations in drinking water and the alluvial aquifer could be used for drinking water outside of the West Lake Landfill boundaries; these standards are potentially relevant and appropriate for groundwater at the Site.
		Maximum Contaminant Levels			
		Inorganics			
		Antimony	0.006 mg/L		
		Arsenic	0.01 mg/L		
		Asbestos	7×10^6 fibers/L		
		Barium	2 mg/L		
		Beryllium	0.004 mg/L		
		Cadmium	0.005 mg/L		
		Chromium	0.1 mg/L		
		Cyanide	0.2 mg/L		
		Fluoride	4.0 mg/L		
		Mercury	0.002 mg/L		
		Nitrate (as N)	10 mg/L		
		Nitrite (as N)	1 mg/L		
		Total Nitrate + Nitrite (as N)	10 mg/L		
		Selenium	0.05 mg/L		
		Thallium	0.002 mg/L		
		Synthetic Organic Compounds			
		Alachlor	0.002 mg/L		
		Atrazine	0.003 mg/L		
		Benzo(a)pyrene	0.0002 mg/L		
		Carbonfugran	0.04 mg/L		
		Chlordane	0.002 mg/L		
		Dalapon	0.2 mg/L		
		Di(2-ethylhexyl) adipate	0.4 mg/L		
		Dibromochloropropane (DBCP)	0.0002 mg/L		
		Di(2-ethylhexyl) phthalate	0.006 mg/L		
		Dinoseb	0.007 mg/L		
		Diquat	0.02 mg/L		
		Endothall	0.1 mg/L		
		Endrin	0.002 mg/L		
		2,4-D	0.07 mg/L		
		Ethylene dibromide (EDB)	0.00005 mg/L		
		Glyphosoate	0.7 mg/L		
		Heptachlor	0.0004 mg/L		
		Heptachlor Epoxide	0.0002 mg/L		

Commented [A7]: Delete "outside of the West Lake Landfill boundaries"

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium Requirement		Preliminary Determination	Remarks
Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4) (cont.)			Hexachlorobenzene	0.001 mg/L	
			Hexachlorocyclopentadiene	0.05 mg/L	
			Lindane	0.0002 mg/L	
			Methoxychlor	0.04 mg/L	
			Oxamyl (Vydate)	0.2 mg/L	
			Picloram	0.5 mg/L	
			Polychlorinated biphenyls (PCBs)	0.0005 mg/L	
			Pentachlorophenol	0.001 mg/L	
			Simazine	0.004 mg/L	
			Toxaphene	0.003 mg/L	
			2,3,7,8-TCDD (Dioxin)	0.00000003 mg/L	
			2,4,5-TP (Silvex)	0.05 mg/L	
			Radionuclides		
			Combined Ra_{226} and Ra_{228}	5 pCi/L	
			Gross alpha (excluding radon & urnaium)	15 pCi/L	
			Uranium	30 ug/L	
			Secondary Contaminants		
			Aluminum	0.05 - 0.2 mg/L	
			Chloride	250 mg/L	
			Copper	1.0 mg/L	
			Fluoride	2.0 mg/L	
			Iron	0.3 mg/L	
			Manganese	0.05 mg/L	
			Silver	0.1 mg/L	
			Sulfate	250 mg/L	
			Total Dissolved Solid (TDS)	500 mg/L	
			Zinc	5 mg/L	
			Volatile Organic Compounds		
			Benzene	0.005 mg/L	
			Carbon tetrachloride	0.005 mg/L	
			1,2-dichloroethane	0.005 mg/L	
			1,1-dichloroethylene	0.007 mg/L	
			para-dichlorobenzene	0.075 mg/L	
			1,1,1-trichloroethane	0.2 mg/L	
			Trichloroethylene	0.005 mg/L	
			Vinyl chloride	0.002 mg/L	
			cis-1,2-dichloroethylene	0.07 mg/L	

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement		Preliminary Determination	Remarks
Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4) (cont.)			Dichloromethane	0.005 mg/L		
			1,2-dichloropropane	0.005 mg/L		
			Ethylbenzene	0.7 mg/L		
			Monodichlorobenzene	0.1 mg/L		
			o-dichlorobenzene	0.6 mg/L		
			Styrene	0.1 mg/L		
			Tetrachloroethylene	0.005 mg/L		
			Toluene	1 mg/L		
			1,2,4-Trichlorobenzene	0.07 mg/L		
			1,1,2-Trichloroethane	0.005 mg/L		
			trans-1,2-dischloroethylene	0.1 mg/L		
			Xylenes (total)	10 mg/L		
OSWER Directive No. 9200.4-25 ("Use of Soil Cleanup Criteria at Radium-226 and Radium-228 Sites" (EPA, 1998))	Radium-226 and Thorium-230 and Thorium-228	Soil	Clarifies EPA's position on the use of the soil cleanup criteria in 40 CFR Part 192 at CERCLA sites with radioactive contamination. In particular, it clarifies the intent of 40 CFR Part 192 in setting remediation levels for subsurface soils. Also, Thorium-230 and Thorium-232 should be cleaned up to the same concentrations as their radium progeny (5 and 15 pCi/g). Radium 226+228: 5 pCi/g plus background. Thorium 230+232: 5 pCi/g plus background		Not an ARAR but potentially relevant and appropriate for the radiologically-contaminated soil on the Crossroad Lot 2A2 Property (and potentially for the Buffer Zone). Crossroads Buffer Zone/ Lot 2A2 Property alternatives that include excavation of soil from	As this is only guidance, it is not an ARAR. As 40 CFR 192 is considered to be potentially relevant and appropriate for the radiologically-contaminated soil on the Crossroad Lot 2A2 Property, this guidance would be a TBC for the Buffer Zone), this guidance would be a TBC for alternatives that include excavation of soil from
40 C.F.R. Part 61 Subpart H, National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities (40 C.F.R. 61.90-97) 40 C.F.R. 61.90-92	Radionuclides other than radon-222 and radon-220	Air	"Emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent to 10 mrem/yr." 40 C.F.R. 61.92. Applies to any DOE facility that emits any radionuclide other than radon-222 and radon-220 into the air, except any disposal facility subject to 40 C.F.R. Part 191, Subpart B or 40 C.F.R. Part 192. "Facility" is defined as "all buildings, structures and operations on one contiguous site." 40 C.F.R. 61.91(b).		Not applicable, but potentially relevant and appropriate for portions of the Site that are "facilities" and not subject to 40 C.F.R. Part 192	Because the West Lake Landfill OU-1 Site is not a Department of Energy owned or operated facility, these standards are not applicable. As these regulations address standards for airborne effluents containing radionuclides, they are potentially relevant and appropriate to any buildings, structures or operations on OU-1 if 40 C.F.R. Part 192 does not otherwise apply.
40 C.F.R. Part 61 Subpart I (codified at 40 C.F.R. 61.100-61.109), National Emission Standards for Radionuclide	Radionuclides	Air	"Emissions of radionuclides, including iodine, to the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr."		Not applicable, but potentially relevant and appropriate	Because the West Lake Landfill OU-1 Site is not owned or operated by any federal agency, these standards are not applicable. As these regulations address standards for airborne effluents containing radionuclides, they

Commented [A8]: Please revise to be consistent with EPA's comments regarding 40 C.F.R. 192 soil cleanup criteria as relevant and appropriate for OU1.

Table 3-1: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Emissions from Federal Facilities other than Nuclear Regulatory Commission Licensees and not Covered by Subpart H 40 C.F.R. 61.102(a)			40 C.F.R. 61.102(a). "Emissions of iodine to the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 3 mrem/yr." 40 C.F.R. 61.102(a). The provisions of this subpart apply to facilities owned or operated by any Federal agency other than the Department of Energy and not licensed by the Nuclear Regulatory Commission, except that this subpart does not apply to disposal at facilities regulated under 40 C.F.R. Part 191, Subpart B, or to any uranium mill tailings pile after it has been disposed of under 40 C.F.R. Part 192, or to low energy accelerators. [61 FR 68981, Dec. 30, 1996]	for portions of the Site that are "facilities" and not subject to 40 C.F.R. Part 192	are potentially relevant and appropriate to any buildings, structures or operations on OU-1 if 40 C.F.R. Part 192 does not otherwise apply.
15 U.S.C. 2605 *et seq*. (Toxic Substances Control Act) 15 U.S.C. 2661 15 U.S.C. 2664 15 U.S.C. 2643(h) 15 U.S.C. 2605(e)	Radon PCBs Asbestos	Waste	This provision of TSCA concerns indoor radon health risks, mandating that EPA publish a guide about radon health risks and to perform studies of radon levels in schools and federal buildings. "The national long-term goal of the United States with respect to radon levels in buildings is that the air within buildings in the United States should be as free of radon as the ambient air outside of buildings." 15 U.S.C. 2661. "The Administrator of the Environmental Protection Agency shall develop model construction standards and techniques for controlling radon levels within new buildings." 15 U.S.C. 2664. 15 U.S.C. 2643(h) – requires EPA to promulgate regulations which prescribe standards for transportation and disposal of asbestos-containing waste material to protect human health and the environment. Such regulations shall include such provisions related to the manner in which transportation vehicles are loaded and unloaded as will assure the physical integrity of containers of asbestos-containing waste material. 115 U.S.C. 2605(e) requires EPA to promulgate rules to prescribe methods for the disposal of polychlorinated biphenyls.	Not applicable nor relevant and appropriate	This statute offers no definable standards for the control of radon exposure or contamination at the West Lake Landfill. Further, the West Lake Landfill is neither a school nor does it contain federal buildings. Therefore, these provisions are neither applicable nor are they relevant and appropriate. PCBs, if encountered, will be addressed under 40 CFR Part 761. Asbestos, if encountered, will be addressed under the asbestos NESHAP (40 CFR Part 61) and Missouri state regulations.

Commented [A9]: Please identify the specific provisions of 40 CFR Part 761 that would be considered ARARs for the partial or full excavation alternatives.

Commented [A10]: Please identify the specific provisions of 40 CFR Part 61 that would be considered ARARs for the partial or full excavation alternatives.

Table 3-1: OSWER DIRECTIVES AND GUIDANCE DOCUMENTS AS POTENTIAL TBCs

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
OSWER Directive 9285.6-20 ("Radiation Risk Assessment at CERCLA Sites: Q&A")	Radon	Air	Specifies an ARAR protectiveness criteria evaluation recommendation of 12 mrem/yr in place of the 15 mrem/yr value previously specified in Directive 9200.4-18.	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR; however, this guidance would be a TBC for purposes of demonstrating compliance with UMTRCA where UMTRCA is identified as an ARAR for indoor radon exposure.
OSWER 9200.4-18 ("Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA, 1997a))	Radioactive Contamination at CERCLA sites		Provide guidance on use of the UMTRCA standards as CERCLA cleanup levels. Cleanup of radionuclides is governed by the risk range for all carcinogens established in the NCP when ARARs are not available or are not sufficiently protective. Where ARARs are not available or are not sufficiently protective EPA generally sets site-specific remediation levels for: (1) carcinogens at a level that represents an exceedance of upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}; and, (2) non-carcinogens such that the cumulative risks from exposure will not result in adverse effects to human populations (including sensitive sub-populations) that may be exposed during a lifetime or part of a lifetime, incorporating an adequate margin of safety. If a dose assessment is conducted at the site, then a 15 millirem per year (mrem/yr) effective dose equivalent should generally be the maximum dose limit for humans. This equates to approximately 3 X 10^-4 increased lifetime risk of cancer and is consistent with levels generally considered protective in other governmental actions.	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR. EPA has defined . . . "complete rad removal" to mean attainment of the risk-based radiological clean levels specified in OSWER directives 9200.4-25 and 9200.4-18. These criteria are based on the UMTRCA standards (40 CFR Part 192 Subpart B) for cleanup of so-called 'vicinity property' (as opposed to the actual waste disposal units.) Although UMTRCA standards are neither applicable nor relevant and appropriate to the solid waste disposal units at the Site, they do represent standards that have been established by EPA for remediating radionuclide occurrences so as to allow for unrestricted use, which may be applicable here.
OSWER No. 9200.4-23 ("Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA")	Various	Various	This directive clarifies the relationship between 1) the requirement to protect human health and the environment, and 2) the requirement to attain, or waive if justified based on site-specific circumstances, ARARs. Specifically, this directive clarifies that EPA may establish preliminary remediation goals at levels that are more protective than required by ARARs.	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR. This guidance may be a TBC.
EPA Memo "Considering a Noncancer Oral Reference Dose for Uranium for Superfund Human Health Risk Assessments" (Dated December 1, 2016)	Soluble uranium	Various	This memorandum provides information and recommendations about an oral reference dose (RfD) for non-radiological toxicity of soluble uranium. This memorandum recommends the use of the ATSDR intermediate MRL for soluble uranium without further adjustment, in lieu of the RfD currently published in IRIS, for assessment of chronic exposures also. Specifically, evaluation of the non-carcinogenic risks posed by uranium should use a toxicity value of 0.0002 mg/kg-day.	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR. This guidance may be a TBC if soluble uranium is identified as a COPC.
OSWER 4283.1-14	Radionuclides	Ground-	OSWER Directive 9283.1-14 addresses the use of uranium	Not an ARAR;	As this is only guidance, it is not an ARAR. This guidance may

Commented [A11]: Include that this guidance provides pCi/l concentration levels to show compliance with the UMTRCA working level indoor air levels.

Table 3-1: OSWER DIRECTIVES AND GUIDANCE DOCUMENTS AS POTENTIAL TBCs

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
("Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA Sites")		water	drinking water standards for groundwater remediation at CERCLA sites. This directive specifies that both the uranium MCL (40 CFR 141) and the UMTRCA standards (40 CFR 192) are potentially relevant and appropriate. This directive also provides guidance on the groundwater point of compliance standard in 40 CFR 192.02 (c)(4) relative to the CERCLA approach for conducting groundwater responses.	potentially a TBC	be a TBC, insofar as it specifies certain standards as ARARs.
EPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, OSWER 530-SW-89-047 (July 1989)	Hazardous Wastes	Hazardous Waste Landfills	Provides design guidance on final cover systems for hazardous waste landfills and surface impoundments. Addresses multilayer cover design to provide long-term protection from infiltration of precipitation.	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR. Although RCRA Subtitle C regulations are neither applicable nor relevant and appropriate to West Lake Landfill OU-1, EPA guidance on the design of landfill covers for RCRA and CERCLA sites may provide information useful for the design of a final cover system under any of the alternatives.
(Draft) Technical Guidance for RCRA/CERCLA Final Covers, EPA OSWER 540-R-04-007 (April 2004)	Hazardous Wastes and MSW	Hazardous Waste and MSW Landfills	Provides design information regarding cover systems for municipal solid waste (MSW) and hazardous waste (HW) landfills being remediated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA) Corrective Action, and sites regulated under the RCRA. This guidance includes updated information related to development of design criteria, use and types of geosynthetics such as geosynthetic clay liners, alternative materials and designs, performance monitoring, maintenance of cover systems, and other issues.	Not an ARAR; potentially a TBC	Although RCRA Subtitle C regulations are neither applicable nor relevant and appropriate to West Lake Landfill OU-1, EPA guidance on the design of landfill covers for RCRA and CERCLA sites may provide information useful for the design of a final cover system under any of the alternatives. Because proper design and construction of a final cover is key to long-term protection from infiltration of precipitation, these guidance documents may need to be considered during the remedial design phase in conjunction with design of the engineered landfill cover system.
OSWER Directive 9200.4-35P ("Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I, Criterion 6(6)")	Uranium processing waste material (Radon, radium, thorium, etc.)	Soil	Clarifies the relationship between the UMTRCA soil standards under 40 CFR 192 and the NRC radium benchmark approach under the 10 CFR 40 Appendix A, I, Criterion 6(6) in setting remediation goals in soil and structures. OSWER Directive 9200.4-35P explains that "The Criterion 6(6) rule is a supplement to the radium standards of 40 CFR Part 192, to address other site-related radionuclides. Therefore, when the 5 pCi/g and 15 pCi/g standards under EPA's UMTRCA rule are not RARs for either radium-226 and/or radium-228, the Criterion 6(6) rule is generally not appropriate … Even if EPA's UMTRCA soil standards were used as TBCs, we recommend that the Criterion 6(6) rule's benchmark dose should not be used as a TBC."	Not an ARAR; potentially a TBC	As this is only guidance, it is not an ARAR. This guidance may be a TBC, insofar as it clarifies the relationship between the UMTRCA soil standards under 40 CFR 192 and the NRC radium benchmark approach under the 10 CFR 40 Appendix A, I, Criterion 6(6) in setting remediation goals in soil and structures, and further clarifies when Criterion 6(6) should be applied.

Commented [A12]: Please identify the specific design guidance. Specifically:

This document recommends and describes a design for a landfill covers that will meet the requirements of RCRA regulations. It is a multilayered system consisting, from the top down, of:

- a top layer of at least 60 cm of soil, either vegetated or armored at the surface;
- a granular or geosynthetic drainage layer with a hydraulic transmissivity no less than 3×10^{-5} cm/sec; and
- a two-component low permeability layer comprised of (1) a flexible membrane liner installed directly on (2) a compacted soil component with an hydraulic conductivity no greater than 1×10^{-7} cm/sec.

Optional layers may be added, e.g., a biotic barrier layer or a gas vent layer, depending on the need.

Commented [A13]: Remedial actions must comply with TBCs that are identified. Please delete this portion of the sentence.