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OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT - DRAFT COMMENT RESPONSE DOCUMENT

07/29/93

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RESPONSES
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Department of Energy
Fernald Environmental Management Project
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JUL 29 1993

DOE-2594-93

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Graham E. Mitchell, Project Manager
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402-2086

Dear Mr. Saric and Mr. Mitchell:

OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT - DRAFT COMMENT RESPONSE DOCUMENT

As we discussed last week, attached for your informal review is the Operable Unit 4 Remedial Investigation Report Comment Response Document. I would greatly appreciate any early feedback on the attachment by August 8, 1993, if possible. The formal revised report and comment responses will be transmitted on August 12, 1993.

If you or your staff have any questions, please call Randi Allen at (513) 648-3102.

Sincerely,

Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Allen

Attachment: As Stated

Recycled and Recyclable

cc w/att:

K. A. Chaney, EM-424, TREV
D. R. Kozlowski, EM-424 TREV
G. Jablonowski, USEPA-V, AT-18J
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AR Coordinator, FERMCO

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R. L. Glenn, Parsons
J. W. Thiesing, FERMCO/2

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U.S. EPA Comments
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COMMENTS ON SECTIONS D.2.0, D.3.0, D.4.0, D.5.0, D.6.0, D.7.0, 6.2, 6.5, 6.6, AND REFERENCES TO THE OPERABLE UNIT (OU) 4 REMEDIAL INVESTIGATION (RI) REPORT

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #1

Comment: The report does not currently include relevant information from title 10 of the Code of Federal Regulations (CFR) regarding the lung retention time for radionuclides. 10 CFR Part 20, Appendix B (CFR 1992), assigns lung retention characteristics of the various elements to three classes: D, W and Y. This classification applies to a range of clearance half-times of less than 10 days for D, from 10 to 100 days for W, and for greater than 100 days for Y. This information should be added to the discussion in the report of radionuclide retention in the lungs. Also, the discussion should note the following: (1) absorption and retention characteristics are based on the elemental reactions with body tissue and do not depend on the isotope of the element, and (2) retention characteristics depend on the chemical form of the element in a compound.

Response: The risk assessment does contain specification of the lung retention classes assigned to radionuclides (Table D.4-3).

Action: Discussion concerning independence of adsorption/retention as suggested by EPA will be added.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #2

Comment: The carcinogenicity of a radioactive isotope of an element depends on several factors, including the following:

- The decay mode of the isotope (alpha, beta, or photon emission)
- The emission energy of the photon or particle
- The radiological half-life of the isotope
- The retention and concentration characteristics (target organ) of the isotope in the human body
- Its toxicity as a nonradioactive element

These guidelines should be followed in the carcinogenicity determination of radioactive isotopes.

Response: The general radiological considerations identified in this comment are added to Section D.4.1.3 the discussion of radiocarcinogens as a group.

Action: On page D-4-11 line 2 after the first sentence of the paragraph add the following text: "The carcinogenicity of a radioactive isotope of an element depends on several factors including the following:

- The type of radiation emitted by the radioisotope
- The energy of the radiation emitted
- The radiological half-life of the radioisotope
- The retention and concentration characteristics of the radioisotope in the human body"

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #3

Comment: The information regarding the toxic effects of particular radioisotopes is not clearly and consistently presented. Some of these effects are briefly described, while others are described in great detail. The hazards of the particle that is emitted are not always explained. Also, target organs, particular isotopes of concern, and respective half-lives are not consistently addressed. For example, the toxic effects of Uranium have been adequately described. The text should show a similar and consistent level of detail for all toxicity profiles.

Response: The level of detail presented for uranium is justified due to the prevalent distribution of uranium at the site. The same level of detail for toxicity profiles for other radionuclides is not required. It is not required by RAGS to include in the toxicity assessment for radionuclides detailed toxicity profiles for each radionuclide. The existing level of detail in the radionuclide toxicity assessment is adequate.

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #4

Comment: Regarding the review of Section 5.0, insufficient data were provided to replicate (1) actual development of unit risk factors (URF), (2) chemical-specific risk estimates, and (3) computer modeling such as Microshield. Sufficient data should be provided to allow reproduction of risk estimates.

Response: The unit risk and unit noncancer toxicity factors and their derivation is sufficiently explained in Attachment I (see Section D.5.2.3). Fate and transport models are sufficiently described in Appendix E. Input data for the Microshield model should be provided.

Action: A table presenting the input data for the Microshield model will be added.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #5

Comment: While it does not appear intentional, the presentation of risks may mask which routes and chemicals contribute significant risk. For example, the discussion may focus on a chemical that contributes 5×10^{-3} carcinogenic risk and fail to mention that three other chemicals contribute significant (greater than 1×10^{-6}) risk. A table showing significant contributions to risk, both by route and specific chemicals, should be added to the risk characterization discussion.

Response: The text and tables in Section D.5 are modified to identify dominant pathway and contaminant risk contributions. The reader is also referred to the results presented in Section D.7.0 and 6.0.

Action: Revise the text and tables of Section D.5.3 to identify dominant exposure pathway contributions and dominant contaminant contributions.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #6

Comment: The sole purpose of analyzing for chemicals of potential concern (CPC) is to identify the subset of site-related contaminants that pose the greatest human health risks at a hazardous waste site. This analysis is often necessary because the list of chemicals detected can be lengthy. A comprehensive quantitative risk assessment (RA) on the myriad of chemicals at most sites could be complex and distract from the dominant risks. Therefore, a step-by-step evaluation applying specific elimination criteria is performed to reduce the number of chemicals to manageable size. An initial analysis may involve eliminating background chemicals from the list of potential CPCs. However, the background analysis is only conducted to facilitate the quantitative RA; it is not a prerequisite for an RA. For this reason, robust statistical analyses are required to confirm which site-related contaminants are truly background chemicals. If the data are insufficient to make such a determination, or the results from the analysis are suspect, the questionable chemicals should be carried through the quantitative RA. Following generally accepted steps, data are sequentially evaluated to ultimately select the most appropriate statistical test. The four statistical tests commonly employed in environmental toxicology for a background analysis include the F-test, Student's t-test, Cochran t-test, and Wilcoxon Rank Sum Test.

Some chemicals were excluded as background without an adequate statistical test for this assumption. Either an adequate statistical evaluation should be performed or all of these chemicals should by carried through the RA.

Response: The statistical methodology for selecting COC's is revised consistent with resolution between EPA and DOE/contractors.

Action: Revise the statistical package used to analyze the characterization data per the resolution reached between EPA and DOE/contractors, use the revised statistical approach to perform the risk assessment.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #7
Comment: Throughout the document the phrase "constituents of concern (COC)" should be changed to "constituents of potential concern (CPC)."

Response: The request is consistent with the Risk Assessment Work Plan Addendum.

Action: The term "constituents of concern" will be changed to "constituents of potential concern" and the acronym "COC's" will be changed to "CPCs".

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.0 Pg. #: D-2-1 Line #: 9 Code:
Original Specific Comment #1
Comment: This section states that only CPCs that migrate from OU4 will be considered in the characterization of risk from associated media and that CPCs already present in the associated media will be considered in the operable unit (OU) 5 RA. This section should be revised to clearly state whether CPCs migrating from OU1, OU2, OU3, and OU4 will be considered in the OU5 RA.

Response: The statement is added as requested.

Action: On page D-2-1 line 13 add the following text: "Operable Units 1, 2, and 3 will address the potential for constituent migration from those operable units and the potential impact on environmental media."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.1.1.1 Pg. #: D-2-2 Line #: NA Code:
Original Specific Comment #2
Comment: Table D.2-1 and various sections of the report refer to surface and subsurface soils. However, it is not clear what soil boring depths represent each soil layer. The report should clearly state and support what sample depths were used to characterize each soil layer.

Response: Agree.

Action: The information contained in Lines 21-24 of Page D-3-23 will be repeated in Section D.2.1.1.3 as requested.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.1.1.3 Pg. #: D-2-5 Line #: 3, 5, and 7 Code:
Original Specific Comment #3
Comment: See Original Comment # 2.

Response: See Response in Comment 2.

Action: See Action in Comment 2.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.1.1.3 Pg. #: D-2-5 Line #: 9 Code:
Original Specific Comment #4

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Comment: This section states that composite samples from 0 to 5 feet below ground surface (bgs) should adequately characterize berm soils because they consist of fill moved into place. However, if chemicals have since been air-deposited, the composite samples would under-represent actual concentrations of air-deposited chemicals. The report should be revised to address this issue.

Response: Agree.

Action: A sentence will be added to Line 11 of Page D-2-5 stating that this approach does not account for the effects of air deposition and air erosion subsequent to moving the berm fill into place.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.1.2 Pg. #: D-2-5 Line #: 21 Code:
Original Specific Comment #5
Comment: This section states that background surface soil samples were analyzed for radionuclides and nonradioactive metals only. However, site related compounds often show up in "background" samples, requiring that a different "background" location be selected (U.S. EPA 1989). Therefore, because volatile organic compounds (VOC) and semivolatile organic compounds (SVOC) are associated with site operations, they should be analyzed for. Their presence and may indicate that "background" samples are actually affected by site operations.

Response: EPA reviewed, commented on, and approved the background soil sampling plan including consideration of analyses requested. Any additional sampling would have to be completed in addition to the present RI activities.

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.2.2 Pg. #: D-2-9 Line #: 18 Code:
Original Specific Comment #6
Comment: The cited U.S. EPA document does not state that one-half the detection limit (DL) should be used to represent chemical concentrations when a chemical is reported as "not detected" in sample analytical results. Rather, the cited document recommends use of one-half the sample quantitation limit (SQL). The text should be revised to replace DL with SQL, and any calculations made using one-half the DL should be recalculated using one-half the SQL.

Response: The terminology is clarified. The risk assessment is based on the use of one half of the sample quantitation limit for nondetections.

Action: On Page D-2-9 change all use of the phrase "detection limit" to "sample quantitation limit".

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.2.2 Pg. #: D-2-9 Line #: 5 Code:
Original Specific Comment #7
Comment: The "curve-fitting or goodness-of-fit" methodology described in this paragraph is an acceptable approach, but it might be useful to include the coefficients of kurtosis and skewness, which are typically included in most statistical software packages, to support a log normal assumption. Furthermore, it is advisable to consider other distributions as well. For example, Pinder and Smith (1975) have shown that the Wellbull distribution fits some radionuclide data better than other distributions.

Response: The statistical methodology for selecting COC's is revised consistent with resolution between EPA and DOE/contractors.

Action: Revise the statistical package used to analyze the characterization data per the resolution reached between EPA and DOE/contractors, use the revised statistical approach to perform the risk assessment.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.3.1 Pg. #: D-2-10 Line #: NA Code:
Original Specific Comment #8
Comment: This section discusses the comparison of on-site chemical concentrations with representative background concentrations to determine whether chemicals are likely to be site related. However, the report does not discuss why such a comparison should be performed on silo contents if it is known that the contents result from site operations. The report should be revised to discuss this issue. Unless justified, all chemicals detected on site and known to be related to past site operations should be included as CPCs regardless of background concentrations.

Response: All of the constituents in the silo material are selected as COC's, except for ubiquitous elements and essential human nutrients. The comparison is made as a routine exercise.

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.3.3.3 Pg. #: D-2-23 Line #: 19 Code:
Original Specific Comment #9
Comment: This section states that CPCs lacking published toxicity data are not evaluated in the risk characterization portion of the report. However, the report does not discuss why surrogate chemicals for which toxicity data are available are not used. Such a discussion should be added to the report. Also, the Environmental Criteria and Assessment Office (ECAO) should be contacted about toxicity values needed for an RA.

Response: The summary sentence in Section D.2.3.3.3 should be modified to indicate that chemicals for which there are no toxicity values are not evaluated quantitatively. Whether or not to use toxicity values from surrogate chemicals, and how closely a surrogate must approximate the specific chemical, are matters of professional judgement. In fact a surrogate was used. The RfD for thallium was derived from the RfD for thallium sulfate. On the other hand, naphthalene was not used as a surrogate for all noncarcinogenic PAHs for which RfDs are not available. An EPA data base that contains ECAO-sanctioned toxicity values (a quarterly updated list compiled by EPA Region III) was consulted during the toxicity evaluation. EPA Region V was contacted to obtain toxicity values from ECAO for chemicals for which toxicity values were not located in IRIS, HEAST or other Agency documents.

Action: The sentence in question in Section D.2.3.3.3 was altered to read, "The chemicals for which there are no toxicity values are not evaluated quantitatively in the risk characterization..." The following was added to Section D.4.1.1 (page D-4-1, line 22): "Other EPA sources of RfD values were also consulted, when available. Surrogate chemicals were not used for derivation of an RfD unless the chemical similarity was very close and the derivation was highly defensible." The following was added to Section D.4.1.2 (page D-4-1, line 29): "Other EPA sources of cancer slope factors were also consulted, when available. Surrogate chemicals were not used for derivation of a cancer slope factor unless the chemical similarity was very close and the derivation was highly defensible."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1 Pg. #: D-3-2 Line #: NA Code:
Original Specific Comment #10
Comment: Not all the lines leaving the secondary source box labeled Soil/Surface are clearly labeled. Figure D.3-1 should be revised to clearly indicate which primary sources these lines refer to.

Response: Agree.

Action: Revise the figure to clarify flow paths.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1 Pg. #: D-3-2 Line #: NA Code:
Original Specific Comment #11
Comment: Figure D.3-1 indicates that only structural failure of Silo 3 will result in contamination of surface soil. Either the figure should be revised to indicate that failure of Silos 1 and 2 may also result in contamination of surface soil, or the text should clearly explain why this is not the case.

Response: The conceptual model text does describe the basis for the assumption that failure of the K-65 silos will not result in contamination of the surface soil with silo material

(see Section D.3.1.2).

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1 Pg. #: D-3-2 Line #: NA Code:
Original Specific Comment #12
Comment: In Figure D.3-1, two lines leave the pathway box labeled Surface Water and Sediments. These lines should be clearly labeled to indicate which line refers to surface water and which refers to sediments.

Response: Agree.

Action: Revise the figure to clarify the flow paths.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1 Pg. #: D-3-2 Line #: NA Code:
Original Specific Comment #13
Comment: Figure D.3-1 includes the terms RME and CT; the figure should be revised to include definitions of these terms.

Response: Agree.

Action: Revise the figure to clarify the terms used.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1 Pg. #: D-3-3 Line #: NA Code:
Original Specific Comment #14
Comment: See Original Comment # 11.

Response: See Comment 11.

Action: See Comment 11.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.1.2 Pg. #: D-3-5 Line #: 19 Code:
Original Specific Comment #15
Comment: The phrase "included risk assessment source term" should be changed to "included as a risk assessment source term."

Response: Agreed.

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Action: "...Included risk assessment source term" was changed to "...included as a risk assessment source term."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.1.2 Pg. #: D-3-5 Line #: 24 to 32 Code:
Original Specific Comment #16
Comment: The paragraph describes the berm fill as a source term and suggests several ways in which this material could have been contaminated. The paragraph should be revised to describe the original source of the berm fill.

Response: Agree.

Action: Text will be added to Line 24 of Page D-3-5 stating that the source of berm fill is described in Section 1.0 of the RI Report.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.1.4 Pg. #: D-3-6 Line #: 22 Code:
Original Specific Comment #17
Comment: The phrase "and risk assessment" should be changed to "and the risk assessment."

Response: Agreed.

Action: "...And risk assessment" was changed to "...and in the risk assessment."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.3.1 Pg. #: D-3-10 Line #: 7 to 10 Code:
Original Specific Comment #18
Comment: This sentence states that fruits and vegetables are affected by plant uptake of contaminants from the soil. However, deposition of contaminants onto leaf surfaces also affects fruits and vegetables. This section should be revised to address air deposition.

Response: Agreed.

Action: "...Following deposition of contaminants on soil" was changed to "...following deposition of contaminants on foliage or soil."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.3.1 Pg. #: D-3-10 Line #: 10 to 13 Code:
Original Specific Comment #19
Comment: The text states that irradiation as a result of exposure within a cloud of radioactive gas contributes insignificantly to human health risk. The reasons for this conclusion are

not readily apparent; the described exposure appears to be potentially significant under some circumstances. The section should be revised to clearly support this conclusion.

Response: Text is added to provide support for the assertion that this exposure pathway is a minor contributor for OU4.

Action: Add text to page D-3-10 to support the assumption in the conceptual model.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.3.3 Pg. #: D-3-10 Line #: 27 Code:
Original Specific Comment #20
Comment: The phrase "and a groundwater" should be changed to "and on groundwater."

Response: Agreed.

Action: "...And a groundwater" was changed to "...and on groundwater."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.4.1 Pg. #: D-3-12 Line #: 5 to 6 Code:
Original Specific Comment #21
Comment: The sentence states that no remedial action is taken beyond that completed by U.S. Department of Energy (DOE) at the time the site is released by DOE. In fact, the RA assumes that no remedial action is taken beyond that presently accomplished and that no additional remedial action takes place under the scenario of current land use without access controls. The section should be revised to clarify that no remedial action is assumed beyond that already accomplished.

Response: Agree.

Action: Line 6 of Page D-3-12 will be changed from "...taken beyond that completed by DOE at the time the site is released by DOE." to "...taken beyond that already accomplished."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.4.3 Pg. #: D-3-14 Line #: 21 Code:
Original Specific Comment #22
Comment: The word "groundwater" should be changed to the phrase "groundwater from the Great Miami aquifer."

Response: The reviewer's request is inappropriate, because ingestion of drinking water is evaluated for both the Great Miami aquifer and perched water in the sand lens.

Action: "Ingestion of groundwater" was changed to "Ingestion of groundwater (separate

evaluations for groundwater from the Great Miami aquifer and for perched water in the sand lens)."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.1.4.3 Pg. #: D-3-14 Line #: 37 Code:
Original Specific Comment #23
Comment: The phrase "sediment associated with the sand lens" should be changed to "sediment potentially impacted by contaminants in the sand lens."

Response: Agreed.

Action: "...Sediment associated with the sand lens" was changed to "...sediment potentially impacted by the sand lens."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2 Pg. #: D-3-23 Line #: 3 Code:
Original Specific Comment #24
Comment: The phrase "exposure concentration" should be changed to "exposure point concentration."

Response: Agreed.

Action: "...Exposure concentration" was changed to "...exposure point concentration."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.1 Pg. #: D-3-23 Line #: 20 Code:
Original Specific Comment #25
Comment: This sentence should include a reference to that part of the RA that presents the method and equations used to calculate upper contaminant levels (UCL).

Response: Agreed.

Action: "...The UCLs calculated from surface soil data are" was changed to "The UCLs calculated from surface soil data (Section D.2.3.3.3) are...".

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.1 Pg. #: D-3-23 Line #: 29 Code:
Original Specific Comment #26
Comment: The sentence beginning at the end of this line is unclear and should be reworded.

Response: DOE agrees that this is confusing and further that the two tables should contain the same values.

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Action: Delete the two sentences starting mid-line 28 and ending on line 31 of Page D-3-23. Correct the values in Table D.3-5 to be consistent with the values report in Table D.2-4.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.1 Pg. #: D-3-24 Line #: NA Code:
Original Specific Comment #27
Comment: Table D.3-4 should be revised as follows:
(1) include a reference to the method and equations used to calculate the UCLs,
(2) add a title to the soil column, and
(3) change the Sediment heading to Sand Lens Sediment.

Response: Agreed:
(1) that a reference to the method and equations used to calculate the UCLs should be added;
(2) that a title should be added to the soil column;
(3) that "Sediment" should be changed to "Sand Lens Sediment."

Action: (1) Footnote a was amended to refer the reader to Section D.2.2.2, where the methodology of UCL calculation is discussed.
(2) The soil column was titled "Soil".
(3) the sediment column was titled "Sand Lens Sediment."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.2 Pg. #: D-3-28 Line #: 5 Code:
Original Specific Comment #28
Comment: The phrase "at the locus" is unclear. It should be changed to "at the location."

Response: Agree.

Action: Line 5 of Page D-3-28 will be changed from "...in air at the locus..." to "...in air at the location..."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.2 Pg. #: D-3-28 Line #: 14 to 15 Code:
Original Specific Comment #29
Comment: The modeled air concentrations introduced in this section and presented in Tables D.3-6 and D.3-7 should be revised in response to comments received on the description of the air model and results presented in Section 5.0 and Appendix E.

Response: DOE agrees.

Action: Tables D.3-6 and D.3-7 will be revised to incorporate any changes due to response

and actions for other comments.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.3 Pg. #: D-3-28 Line #: 20 to 22 Code:
Original Specific Comment #30
Comment: The modeled groundwater concentrations introduced in this section and presented in Table D.3-8 should be revised in response to comments received on the description of the groundwater model and results presented in Section 5.0 and Appendix E.

Response: Any changes made will be incorporated as appropriate.

Action: Ensure coordination of the revision of Appendix E, Chapter 5, Appendix D and Chapter 6.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.2 Pg. #: D-3-29 Line #: NA Code:
Original Specific Comment #31
Comment: In Table D.3-6, microgram should be changed to picogram in footnote c.

Response: Agree.

Action: In Footnote "C" of Table D.3-6 on Page D-3-29, "microgram" will be changed to "picogram".

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.2.4 Pg. #: D-3-34 Line #: 14 to 15 Code:
Original Specific Comment #32
Comment: The modeled surface water concentrations introduced in this section and presented in Tables D.3-9 and D.3-10 should be revised in response to comments received on the model assumptions, equations, parameters, and results presented in Section 5.0 and Appendix E.

Response: Any changes to Appendix E and Chapter 5 will be incorporated in Tables D.3-9 and D.3-10.

Action: Ensure agreement between Appendix E surface water concentrations and Section D.3.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3. Pg. #: D-3-38 Line #: 11 Code:
Original Specific Comment #33
Comment: The term Cs should be changed to C_s.

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Response: Agree.

Action: Line 11 of Page D-3-38 will be changed from "...(Cs)..." to "...(C_s)..."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-39 Line #: NA Code:
Original Specific Comment #34
Comment: Tables D.3-11 and D.3-12 present inhalation and ingestion rates in cubic meters per hour (m^3/hr), liters per hour (L/hr), liters per day (L/day), and cubic meters per day (m^3/day). However, Sections D.3.3.2, D.3.3.3, D.3.3.5, and D.3.3.7, require annual inhalation and ingestion rates in order to calculate radiologic exposures. Tables D.3-11 and D.3-12 should be revised to present annual inhalation and ingestion rates as appropriate.

Response: Agreed that variables in the equations used to quantify intake and the tables of parameter values that are used in the equations should be expressed in the same units.

Action: The intake equations were rewritten, including the addition of appropriate conversion factors, so that the variables are expressed in the same units as the parameters in the tables of parameter values.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-39 Line #: NA Code:
Original Specific Comment #35
Comment: Tables D.3-11 and D.3-12 should be revised to clearly explain the source of the parameters that are not specifically referenced within the tables.

Response: Footnote a, located prominently in the table titles, clearly states that the source of the exposure parameters, unless otherwise noted, is the RAWPA. Repeating the discussion of the sources of these parameters in the RI document would only expand the size of the document without improving its accuracy, clarity or utility.

Action: None taken.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-39 Line #: NA Code:
Original Specific Comment #36
Comment: Tables D.3-11 and D.3-12 should be revised to clearly explain where the chemical specific values (csv) referred to in these tables are presented.

Response: Agreed that the table should be revised to indicate where the chemical-specific values are presented.

Action: The footnote defining csv as chemical-specific value was expanded to provide the location where the values for PC, ABS and DR are presented.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-40 Line #: NA Code:
Original Specific Comment #37
Comment: Tables D.3-11 and D.3-12 should be revised to present and reference values for both the ingestion rate (IR) and fraction ingested from contaminated source (FI) parameters; in most cases only the product of these terms (IR x FI) is presented and referenced.

Response: Agreed to separate IR and FI in the exposure parameter tables.

Action: IR and FI were separated and presented as different values in Tables D.3-11 and D.3-12.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-41 Line #: NA Code:
Original Specific Comment #38
Comment: Footnote d in Table D.3-11 refers to specific guidance from U.S. EPA Region 5. This footnote should be revised with specific reference to this guidance. For example, the footnote could refer to a specific meeting, telephone conversation, or letter; the reference should include a date and the U.S. EPA Region 5 personnel who supplied the guidance.

Response: Agreed, that more specific information regarding dates, U.S. EPA Region V personnel, etc. should be provided in the footnotes d and f referring to special guidance from Region V.

Action: The requested information was added to the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-41 Line #: NA Code:
Original Specific Comment #39
Comment: Footnote f in Table D.3-11 includes a citation from U.S. EPA Region 5. This footnote should be revised to supply a specific reference for the assumptions made (see Specific Comment #38).

Response: Agreed, that more specific information regarding dates, U.S. EPA Region V personnel, etc. should be provided in the footnotes d and f referring to special guidance from Region V.

Action: The requested information was added to the footnotes.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-41 Line #: NA Code:
Original Specific Comment #40
Comment: Footnote h in Table D.3-11 refers to page 10 of a specific reference; this page does not apply to all the instances in which this footnote is cited. Footnote h should be revised to either include all the appropriate page references or eliminate the reference to page 10.

Response: Agreed that specific page numbers should be eliminated from the reference footnotes.

Action: The references to specific page numbers were eliminated from the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-41 Line #: NA Code:
Original Specific Comment #41
Comment: Footnote k in Table D.3-11 refers to Sections 6.1 and 6.2 of the Risk Assessment Guidance for Superfund (U.S. EPA 1989). However, these sections do not address the use of 50th percentile body weight as suggested in the footnote. Footnote k should be revised to either refer to the correct sections as appropriate or eliminate any reference to specific sections of this guidance document.

Response: Agreed, that specific page numbers should be eliminated from the reference footnotes.

Action: The references to specific page numbers were eliminated from the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-42 Line #: NA Code:
Original Specific Comment #42
Comment: Footnote l in Table D.3-11 includes references to specific pages in the guidance document cited. However, these references are incorrect in some cases. For example, exposure frequency (EF) should refer to pages 8-7 and 8-8 rather than 8-6. Footnote l should be revised to include correct page references.

Response: Agreed, that specific page numbers should be eliminated from the reference footnotes.

Action: The references to specific page numbers were eliminated from the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-43 Line #: NA Code:
Original Specific Comment #43
Comment: The inhalation rate (0.83 m^3) presented in Table D.3-12 for an on-property resident child, age 1-6, exposed to dusts, volatiles, and radon is derived from a daily adult

inhalation rate. The table should be revised to present an age-specific inhalation rate or should clearly explain the uncertainties of using an adult inhalation rate.

Response: Agreed that a more age-specific estimate of inhalation rate should be used for the on-property resident child.

Action: The inhalation rate of 0.83 m^3/hour for the on-property resident child was changed to 0.5 m^3/hour to conform to the breathing rate for a 1-6 year-old child(U.S. EPA, 1993c).

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-46 Line #: NA Code:
Original Specific Comment #44
Comment: Footnote d in Table D.3-12 refers to specific U.S. EPA Region 5 guidance. The footnote should be revised to clearly identify the source of this specific guidance.

Response: Agreed, that more specific information regarding dates, U.S. EPA Region V personnel, etc. should be provided in the footnotes referring to special guidance from Region V.

Action: The requested information was added to the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-46 Line #: NA Code:
Original Specific Comment #45
Comment: In footnote g in Table D.3-12, Oswer should be changed to OSWER.

Response: Agree.

Action: Change Oswer to OSWER.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-46 Line #: NA Code:
Original Specific Comment #46
Comment: Footnote k in Table D.3-12 refers to chemical specific values (csv). This footnote should be revised to specify where the csv are located in the report.

Response: Agreed that the table should be revised to indicate where the chemical-specific values are presented.

Action: The footnote defining csv as chemical-specific value was expanded to provide the location where the values for PC, ABS and DR are presented.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-46 Line #: NA Code:
Original Specific Comment #47
Comment: Footnote n in Table D.3-12 refers to page 6-36 of the Risk Assessment Guidance for Superfund (U.S. EPA 1989). This page does not appear to contain the information necessary to support the footnoted items. The footnote should be revised with the appropriate page citation.

Response: As noted above, the reference footnotes will be simplified to indicate the document, but not section, page, or table number, from which the parameters were obtained.

Action: The footnote was simplified to indicate the document, but not the section, page or table number, from which the parameters were obtained.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-47 Line #: NA Code:
Original Specific Comment #48
Comment: The table header of Table D.3-13 contains the term TF; this term must be defined. Further, the text alternately refers to transfer coefficients and transfer factors (TF). If possible, the RA should be revised to use only one of these terms. Otherwise, the RA should be revised to clarify the meaning of each term.

Response: Agreed that a definition of TF should be provided in the table, and that only one term, transfer factor or transfer coefficient, should be used consistently throughout this section.

Action: "(TF)" was placed after Transfer Factor in the table title to provide a definition of TF. Section D.3.3 was revised to consistently use "transfer factor" rather than "transfer coefficient".

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-48 Line #: NA Code:
Original Specific Comment #49
Comment: The second page of Table D.3-13 contains a superfluous line beneath the transfer coefficients for 3-methyl-2-butanone-3-methyl. This line appears to serve no purpose and should be removed.

Response: Agreed that the extraneous line beneath the data for 3-methyl-2-butone, 3-methyl should be removed.

Action: The extraneous line beneath the data for 3-methyl-2-butanone, 3-methyl was removed. In addition, the chemical name was changed to 3-methyl-2-butanone, which is correct.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-48 Line #: NA Code:
Original Specific Comment #50
Comment: Table D.3-13 contains minor errors in the estimation of the beef TF and milk TF for some organics. For example, using the log K_{ow} for carbon tetrachloride presented in the Superfund Public Health Evaluation Manual, a beef TF of 1.1×10^{-5} was calculated versus the value of 1.35×10^{-5} presented in the table. The beef and milk TFs presented for organics should be verified. Also, the source of the log K_{ow} used to calculate these terms should be clearly identified.

Response: Agreed that the TFs for beef and milk should be verified, and that references should be provided for the K_{ow} values used in the calculations of the TFs in the table.

Action: All TFs were verified. The Ref. columns were removed and the references for the TF values were presented as superscripted footnotes. The references for the Log K_{ow} values were provided.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3.2 Pg. #: D-3-51 Line #: 4 Code:
Original Specific Comment #51
Comment: The term C_{ivd} was not used in Equation D.3-3 and should be removed.

Response: Agree.

Action: Line 4 on Page D-3-5 will be deleted.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3.2 Pg. #: D-3-51 Line #: 17 Code:
Original Specific Comment #52
Comment: This line suggests that the potential for vegetables to be exposed to contaminated dusts will be evaluated. However, the only equations presented in this section refer to exposure to contaminated irrigation water and to contaminated soils. The section should be revised to evaluate the potential for vegetable contamination as a result of contaminated dusts or should clearly explain and justify why this potential source of contamination is not evaluated.

Response: This pathway is quantified.

Action: Equations 7-10, 7-11, and 7-12 of Page 10 of Section 7 of the Risk Assessment Work Plan Addendum will be added to Page D-3-51 with appropriate parameter descriptions.

Commenting Organization: U.S. EPA Commentor: Saric

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Section #: D.3.3.2 Pg. #: D-3-51 Line #: NA Code:
Original Specific Comment #53
Comment: The section should be revised to provide a reference for Equation D.3-4.

Response: Agree.

Action: The correct reference, (DOE 1992a), will be added to Line 22 of Page D-3-51.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3.4 Pg. #: D-3-57 Line #: NA Code:
Original Specific Comment #54
Comment: Footnote a of Table D.3-14 refers to a regression equation in Fernald Environmental Management Project's (FEMP) reference EPA, 1992d. However, this reference contains numerous equations. The footnote should be revised to either include the specific equation or provide a more detailed citation.

Response: Agreed that the equation for KP should be provided.

Action: The equation for KP was provided in a footnote.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3.6 Pg. #: D-3-58 Line #: NA Code:
Original Specific Comment #55
Comment: The section should be revised to provide a reference for Equation D.3-16.

Response: Agree.

Action: The correct reference, (DOE 1992a), will be added to Line 9 of D-3-58.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-2 through D-4-9 Line #: NA Code:
Original Specific Comment #56
Comment: Following the review of about 20 percent of the data in Tables D.4-1 and D.4-2, data for acenaphthylene, endosulfan, and arsenic were found to be inconsistent with information currently available in the Integrated Risk Information System (IRIS). Therefore, the tables should be updated to reflect current IRIS data.

Response: The toxicity values in these tables were current when the tables were compiled.

Action: All toxicity values and associated data were checked to be certain they were correct and current with IRIS (as of April, 1993) and the 1992 HEAST (including Supplements dated July and November 1992). In addition, an EPA data base updated quarterly that lists other ECAO-sanctioned toxicity values was consulted. Also, EPA

Region V was given a list of chemicals for which toxicity values were not located. If toxicity values for these chemicals are obtained in a timely manner, they will be incorporated into the revised document and used in the risk characterization.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-2 through D-4-5 Line #: NA Code:
Original Specific Comment #57

Comment: Because only inhalation reference concentrations (RfC) were provided for boron and manganese in the referenced documents, the methods and justifications (such as conversion factors and assumptions) used to convert RfCs to reference doses (RfD) in Table D.4-1 should be explained.

Response: Agreed that the justification and rationale for converting an inhalation RfC to an inhalation RfD should be added.

Action: The following was added to page D-4-1, line 19: "Inhalation noncancer toxicity values are usually expressed as inhalation concentrations (RfCs) in units of mg/m^3. Because noncancer risk characterization requires an estimate of dose in units of mg/kg-day, the inhalation RfC must be converted to an inhalation RfD. This is done by assuming humans weigh 70 kg and inhale 20 m^3 of air/day, i.e., the inhalation RfC (mg/m^3) multiplied by 20 m^3/day and divided by 70 kg yields an inhalation RfD (mg/kg-day)." In addition, a footnote was added to the table explaining the origin of the inhalation RfD.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-6 through D-4-9 Line #: NA Code:
Original Specific Comment #58

Comment: Because only unit risks were provided for arsenic and methylene chloride in the referenced documents, the methods used to convert unit risks to inhalation cancer slope factors in Table D.4-2 should be explained.

Response: Agreed that the justification and rationale for converting an inhalation unit risk to the mathematical equivalent of an inhalation cancer slope factor should be added.

Action: The following was added to page D-4-1, line 28: "Inhalation cancer toxicity values are usually expressed as inhalation unit risks in units of reciprocal $\mu g/m^3$ ($1/\mu g/m^3$). Because cancer risk characterization requires an estimate of reciprocal dose in units of 1/mg/kg-day, the inhalation unit risk must be converted to the mathematical equivalent of an inhalation cancer slope factor, or risk per unit dose (mg/kg-day). This is done by assuming humans weigh 70 kg and inhale 20 m^3 of air/day, i.e., the inhalation unit risk ($1/\mu g/m^3$) divided by 20 m^3/day, multiplied by 70 kg and multiplied by 1000 $\mu g/mg$ yields the mathematical equivalent of an inhalation slope factor (1/mg/kg-day)." In addition, a footnote was added to the table explaining the origin of the inhalation cancer slope factor.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-7 Line#: NA Code:
Original Specific Comment #59
Comment: The reference in Table D.4-2 is incorrectly footnoted as Health Effects Assessment Summary Table (HEAST) ("e"). The correct reference is IRIS; therefore, the footnote should be changed to "d" to indicate IRIS.

Response: It is unclear for which chemical(s) the reviewer noted that the reference was incorrect.

Action: All the toxicity values in Table D.4-1 and D.4-2 were updated and all references were checked.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-10 Line #: NA Code:
Original Specific Comment #60
Comment: Table D.4-3 should include a footnote indicating the reference used to prepare the table.

Response: Agree.

Action: The appropriate references of HEAST will be added as a footnote to Table D.4-3.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.1.1 Pg. #: D-4-15 Line #: 16 Code:
Original Specific Comment #61
Comment: The text states that actinium-227 clearance from the lungs is expected to take years. However, retention of actinium in the lungs is class W for halides and nitrates, class Y for oxides and hydroxides, and class D for all other compounds (CFR 1992). Therefore, further discussion regarding these classifications and their corresponding lung retention characteristics should be added to the text.

Response: DOE and U.S.EPA reached agreement on the method for discussion of the toxicity of radionuclides in the meeting held on July 13, 1993. DOE will follow the recommendations of Section 10 of RAGS Part A and only include a general discussion of the nature of radiation including alpha particles, beta particles, and gamma photons.

Action: Revise Section D.4.2 to include a general discussion for radiocarcinogenicity drawing heavily on the discussion in RAGS, Section 10, Pages 10-3 through 10-8, and Pages 10-28 through 10-30, including a table for radionuclides of potential concern similar to Exhibit 10-1.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.1.3 Pg. #: D-4-15 Line #: 26 Code:
Original Specific Comment #62

Comment: The text states that the "carcinogenicity of actinium-227 is due to its emission of low-energy beta particles." Carcinogenicity is determined by several factors (see General Comment #2). The guidelines presented in General Comment #2 should be followed in the carcinogenicity determination of radioactive isotopes.

The following information should be added to the toxic effects description of actinium-227: because the low-energy beta particles from this radionuclide are attenuated by dead layers of skin and the half-life of actinium-227 is about 22 years, this radionuclide primarily presents only an internal hazard (see General Comment #3).

Response: Disagree. Extensive information regarding the carcinogenicity of actinium is not required by RAGS.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.1.3 Pg. #: D-4-15 Line #: 26 Code:
Original Specific Comment #63

Comment: The text states that the "carcinogenicity of protactinium-231 is due to its emission of alpha particles." Carcinogenicity is determined by several factors (see General Comment #2). The guidelines presented in General Comment #2 should be followed in the carcinogenicity determination of radioactive isotopes.

The following information should be added to the toxic effects description of protactinium-231: alpha particles are primarily considered an external hazard and the half-life of protactinium-231 is about 30,000 years (see General Comment #3).

Also, the text should note the isotope(s) of protactinium which are of concern. If protactinium-231 is the only isotope of concern, this should be noted.

Response: Disagree. Extensive information regarding the carcinogenicity of protactinium is not required by RAGS.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.2.1 Pg. #: D-4-16 Line #: 3 Code:
Original Specific Comment #64
Comment: This introduction should be revised to state that antimony is found in trivalent and pentavalent (not petravalent) states, as stated correctly in Lines 19 and 22.

Response: Agreed.

Action: "Tetravalent" was changed to "pentavalent".

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.2.1 Pg. #: D-4-16 Line #: 8 Code:
Original Specific Comment #65
Comment: This relatively high absorption efficiency is characteristic of organoantimony complexes. Inorganic antimony compounds have much less water solubility and, therefore, very low absorption efficiencies. Unless there is sound evidence that the antimony in FEMP media is in organoantimony form, then the characteristics of inorganic antimony should be used.

Response: While it is true that antimony at the FEMP would most likely be found as relatively insoluble oxides or other inorganic forms, the GAF is used not to establish oral toxicity values, but to establish dermal toxicity values. Since antimony potassium tartrate was used in the oral studies from which the oral toxicity values were derived, GI absorption data for antimony potassium tartrate are the most appropriate to use to derive dermal toxicity values from oral toxicity values.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.15.2 Pg. #: D-4-38 Line #: 14 Code:
Original Specific Comment #66
Comment: The molybdenum livestock syndrome is called "teart disease" (derived from the dialect of Somersetshire, England), not "heart disease."

Response: Agree.

Action: Line 14 of Page D-4-38 will be changed from "...heart..." to "...teart..."

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.18.1 Pg. #: D-4-42 Line #: 4 Code:
Original Specific Comment #67
Comment: The text states that protactinium clearance from the lungs is expected to take years. However, retention of actinium in the lungs is class W for halides and nitrates, class Y for oxides and hydroxides, and class D for all other compounds (CFR 1992). Therefore, further discussion regarding these classifications and their corresponding lung retention characteristics should be added to the text.

Response: See response to Comment #61.

Action: As noted in Response/Action for Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.19 Pg. #: D-4-42 Line #: 23 Code:
Original Specific Comment #68
Comment: The pharmacokinetics for radium should be provided. Retention of radium in the lungs is class W for all compounds (CFR 1992). The text should also note that radium is a bone-seeking element.

Response: Disagree. RAGS does not require a pharmacokinetics section to be included in this risk assessment.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.20 Pg. #: D-4-43 Line #: 22 Code:
Original Specific Comment #69
Comment: Regarding pharmacokinetics, the text should note that radon is an inert gas and as such is not classified in terms of lung retention.

Response: Disagree. RAGS does not require that information regarding radon's status as an inert gas be included in this risk assessment.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.23.1 Pg. #: D-4-48 Line #: 19 Code:
Original Specific Comment #70
Comment: The text notes that data were not located regarding strontium inhalation absorption. Retention of strontium in the lungs is class D for all soluble compounds except $SrTiO_3$, and class Y for all insoluble compounds including $SrTiO_3$ (CFR 1992). This information should be included in the text.

Response: As discussed above, it is not necessary to supply toxicity profiles or pharmacokinetic details regarding lung clearance times for radionuclides (see RAGS, Chapter 10).

Action: None taken.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.23.3 Pg. #: D-4-49 Line #: 1 Code:
Original Specific Comment #71
Comment: The text should note that Sr-90 is the only isotope of strontium of concern, if that is the case. The text should also be revised to include the following information regarding Sr-90 that is not currently included in the text. Sr-90 is a fission product that has a half-life of about 29 years and emits a beta particle of fairly low energy. It decays to yttrium (Y-90) which has a short half-life (64 hours) and emits a relatively high energy beta particle. Yttrium decays to stable zirconium. Of primary concern is that Sr-90 accumulates and is retained in bone. Beta particles are primarily an internal hazard (see General Comment #3).

Response: Disagree. Extensive information concerning the carcinogenicity of strontium is not required by RAGS.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.24.1 Pg. #: D-4-49 Line #: 12 Code:
Original Specific Comment #72
Comment: The text notes that data were not located regarding technetium inhalation absorption. Retention of technetium in the lungs is class W for oxides, hydroxides, halides and nitrates and class D for all others (CFR 1992). This information should be included in the text.

Response: Disagree. Extensive information concerning the pharmacokinetics of technetium is not required by RAGS.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.24.3 Pg. #: D-4-49 Line #: 24 Code:
Original Specific Comment #73
Comment: If technetium-99 is the only isotope of technetium of concern, it should be noted. Technetium-99 is a fission product which has a half-life of over 10,000 years and decays by emitting a relatively low energy beta particle. It decays to stable ruthenium. Beta particles are primarily an internal hazard (see General Comment #3). This information should be included in the text.

Also, the text states that the "carcinogenicity of technetium-99 is due to its emission of low-energy beta particles." Carcinogenicities of radionuclides are determined by several factors (see General Comment #2) and these should be noted in the text.

Response: Disagree. Extensive information concerning the carcinogenicity of technetium is not required by RAGS.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.26 Pg. #: D-4-51 Line #: 6 Code:
Original Specific Comment #74
Comment: The pharmacokinetics should be provided for thorium. Retention of thorium in the lungs is class Y for oxides and hydroxides and class W for all other compounds (CFR 1992). In addition, thorium has a very low absorption factor of 0.02 percent. The text should note that thorium tends to concentrate in the bone, liver, and spleen.

Response: Disagree. RAGS does not require a pharmacokinetics section to be included in this risk assessment.

Action: See Comment #61.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.27 Pg. #: D-4-52 Line #: 21 Code:
Original Specific Comment #75
Comment: The text does not provide the inhalation characteristics of uranium. Retention of uranium in the lungs is class D for UF_6, $UO_2(NO_3)_2$, and UO_2F_2, class W for UO_3, UF_4 and UCl_4, and class Y for UO_2 and U_3O_8 (CFR 1992). This information should be included in the text.

Response: Disagree. RAGS does not require a pharmacokinetics section to be included in this risk assessment.

Action: See Comment #61.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.2.27.3 Pg. #: D-4-54 Line #: 10 Code:
Original Specific Comment #76

Comment: This section details the physical properties of alpha particles. This information should also be included or referenced in any other section dealing with radioisotopes that emit alpha particles. Also, similar supporting information should be presented for beta particle emission.

Response: DOE and U.S.EPA reached agreement on the method for discussion of the toxicity of radionuclides in the meeting held on July 13, 1993. DOE will follow the recommendations of Section 10 of RAGS Part A and only include a general discussion of the nature of radiation including alpha particles, beta particles, and gamma photons.

Action: Revise Section D.4.2 to include a general discussion for radiocarcinogenicity drawing heavily on the discussion in RAGS, Section 10, Pages 10-3 through 10-8, and Pages 10-28 through 10-30, including a table for radionuclides of potential concern similar to Exhibit 10-1.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.1.1 Pg. #: D-5-1 Line #: 18 rb
Original Specific Comment #77

Comment: Equation D.5-1 calculates risk from the intake of a radionuclide. However, the equation does not define whether this intake is acute or chronic. The equation should be revised to define whether the intake is acute or chronic. If the intake is chronic, the definition should include the averaging period.

Response: Disagree. The intake is chronic. According to RAGS intake calculation methodology the averaging time is not used with radionuclides.

Action: None.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.1.1 Pg. #: D-5-1 Line #: 20 Code:
Original Specific Comment #78
Comment: This section discusses the development of unit risk factors (URF). While the use of URFs appears reasonable, their use may mask whether a single exposure route contributes most of the risk or all routes contribute equally. Care should be taken throughout the report to clearly indicate which route(s) contribute significant risk.

Response: As noted by the reviewer, Section D.5.1 describes the development of the unit risk factors and unit toxicity factors. Section D.5.1 also refers the reader to Attachment D.I, where the unit risks and unit toxicity factors for each exposure route are presented. Attachment D.II presented the risk results in the same format, ensuring that the contribution of each exposure route to the total risk from exposure to the medium was clearly presented.

Action: The format of the Section D.5 results tables will be changed to incorporate the exposure route-specific information formally presented in Attachment D.II. This will make the risk by route of exposure even more evident.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.1.2 Pg. #: D-5-2 Line #: 7 Code:
Original Specific Comment #79
Comment: Equation D.5-3 does not estimate a risk, as indicated. Rather, the equation estimates a dose. Therefore, the text should be revised to clarify this, and the method of estimating risk from the dose calculated in the equation should be presented.

Response: Agree.

Action: The appropriate explanation of calculating risk from dose of external radiation will be incorporated into Section D.5.1.2.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.2.1 Pg. #: D-5-2 Line #: NA Code:
Original Specific Comment #80
Comment: This section implies that no radionuclides have noncarcinogenic effects, which is not true. The report should be revised to indicate whether any radionuclides included as CPCs in the RA have noncarcinogenic health effects.

Response: Agreed.

Action: "Some carcinogenic chemicals..." was changed to "Some radionuclides and other carcinogenic chemicals..."

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.3.1.1 Pg. #: D-5-5 Line #: 25 Code:
Original Specific Comment #81
Comment: This section states that the trespassing child receptor was not evaluated with current access controls because the effect of current access controls on exposure frequency could not be determined. However, this may imply that current access controls result in no trespassing child exposure. The report should clearly state whether there is evidence to support such an implication or clearly state that some exposure may occur.

Response: Agree.

Action: The following sentence will be inserted after the sentence that ends on Line 24: "As noted in Section D.3.1.4.2, it is assumed that the trespassing child under the current land use with access controls scenario is exposed by the same pathways that were evaluated under the current land use without access controls scenario. Although the access controls are expected to reduce the frequency or duration of visits by this receptor, the impact of the access controls could not be quantified."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.3.1.1 Pg. #: D-5-8 Line #: 4 Code:
Original Specific Comment #82
Comment: This section discusses chemicals contributing carcinogenic risks between 1×10^{-6} and 1×10^{-4}. However, benzo(a)pyrene (b[a]p), which has a carcinogenic risk of 1.8×10^{-5} in Table D.5.1, is not discussed. B(a)p should be added to the discussion.

Response: All risk estimates will be rerun, following revision of COC lists, UCL calculations, changes in exposure parameters and changes in toxicity values.

Action: The risk characterization text will be rewritten to conform to the quantitative estimates.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.5.3.1.1 Pg. #: D-5-8 Line #: 23 Code:
Original Specific Comment #83
Comment: The risks estimated for a trespassing child from CPCs in the silos range from above (5×10^{-3}) to below (4×10^{-5}), depending on the location of the receptor. Because the presented risks range over approximately two orders of magnitude, a likely exposure point for a trespassing child in the silos should be presented with the corresponding risk.

Response: Agree.

Action: Risks for each receptor will be summed across all appropriate pathways and media.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.0 Pg. #: D-6-1 Line #: 2 to 8 Code:
Original Specific Comment #84

Comment: The organization of this section is inadequate. The introduction does not clearly explain how the section is organized. For example, under the current organization, the introduction should briefly identify Section D.6.1 Terminology, Section D.6.2 Sources of Uncertainty, Section D.6.3 Toxicity Assessment, and Section D.6.4 Uncertainty Analysis For Operable Unit 4. However, Section D.6.2, which should discuss sources of uncertainty discusses only sources of uncertainty in the exposure assessment. Sources of uncertainty associated with the toxicity assessment are presented in Section D.6.3, and sources of uncertainty associated with the risk characterization are not addressed.

Section D.6.0 should be reorganized to clearly and completely discuss the uncertainties associated with the RA. One alternative would be to use three major subsections: D.6.1 Terminology, D.6.2 Sources of Uncertainty (including uncertainties associated with the exposure assessment, toxicity assessment, and risk characterization), and D.6.3 Uncertainty Analysis For Operable Unit 4.

Response: Agreed that the introduction does not clearly present the organization of Section D.6.0.

Action: Section D.6.0 was reorganized as suggested by the reviewer, so that the section headings are: D.6.1 Terminology; D.6.2 Sources of Uncertainty; D.6.3 Uncertainty Analysis for Operable Unit 4. In addition, the last sentence in the introduction (page D-6-1, line 7) was changed to: "Section D.6.1 discusses some of the terminology and defines the two types of uncertainty found in risk assessments. Section D.6.2 presents the sources of the uncertainty in the exposure assessment, the toxicity assessment, and the risk characterization. Section D.6.3 discusses the impact uncertainty on the risk assessment for OU4."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.1 Pg. #: D-6-1 Line #: 10 Code:
Original Specific Comment #85

Comment: This line mentions two types of uncertainty. The first is called measurement uncertainty, while the second type is not named. The first paragraph of this section should be revised to provide a name, such as informational uncertainty, for the second type of uncertainty as well as a clearer explanation, including some examples, of this type of uncertainty.

Response: Agreed, that the second type of uncertainty should be given a name; "informational uncertainty" is reasonable. The next two sentences provide clear examples of informational uncertainty that have a major impact, and that have a minor impact, on the risk assessment.

Action: The sentence, "A different kind of uncertainty arises..." was changed to "The second, which may be called informational uncertainty, arises..." To provide further clarification, the sentence, "In other instances, the overall impact can be minimized..." was changed to "In other instances, such as for human physiological variables, the overall impact can be minimized..."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.1 Pg. #: D-6-2 Line #: 4 Code:
Original Specific Comment #86

Comment: This line discusses the conveyance of "real world" information. While reasonable maximum exposures (RME) are by definition conservative, these exposures are also by definition not maximum exposures. Therefore, lines 4 through 8 should be rewritten to clearly explain that RMEs are not maximum exposures and contain some degree of "real world" information.

Response: We do agree that the RME evaluation conveys some real world information, such as physiological parameters (e.g., body weight). Although by definition, or more correctly by intent, the RME exposure evaluation is conservative and is not maximum, the concatenation of upper-bound parameters for IR, ET and EF results in an evaluation that may be so far above reasonably maximum as to effectively mask the real world information present in the evaluation.

Action: The sentence beginning on page D-2-1 line 34 will be rewritten as follows: "Although it is possible that an individual may receive exposures greater than the RME estimate, the likelihood is small; and the likelihood that such an individual is also above the upper bound in terms of sensitivity is many time smaller." The sentence beginning on page D-6-2 line 3 will be rewritten as follows: "The effect of the multiplicative linking together of upper-bound model parameters, scenarios, and assumptions in the risk characterization may mask completely the small amount of "real world" information used in the risk characterization (EPA, 1992c), and thereby be misleading."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.1 Pg. #: D-6-2 Line #: 22 Code:
Original Specific Comment #87
Comment: The word "Medium" should be changed to "Median."

Response: Agreed.

Action: "Medium" was changed to "Median."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.1 Pg. #: D-6-2 Line #: 25 Code:
Original Specific Comment #88
Comment: The word "subgroups" should be changed to "subgroup."

Response: Agreed.

Action: "Subgroups" was changed to "subgroup."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.2 Pg. #: D-6-3 Line #: 1 Code:
Original Specific Comment #89
Comment: This line implies that all parameters used in the RA are conservatively biased. This is not the case. Therefore, the phrase "conservative bias of parameters" should be changed to "conservative bias of some parameters."

Response: Agreed.

Action: "Conservative bias of parameters" was changed to "conservative bias of some parameters."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.2.1.1 Pg. #: D-6-3 Line #: 16 Code:
Original Specific Comment #90
Comment: This line refers to "generic reasons previously discussed." It is not clear what reasons this statement refers to. The section should be revised to restate these reasons or provide a specific reference to where in the report these reasons are discussed.

Response: Agreed.

Action: The first sentence in Section D.6.2.1.1 will be rewritten as follows: "Sources of uncertainty in selection of the COC's include: Adequacy of the site sampling process; Variation in sample collection and analytical procedure; Appropriateness of screening

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procedures that eliminate chemicals."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.2.1.2 Pg. #: D-6-4 Line #: 20 and 21 Code:
Original Specific Comment #91
Comment: These lines state that most model parameter values used in modeling efforts maximize estimates of transport (and hence risk). This discussion should be revised to give some examples of such parameters.

Response: Agree.

Action: Modeling parameters that tend to maximize risk, such as the low uranium 1.8 ml/g K_d, will be discussed in Section D.6.2.1.2.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.4 Pg. #: D-6-7 Line #: NA Code:
Original Specific Comment #92
Comment: All of the specific examples of OU4 uncertainties discussed in this section should also appear in Table D.6-1. Some examples, such as soil-to-plant transfer factors (B_{iv}) do not appear in this table.

Response: Agreed.

Action: The following examples of uncertainty were added to Table D.6-1: Continuous location of the receptor at the point of highest concentration; Heterogeneity of waste form; Assumption that UCL concentration is uniformly distributed in the mass of contaminated medium; Development of the leachate source term; Selection of exposure parameters

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.6.4 Pg. #: D-6-8 Line #: NA Code:
Original Specific Comment #93
Comment: The specific uncertainties presented in Table D.6-1 should be grouped by the general source of the uncertainty (exposure assessment, toxicity assessment, and risk characterization).

Response: Agreed, the entries in Table D.6-1 should be grouped by category and should follow the organization of the text.

Action: The entries in Table D.6-1 were grouped by category and arranged according to the organization of the text.

Commenting Organization: U.S. EPA Commentor: Saric

Section #: D.6.4 Pg. #: D-6-10 Line #: 29 Code:
Original Specific Comment #94
Comment: This line refers to Version 6.0 of the U.S. EPA UBK model used to estimate blood lead levels. This sentence should be revised to include a reference for this model.

Response: The reviewer noted that a reference was not provided for version 0.6 of the EPA UBK model.

Action: The requested reference was provided (EPA, 1990d, 1991e).

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.7.0 Pg. #: D-7-1 Line #: NA Code:
Original Specific Comment #95
Comment: This section should be revised in response to comments regarding Sections D.1.0 through D.6.0.

Response: All risk estimates will be re-run, following revision of COC lists, UCL calculations, changes in exposure parameters and changes in toxicity values.

Action: The text and table in Section 7 will be rewritten to conform to the new quantitative estimates. Care will be taken to define NA and to present risks rounded to one significant figure.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.7.1 Pg. #: D-7-2 Line #: NA Code:
Original Specific Comment #96
Comment: Table D.7-1 should be revised to provide a definition of the term "NA." Also, this table presents carcinogenic and noncarcinogenic risk estimates to two significant figures. U.S. EPA's Risk Assessment Guidance for Superfund (U.S. EPA 1989) specifies that these risk estimates should be presented to only one significant figure. Table D.7-1 should be revised to present all risks to one significant figure.

Response: Agreed.

Action: When the risks are rerun and the tables recreated, care will be taken to provide a definition for NA and to round summary risk estimates to one significant figure.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.7.1 Pg. #: D-7-3 Line #: 31 Code:
Original Specific Comment #97
Comment: This line stops prematurely after only two words. The text beginning on line 32 should begin on this line.

Response: Agreed.

Action: The format problem will be corrected when this section is rewritten to conform to the newly quantified risk estimates.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.7.1 Pg. #: D-7-5 Line #: NA Code:
Original Specific Comment #98
Comment: Table D.7-2 should be revised to present all risks to one significant figure.

Response: All risk estimates will be rerun, following revision of COC lists, UCL calculations, changes in exposure parameters and changes in toxicity values.

Action: The text and tables in Section 7 will be rewritten to conform to the new quantitative estimates. Care will be taken to present risks rounded to one significant figure.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.7.2 Pg. #: D-7-8 and D-7-9 Line #: NA Code:
Original Specific Comment #99
Comment: Tables D.7-3 and D.7-4 present risks associated with background concentrations of COC's in soil. These tables would be more useful if they also presented risks associated with RME conditions. Tables D.7-3 and D.7-4 should be revised to include RME risks. Also, these tables should be revised to present risks to only one significant figure.

Response: DOE agrees.

Action: Tables D.7-3 and D.7-4 will be revised to include the comparable RME scenario for site-related concentrations of each constituent. The risks will be presented to one significant digit for both risk estimates.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 6.2 Pg. #: 6-2 Line #: NA Code:
Original Specific Comment #100
Comment: This section states that if sufficient information is available to perform the t-test, Wilcoxon Rank Sum Test, or upper tolerance limit (UTL) test (which is only a simple comparison), a visual comparison of the histograms for the background and site-related data will be performed. It appears as though in these particular cases, subjective professional judgement will be used to eliminate chemicals. This can lead to a conclusion that is not scientifically tenable. The elimination of chemicals from consideration in the RA should follow U.S. EPA Risk Assessment Guidance for Superfund (U.S. EPA 1989), which suggests that subjective elimination of chemicals is not appropriate.

Also, the report does not clearly define how the UTL test will be used. The UTL approach is not a robust statistical test. This approach is, at best, a screening procedure. With the UTL approach, individual maximum contaminant concentrations are simply compared with the calculated upper 95 percent confidence limit of the mean background concentration. This approach does not address whether the population of site-specific and background chemical data is different and therefore can result in either a false negative or false positive conclusion. If, for example, the maximum detected concentrations represent spurious data points or a hot spot, one could erroneously concluded that site-specific and background contamination was different, when these concentrations were only isolated outliers. Conversely, if site-related contaminants had a lower standard deviation than background, the maximum concentration could be less than the 95 UTL, but the site-specific and background mean concentrations could be statistically different. For these reasons, the UTL should be used exclusively for screening purposes or for hot spot analysis and the report should be revised to clearly define how the UTL test will be used.

Response: This topic was discussed and a concern reached in the meeting with EPA/OEPA on July 13. DOE will revise the report to reflect this consensus.

Action: Provide the detailed logic for solution of constituents of potential concern. Also see the Action in response to Pat Van Leeuwen on this subject.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 6.5 Pg. #: 6-6 Line #: NA Code:
Original Specific Comment #101

Comment: Table 6-1 lists the pathway, but not the route, contributing significant risk. Because different routes (that is, ingestion, inhalation, dermal contact, direct exposure) have different associated uncertainties, mechanisms of exposure, and methods of control or prevention, the route(s) contributing significant risk should be listed.

Response: The summary tables for the risk assessment will be revised as discussed in the July 13 meeting with U.S.EPA/OEPA.

Action: Revise all receptor hazard and risk summary tables in Chapter 6, 7, and Appendix D to identify risk/hazard by exposure route for a given media.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 6.5.5 Pg. #: 6-8 Line #: 9 Code:
Original Specific Comment #102

Comment: The risks from chronic exposure discussed here are extremely high. This suggests that risks from acute exposure may also be significant. Therefore, the possibility of acute effects should be discussed in the conclusion and may be evaluated in a separate report.

Response: High estimated cancer risks cannot be interpreted to have any meaning regarding the likelihood of acute effects. Although is possible that cancer can arise from a single exposure to a radionuclide or a carcinogenic chemical, cancer is evaluated as a chronic phenomenon. Acute effects, therefore, must be noncancer effects. Although the HI is not intended to be a probabilistic measure of acute effects, the HI of 1700 for the on-property resident child exposed directly to silo 3 contents raises concern that acute effects may arise from such an exposure. Currently, however, the EPA has no methodology for risk characterization for acute effects (i.e., no acute RfD values are derived and no methodology exists for their derivation). A separate report addressing acute effects is beyond the scope of this project.

Action: The following will be added to Section 6.5.5: "Extremely high HI values for the on-property resident child exposed directly to silo 3 contents raises concern that acute effects may arise from such an exposure, but the methodology does not exist to quantify the risk or predict the likelihood."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 6.6 Pg. #: 6-8 Line #: NA Code:
Original Specific Comment #103

Comment: This section does not include a discussion of data sufficiency. Any "data gaps" may lead to a poor characterization of on-site concentrations and errors in selection of CPCs. These sources of uncertainty and their potential impact on risk characterization should be discussed in this section.

Response: Agreed that discussion of the uncertainty introduced by data gaps should be included in Section 6.6. It seems that a more logical location for this discussion, however, would be Section 6.6.1 Sources of Uncertainty.

Action: The following was added to page 6-9, line 3: "The first source of uncertainty arises from frank data gaps or limitations in the data. For example, the data set for soil is limited, and virtually nothing is known regarding contaminants in the area of the former drum-handling building. These limitations could result in failure to identify some chemicals of potential concern, which may result in underestimating risk. As a practical matter, however, these data limitations probably represent risks that are trivial compared with the risk associated with exposure to the contents of the silos." The sentence beginning on line 3 was changed from "These uncertainties are due to a number of factors, including..." to "Other sources of uncertainty include...".

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: References Pg. #: D-R-8 Line #: NA Code:
Original Specific Comment #104
Comment: The reference cited as U.S. EPA, 1992d reads in part "Interim Guidance for Dermal Exposure Assessment." This reference should be changed to "Dermal Exposure Assessment: Principles and Applications."

Response: Agreed.

Action: The reference was corrected.

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REFERENCES

Code of Federal Regulations (CFR). 1992. Title 10, Part 20, Appendix B to Sections 20.1001 through 20.2402. Revised January 1.

Pinder, J.E. III and Smith, M.H. 1975. *Frequency distributions of radiocesium concentrations in soil and biota, in Mineral Cycling in Southeastern Ecosystems.* Howell, F.B., Gentry J.B., and Smith, M.H., eds. CONF-740513. National Technical Information Service, Springfield, VA. pp. 107-125.

Stannard, J. Newall. 1988. *Radioactivity and Health, A History.* October.

U.S. Environmental Protection Agency (U.S. EPA). 1989. Risk Assessment Guidance for Superfund (RAGS), Human Health Evaluation Manual Part A. July.

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-BASELINE RISK ASSESSMENT COMMENTS-

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.1.4 Pg. #: D-1-5 Line #: 10 Code:
Original Specific Comment #105

Comment: The justification presented in the report for assuming that all environmental data from the site are distributed lognormally is inadequate. According to Pinder and Smith (1975), some environmental contaminants, such as radionuclides, are better fitted with a Weibull distribution than a two-parameter lognormal distribution. Therefore, because it may be untenable to assume a priori that all contaminants at the site are distributed lognormally, the report should provide justification for any determination of distribution. This will facilitate the selection of appropriate statistical procedures for background comparisons. Also, in the cases where the distribution cannot be reliably determined, a normal distribution should be assumed.

Response: U.S. EPA Supplemental Guidance to RAGS: Calculating the Concentration Term suggests the use of a lognormal distribution for soil data sets which are sufficiently small to make determination of a distribution difficult. However, based on the July 13 meeting with U.S. EPA/OPEA, DOE has agreed to use the Kolmogorov-Smirnov test for normality and to justify any assumed distribution for undefined data sets prior to calculation of the UCL of the arithmetic mean (concentration term).

Action: Use Kolmogorov-Smirnov test to determine the distribution type.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.1.4 Pg. #: D-1-5 Line #: NA Code:
Original Specific Comment #106

Comment: The calculation of statistics for estimating intake should be based on the arithmetic, not the geometric mean. This is because the exposure of an individual to site-related contaminants is evaluated spatially and carcinogenic and noncarcinogenic toxicity data is based on lifetime average exposures. It is a fundamental assumption that the exposed individual randomly comes into contact with contaminants across the site. Under this assumption, the spatially averaged soil concentration can be used to estimate the true average concentration contacted over time. In addition, EPA's health criteria are based on the long-term average daily dose which is by definition based on the arithmetic mean, not the geometric mean. Therefore, the arithmetic mean should be calculated and used for estimating exposure in the baseline risk assessment.

Response: DOE agrees with the comment. Please see Pat Van Leeuwen comments for a

response and action.

Action: As noted above.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.2.2 Pg. #: D-2-9 Line #: 5 Code:
Original Specific Comment #107
Comment: It is appropriate and correct to carry out a line fitting analysis to identify the distribution of the data set. However, using such an analysis to choose between a normal and lognormal distribution for a particular data set appears to be somewhat arbitrary and limited. There are many other distributions that were not considered in the curve fitting analysis, including Weibull and random distributions. Determining the distribution is not an academic exercise since the calculated arithmetic and geometric means can differ by an order of magnitude for the same data set. Simply choosing the distribution based on higher correlation coefficient between lognormal and normal ignores the case in which data do not fit either curve. Therefore, an alternate approach should be used, such as establishing a threshold criteria below which an alternate distribution would be evaluated.

Response: See response to #105 above.

Action: See action for #105 above.

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Comments on the Draft "Remedial Investigation Report for Operable Unit 4"

U.S. EPA Region 5 Radiation Section

May 1993

Commenting Organization: U.S. EPA, Radiation Section
Section #: 3.1.2 Page #: 3-6 Line #: 21 Code: C
Original Comment #: 1
Comment: As part of the summary of the physical characteristics of the waste residues within Silos 1 and 2, contour maps indicating the bentonite thickness, a plot of the difference between the baseline waste surface data and the bentonite surface data, should be provided. This would provide a graphic representation of the nature and extent of thin bentonite coverage.

Response: DOE provided a summary of the information from the final bentonite mapping report, including the two referenced reports. A separate map depicting the difference between the provided maps cannot be readily accomplished within the timeframe available and provides only limited additional information. In the comment EPA appears to be expressing concern regarding the occurrence of thin areas of bentonite (that is, less than one (1) foot minimum thickness of bentonite). The areas identified through the bentonite mapping suspected of having areas in Silo 2. The available videos from the removal actions clearly show the mounds being significantly reduced in size by the effects of the slurry being sprayed onto the raised areas. It is the contention of DOE that the net result of the program was a minimum of the thickness of one (1) foot of bentonite over all K-65 residues including the raised areas. A figure depicting bentonite thickness on the basis of the mapping results only would not portray the true thickness of the bentonite over raised areas such as those in Silo 2.

Action: None Required.

Commenting Organization: U.S. EPA, Radiation Section
Section #: 4.2.2.1 Page #: 4-68 Line #: 32 Code: C
Original Comment #: 2
Comment: Please clarify the assertion that the ratios of the various constituents of Boring 1622 are very similar to silo residues, as well as the claim that these ratios are constant. The Silo 1, Zone C radiological concentrations appear to have a different ratio distribution than that of the concentrations of Boring 1622, Sample 99623; indicating the possibility of leaching of contaminants from the base of the Silo 1.

Response: The ratio of the radiological constituents of Boring 1622 are similar, but not identical,

to the Silo 1, northwest manway, zone c sample. Therefore, spillage during operation is the most probable source of this contamination. However, we agree that there is the possibility of leakage of the silo underdrains to the subsurface soils. Therefore, discussion of this possibility will be discussed in the text.

Action: Revise the last sentence of the paragraph to read: If this material had originated as a liquid (i.e., leachate) the ratios would not likely remain similar. Therefore, operational spillage is considered the most probable source of the contamination. However, this does not rule out the potential for leakage of the silo underdrains to the subsurface soils.

Commenting Organization: U.S. EPA, Radiation Section
Section #: 4.6.1 Page #: 4-132 Line #: 8 Code: C
Original Comment #: 3
Comment: Please state how it can be confirmed that Sr-90 and Tc-99 are not present in Silos 1 and 2 if RI/FS analysis for these radionuclides in silo residues was not performed.

Response: These two radionuclides are fission products. As stated in Chapter 1 of the RI no materials containing these radionuclides were handled at FEMP until after the filling of the K-65 Silos. While these radionuclides were evaluated as potential constituents of concern for surface soils in Operable Unit 4 due to the potential for atmospheric deposition from other FEMP areas and facilities such an evaluation for the silos is unnecessary.

Action: No action planned.

Commenting Organization: U.S. EPA, Radiation Section
Section #: 5.3.2 Page #: 5-11 Line #: 17 Code: C
Original Comment #: 4
Comment: Please explain how the data from the surface soil and the first 5 feet of berm fill were "combined".

Response: On Page 5-11, Line 17, the text will be revised to explain how the data were combined.

Action: On page 5-11, Line 17, replace the word 'combine' with the phrase 'considered as a single data set.'

Commenting Organization: U.S. EPA, Radiation Section
Section #: 5.4.1 Page #: 5-23 Table #: 5-2 Code: E
Original Comment #: 5

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Comment: Table 5-2, Estimated Airborne Concentrations of Suspended Species from Operable Unit 4 - Current Source Term Scenario, should be corrected to indicate radionuclide concentrations in "pCi/l" and confirm that the proper values are listed. The errors in footnote usage should also be corrected.

Response: The estimated airborne concentrations of suspended species are in pCi/M^3 for the radionuclides. Also, the text following the footnotes "b" and "c" are to be interchanged. These corrections have been made in the final document.

Action: Table 5-2 will be corrected.

Commenting Organization: U.S. EPA, Radiation Section
Section #: D.3.1.2 Page #: D-3-7 Line #: N/A Code: M
Original Comment #: 6
Comment: In the discussion of potential release mechanisms in OU4, please explain the basis for the assumption that the bentonite clay layer will remain intact in the event of silo dome collapse in the future source-term scenario. While the average bentonite thickness for the silo residue cover is around 30 inches, portions of this cover thin to as little as 0.4 inches at the top of the highest mound of silo residue. Areas of such light bentonite cover seem susceptible to breakthrough and erosion that would expose the silo residues, possibly allowing the resuspension of contaminants, increased infiltration of water into the silo residues, and the leaching of contaminants into rainwater ponding in the failed silos.

Response: DOE agrees that this potential release mechanism should be discussed and its non-quantitative evaluation justified.

Action: Clarify the rationale for not including the release of particulate materials from Silos 1 & 2 following dome failure in Section D.3 and in Section E.1.

Commenting Organization: U.S. EPA, Radiation Section
Section #: E.1.6.1.1 Page #: E-1-9 Line #: 31 Code: M
Original Comment #: 7
Comment: The average daily radon headspace concentration data for the month of December 1992 does not appear representative of the annual average radon concentrations for the Silo 1 and 2 domes. Page 3-8 of the K-65 Silo Removal Action - Bentonite Effectiveness Evaluation, December 17, 1992 presents post-bentonite headspace concentrations monitored from July 20, 1992, to September 15, 1992; the stated mean values for Silos 1 and 2 were **45,081 pCi/l** and **219,585 pCi/l**, respectively. This 219,585 pCi/l mean value for Silo 2 is about 73% higher than the 126,922 pCi/l mean value stated in the OU4 RI. Using radon measurement data for only one month, especially a cold month

as December, is not representative for an entire year as colder temperatures tend to dampen radon emanation from materials such as soils and clays. Average daily radon concentration data used in the OU4 RI should reflect annual conditions and Table E.1-4, Radon Release Rates and Emission Flux from all Sources in Operable Unit 4, should be revised appropriately.

Response: Doe agrees that there is temporal variability in the K-65 Silo headspace radon concentrations. Additionally DOE has discovered a significant underestimation of the headspace radon concentration during the period of January, 1992, through April, 1993, since the RI Report was delivered to U.S. EPA. DOE has used the data collected during May and June to reconstruct the headspace radon concentrations for January, 1992, through April, 1993.

Action: DOE will recalculate the Radon Release Rates and Emission Flux for the K-65 Silos in Table E.1-4. Fate and Transport Modeling will be completed for the higher concentration of either the May-June 1993 or January 1992 through December 1992 time period. DOE will use a more conservative breathing rate for the silos as described in the "K-65" Silo Removal Action-Bentonite Effectiveness Evaluation, December 17, 1992." The risk assessment will be revised accordingly.

Commenting Organization: U.S. EPA, Radiation Section
Section #: E.1.6.1.1 Page #: E-1-11 Line #: 6 Code: M
Original Comment #: 8
Comment: No indication is made as to how the silo headspace differential pressure measurement data, discussed in Section 2.4.2, is integrated into the determination of breathing rates for the silos, please clarify.

Response: The method for calculating silo breathing rates was modified to be consistent with the methodology used in K-65 Removal Action - Bentonite Effectiness Evaluation Report. The ideal gas law is used to calculate the moles of headspace gas present at the beginning and end of each 15 minute measurement period. The temperature and pressure measured for each period is utilized in this calculation. The change in moles can be calculated and averaged over several 15 minute measurement periods to produce an average mole increase. Only positive mole changes are used to represent expiration of gas. The average mole change for headspace gas is then combined with the average silo headspace radon concentration to yield a breathing rate for radon.
Action: Add discussion to the text on page E-1-11 to clarify the basis for the silo breathing rates used to estimate radon release rates.

Commenting Organization: U.S. EPA, Radiation Section
Section #: E.1.6.1.1 Page #: E-1-11 Line #: 8 Code: M

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Original Comment #: 9

Comment: It is not clear how the Silo 1 and 2 temperature monitoring data was used to derive the average daily temperature variation and establish the initial headspace temperature for the silos.

Response: See Response for Comment #8.

Action: Add discussion to the text on page E-1-11 to clarify the basis for the silo breathing rates used to estimate radon release rates.

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OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT TECHNICAL COMMENTS

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.1 Pg. #: D-1-5 Line #: NA Code:
Original Comment #1

Comment: Regarding the use of the geometric mean for small data populations, we refer DOE to the June 22, 1992 Memorandum requiring the use of "Intermittent Bulletin Volume 1, Number 1: Supplemental Guidance to RAGS: Calculating the Concentration Term.: This bulletin refers to methodology to be used for determining the shape of the data distribution. It further reaffirms that in cases where the data can be shown to be log normally distributed, the UCL of the arithmetic mean for the log transformed data should be calculated. As equations are not presented here, I cannot evaluate whether this was calculated correctly. Present the equations used in this OU report.

Response: DOE used the cited guidance to the degree to which it addressed the issues present in the Operable Unit 4 Baseline Risk Assessment. However, the supplemental guidance notes that data set of less than 10 samples forms a special case in determining the concentration term. DOE will address these small data set as agreed to in the meeting with U.S. EPA and OEPA on July 13, 1993. The maximum sample value will be used for data sets having fewer than seven "hits" or greater than 50% non detects. DOE did calculate the arithmetic mean for lognormally distributed data sets as recommended in the supplemental guidance. DOE agrees that this is not clear in the reference text.

Action: Recalculate the concentration term for small data sets as agreed to in the July 13, 1993 meeting. Revise the risk characterization based on the revised concentration term. Revise the text to include the formula used for calculating the arithmetic mean of lognormally distributed data sets and clearly state that the arithmetic mean was used in the risk assessment text.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.1 Pg. #: D-1-7 Line #: NA Code:
Original Comment #2

Comment: Regarding the use of the "Unit Risk Factor" methodology for the calculation of intake equations, described in Sections D.5.0 and Attachment D.1, EPA has agreed to review this methodology before allowing its use in an OU risk assessment. As was discussed at the Chicago meeting, the develop of the Unit Risk Factors (URFs) and Unit Toxicity Factors (UTFs) are not fully described. We are still awaiting a sample calculation and presentation of the results. The sample calculation presented in Attachment D.1 was previously rejected as it was based on the methodology for radionuclides and does not include an example of a calculation for the dermal pathways. EPA will review this methodology when an appropriate example is submitted for review; until then the methodology is considered unacceptable for use in OU risk assessments.

Response: The unit risk factor methodology and unit toxicity factor are described in Attachment D-1 to Appendix D. The unit risk factor is simply all the terms in a exposure route equation (taken from RAGS) except the concentration term. An example equation is shown on page D-I-3 and 4 for one exposure route for the medium, air. As noted in the text, the unit risk factor is all terms in the equation except the concentration term. Additional unit risk factors are developed for each exposure route for a given medium, in this case air. If special sub-populations exist then unit risk factors are developed for these receptors. A stated concern of U.S. EPA is the summing of unit risk factors for a receptor for a given media. DOE is not doing this in the Operable Unit 4 Baseline Risk Assessment. The risk from each exposure route for each receptor for each medium is presented in Attachment D.I. These risks/toxicities are summed prior to presentation in the main body of the risk assessment. As discussed in the July 13, 1993 meeting with the U.S. EPA, DOE will provide summary tables in the main text which are more descriptive of the risk by individual exposure routes.

Action: Revise the tables summarizing ILCR and hazard quotients in Section D.5 to provide the reader with greater detail on the risk/hazard for each constituent for each medium for each exposure route.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.1 Pg. #: D-1-7 Line #: NA Code:
Original Comment #3

Comment: Regarding the modifications to the dermal contact models and parameters, DOE referenced the correct dermal guidance in the footnotes (but not in the reference section): Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B; however I do not see that the recommended default parameter values given in Table 8-6 of that document were incorporated in the risk assessment. References to the document for some parameter values are incorrect as these parameters are not discussed in those sections of the documents.

Response: Agreed that reference citation for 1992 Dermal Guidance must be corrected. The other issues in this comment are addressed in the comments on Tables D.3-11 and D.3-12, which deal with the exposure parameters.

Action: The referenced citation for the 1992 Dermal Guidance was changed to: U.S. EPA, 1992, "Dermal Exposure Assessment: Principles and Applications," Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2 Pg. #: D-2-3 Line #: 17 Code:
Original Comment #4

Comment: Is data from 31 consecutive days in December adequate for evaluating the radon concentration in the silo headspace? Are there seasonal differences in the silo breathing rate? This section requires more explanation to be convincing that the methods used give a true representation of the silo radon concentration.

Response: Text is added to discuss further the adequacy of the radon data used, additional data are available. Reference is also made in the text to the radon source term discussion presented in Appendix E (fate and transport modeling).

Action: Revise Section D.2.1.1.2 to discuss the new radon data available for use, its adequacy, and the silo breathing rate used. In addition, reference Appendix E for similar radon source term discussion. Modeling will be re-done using the additional data.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2 Pg. #: D-2-9 Line #: 2 Code:
Original Comment #5

Comment: The arithmetic mean should be specified here. In general, the UCL of the mean is not used to select the Chemicals of Concern (COC's). If the mean is unstable (due to small sample size or non-detects), the UCL of the mean will be even more unstable.

Response: This section is not describing the selection of C of Cs but rather the method used to calculate the concentration term for risk characterization. Selection of C of Cs is discussed in Section D.2.3. As noted in this section (Page D-2-10, lines 25-28), C of Cs are selected based upon a comparison of the site-related data set for a given medium using the Student-t test. If the null hypothesis is supported by this test (i.e. both set are of the same distribution) the maximum value of the site-related data set is compared with the UTL of the background data set to identify the presence of "hot spots". If the maximum values exceeds the UTL after "passing" the t-test, the constituent is included as a constituent of potential concern. As agreed in the July 13, 1993 meeting, DOE will replace the UTL test with a comparison against the 95 quantile of the background data set.

Action: Revise the selection of C of Cs as stated above.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2 Pg. #: D-2-9 Line #: 21 Code:
Original Comment #6

Comment: The value to be used for "nondetects" is 1/2 the sample quantitation limit, <u>not</u> 1/2 the detection limit. We have discussed this issue for nearly two years; make the change in the text and in the calculations.

Response: The text is revised to reflect the fact that one half of the sample quantitation limit was in fact used.

Action: Search Section D.2.0 (including all associated tables) and replace all uses of the phrase "detection limit" with the phrase "sample quantitation limit".

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2 Pg. #: D-2-10 Line #: 5-11 Code:
Original Comment #7

Comment: The use of the Upper Tolerance Limit (UTL) test, as described here to choose Chemicals of Concern, has been a point of discussion since the preparation of the site Work Plan. We continue to request the use of traditional statistical methods which provide predictable outputs in this step of the risk assessment. This is consistent with the preparation of all risk assessments reviewed in this Region. Furthermore, the discussion in this section does not indicate how the UTL is being used. A recent teleconference, which included DOE and EPA statisticians, failed to resolve this issue. Thus, this method is still under discussion and has not been approved for use in this or any other OU risk assessment, although it appears to not have created any bias in this instance.

Response: DOE agrees that the text is confusing in its discussion of the selection of C of Cs. DOE feels it is complying with the special direction of Region V in this matter. Based on the discussion of July 13, 1993, and the new direction given to use the 95 quantile (as opposed to Paul White's suggested use of the UTL for "hot spot" identification), DOE again feels it has complied but poorly described this in the text.

Action: Revise the text in Section D.2.2.3 to avoid discussion of selection of C of Cs and provide a clear logic diagram for reference in Section D.2.3.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Fig. #: D.3-1 Line #: NA Code:
Original Comment #8

Comment: We had discussed the release of radon from the silos and the deposition of radon daughters on soil, both from burping and if the silos fail. The potential receptors are off-site farmers, nearby residents, trespassers, grounds workers and future residents and the significant exposure pathways include incidental ingestion, dermal absorption and direct radiation. This pathway is now listed as minor and dismissed in the risk assessment, without even a discussion. This approach is not satisfactory.

Response: See discussion of U.S. EPA Technical Comments - General Comment #11. DOE agrees that the discussion of the rationale for not assessing radon daughter deposition to soil following air transport is inadequate.

Action: Revise the discussion of the conceptual model to provide justification for not assessing all pathways dismissed as minor. For the subject pathway (soil deposition of radon daughters) the rationale lies in the conservative assumption used in assessing inhalation risk. As noted in the response to EPA General Comment #11, the ingrowth of radon daughter products at locations near the silos and even the FEMP is small. However, an extremely conservative approach was adopted by assuming equilibrium

daughter product concentrations. Since the inhalation of daughters results in a greater potential health impact than ingestion (compare slope factors for inhalation vs. ingestion) this is a conservative exposure route for the daughters.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-15 Line #: 29-30 Code:
Original Comment #9

Comment: I do not understand how the trespassing child could have assess to the silo area if access controls are in place. I think this scenario needs reevaluating. the trespass scenario should be site-specific and make sense. The trespassing child could still have access to contaminants carried to Paddys Run or deposited in more accessible areas.

Response: The trespassing child scenario is included in the risk assessment at the request of EPA review comments on the SWCR, which specified the standard exposure time and exposure frequency parameter values to use. This receptor is a logical receptor for current land use with access controls because in the absence of access controls the child would not be committing trespass.

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-25 Line #: footnote a Code:
Original Comment #10

Comment: The "geometric upper 95% CI on the mean" should be replaced by the "upper 95% CI on the arithmetic mean of the log-transformed data." Also I did not see any mention of "hot spot" analysis in the calculation of the exposure point concentration values in this table. Was the data examined for hot spots? The histograms, while only a visual examination, should at least indicate if hot spots are present.

Response: The footnote will be revised. The data were evaluated for "hot spot" contamination, this is one of the benefits of including the UTL test in the statistical procedure because it involves comparing each sample detection to the background UTL. The UTL test is not used to eliminate COC's; however, it sometimes results in inclusion of a COC that was not selected as a COC by the more traditional statistical procedures.

Action: Revise footnote "a" in Table D.3-4 (and any similar footnote in all tables in Sections D.2.0 and D.3.0) to replace the phrase "geometric upper 95% CI on the mean" with the phrase "upper 95% CI on the arithmetic mean".

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-23 Line #: 28-29 Code:
Original Comment #11

Comment: I did not understand this comment. Why do the values in Tables D.2-4 and D.3-5 differ?

Response: Major changes in statistical methodology for data analysis will result in changes in COPCs selected and source term concentrations.

Action: When these changes are complete all D.2, D.3, D.4 and D.5 tables will be made consistent. A consistent set of data qualifiers will be used throughout all calculations.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-39 Table #: D.3-11 Code:
Original Comment #12

Comment: I do not see where the SA parameter values for the Dermal Contact with Soil/Sediments pathway came from. These are not the recommended RME values from Table 8-6 of the referenced document.
The parameter values for ET and EF given for the Incidental Ingestion and Dermal Contact with Surface Water pathways are not the RME values from Table 8-6 of the referenced document, nor are they consistent with the values in the other pathway. The difference warrants discussion.
Check footnote 1; the referenced document does not have a Table 10-1. The Table of recommended values is Table 8-6.
Where are the CT parameter values for these receptor populations?

Response: The SA value for Dermal Contact with Soil/Sediment for the adult receptor came from Table 8-6 as requested. As written, this comment implies that the upper value should have been chosen instead of the central value. Choosing the upper value, however, is inconsistent with guidance in OSWER directive 9285.6-03, which specifies that, for RME evaluation, upper values should be chosen for IR, EF and ET, but that average values should be chosen for BW. The agency is presently evaluating methods for calculating RME using other parameters (e.g., which other parameters should be based on upper-bound or mid-range values). The RAGs Part A suggest using 50th percentile values, instead of 95th percentile, for SA since BW and SA are well correlated. The SA value for the child receptor came from Table 8.3. ET and EF for exposure to surface water during swim and play differ from ET and EF for other pathways (inhalation, ingestion, dermal contact with soil, external radiation) because the trespassing child would not be playing in water all the time he is on the site. Values for ET and EF were attributed to the 1992 Dermal Guidance, which states that 0.5 hours/day and 5 days/year are appropriate central values. Upper values, 1 hour/day and 150 days/year, are considered reasonable for those who swim regularly for exercise or to train for competition. Although, as stated above, RME evaluations usually include upper values for EF and ET, it seems unreasonable to believe that 7-18 year-olds exercising or training for competition would chose to do so in the surface water in OU4. Table 10-1, Default Values for Water-Contact Exposure Parameters, is on page 10-3 of the referenced document. The title for Chapter 10, Stepwise Dermal Exposure Assessment Process, suggests that the document authors intend that the default values contained therein are appropriate for dermal exposure assessment. By agreement arrived at during previous discussions with EPA Region V, a CT evaluation was performed for only one receptor, the on-property farmer resident under the future land-use scenario; parameters for this receptor are presented in Table D.3-12.

Action: The reference footnotes in this table were simplified to indicate the document, but not section, page, or table number, from which the parameters were obtained. The SA

values for Dermal Contact with Soil/Sediment were not changed. A footnote was added to the ET and EF values for Incidental Ingestion and Dermal Contact with Surface Water pathways, stating, "Differs from these parameters for other exposure pathways because the receptor is not expected to play in water all the time he is on site." The EF and ET values were not changed. As noted above, the footnotes in this table were simplified. No other actions required.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-43 Table #: D.3-12 Code:
Original Comment #13

Comment: Why are CT parameter values given for only one receptor population? To what is the CT scenario given here to be compared? There is no RME on-property resident. The On-site Farmer scenario indicates exposure from age 0-70. It would be more appropriate to include a RME On-site resident exposure, with 6 years as a child, 14 years as an adult and a 50 years farming exposure. We discussed within the past. Explain the rationale for the ET parameter values for the Inhalation of Dusts, etc. pathway in footnote d. Also explain the ET values for other exposure pathway parameters where this footnote is used.
Footnote d is not correct for the RME On-site Farmer IR value under Incidental Ingestion pathway or for the Ingestion of Fruits/Vegetables, Meat or Milk pathways. See also the comments on Table D.3-11.
Footnote j is incorrect. See above. Why is reference m needed in addition to footnote j? The recommended body surface area values for the RME and CT exposures, as well as values for ET and EF, are given in Table 8-6 of the reference.

Response: By agreement arrived at during previous discussions with EPA Region V, a CT evaluation was performed for only one receptor, the on-property farmer resident under the future land-use scenario; parameters for this receptor are presented in Table D.3-12. Confusion regarding which RME-CT parameters should be compared stems from inconsistency regarding the names assigned to the receptors in various sections of the documents. The RME and CT receptors for comparison are the RME On-property Resident Farmer and the CT On-property Resident Farmer. Table D.3-12 should have the work "farmer" added to the CT on-property resident. Agreed, that the 0.48 g/day soil ingestion level for 50 years of occupational (farming) exposure should not be applied to the entire 70-year lifetime of the RME on-property resident farmer. Agreed, that more detail should be provided for data referenced to "Special guidance from U.S. EPA Region V." Footnote d, when expanded to indicate the December 3, 1992 teleconference between Mile Bollenbacher, IT and Pat VanLeeuwen, U.S. EPA Region V, was found to be the correct citation for the fruits/vegetables, meat and milk ingestion pathways, and footnote e, when expanded to indicate the February 25, 1993 teleconference between Mile Bollenbacher, IT and Pat VanLeeuwen, U.S. EPA Region V, was found to be the correct citation for the incidental ingestion of soil pathway. Agreed, that footnote j is confusing because of reference to specific sections, pages and tables of the 1992 Dermal Guidance document. When footnote j is clarified, footnote m is no longer needed.

Action: The names of the RME On-property Resident Farmer and the CT On-property Resident Farmer were made consistent throughout the document. The soil ingestion rate (g/day) for the RME on-property farmer was estimated as the reviewer suggested: 0.48 g/day for 50 years of occupational exposure, 0.2 g/day for 6 years as a child, and 0.1 g/day for the remaining 14 years. The time-weighted average, 0.38 g/day,

was used as the average soil ingestion rate. Citation of records of the teleconferences between Mike Bollenbacher, IT and Pat VanLeeuwen, U.S. EPA Region V were included in the appropriate footnotes. Footnotes d and e were expanded to include references to the specific IT-U.S. EPA Region V teleconferences during which the indicated parameter values were decided. All the exposure parameters attributed to the 1992 Dermal Guidance document were checked and found to be correct; the reference in the footnote was simplified to eliminate reference to table, section and page number. With the simplification of footnote j, footnote m is no longer needed and was removed.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: D-3-54 Line #: 2 Code:
Original Comment #14
Comment: "Decimally absorbed dose" is not the correct meaning for DAD; the correct term here is "dermally absorbed dose."

Response: Agreed.

Action: "Decimally absorbed dose" was changed to "dermally absorbed dose."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Table #: D.3-14 Line #: NA Code:
Original Comment #15
Comment: Some of the Soil Absorption Coefficients listed are incorrect and do not agree with the values presented in Dermal Exposure Assessment: Principles and Applications, EPA/600/8-91/011B. The soil absorption value for cadmium is 1.0%, not 0.1%. The reference in footnote b is outdated and has been replaced by Human Health Evaluation Manual, Supplemental Guidance: "Interim Dermal Risk Assessment Guidance" DRAFT, September 23, 1992. The values for the dermal absorption of carcinogenic PAHs are inappropriate because these compounds are dermally active and have a different endpoint when the exposure pathway is the dermal route. Addressing the dermal absorption of PAHs in this manner will not be protective, and dermal toxicity values should not be derived for these compounds.

Response: We believe that there are some inconsistencies between the values for water permeability coefficient and soil absorption coefficient and the most recent U.S. EPA guidance. We agree that the references were incorrect and/or outdated. We agree that the derivation of dermal cancer slope factors for the Group B2 PAHs by extrapolation from other routes of exposure is inappropriate.

Action: Values for water permeability coefficient will be obtained by the following priority: 1) Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance (August

18, 1992); 2) Dermal Exposure Assessment: Principles and Applications; 3) Derived from the formula for KP provided in the documents referenced above. Values for soil absorption coefficient will be obtained by the following priority: 1) Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance (August 18, 1992); 2) Derived from log K_{ow} using the McKone model. Each value in the table will be given a reference by footnote; the August 1992 version is the most recent Interim Dermal Risk Assessment Guidance available to us and will be used for this revision. The dermal water permeability coefficients and soil absorption coefficients for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene were removed from the table.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: NA Line #: NA Code:
Original Comment #16

Comment: I did not see the inhalation shower scenario described here. The methodology for exposure to volatiles released during showering described on page D-1-12 is not referenced, but appears not to follow the methods developed for EPA.

Response: Agreed that it is unclear whether the Andelman model was used to quantify inhalation of volatiles from household use of water; no equation was provided in Section D.3.3 and the exposure parameters presented in Table D.3-12 are not those specified in the equation.

Action: The exposure parameters for Inhalation of Volatiles Released from Household Water Use in Table D.3-12 were conformed to those required by the Andelman model. A discussion of the Andelman model was added to Section D.3.3. The Andelman model was used to quantify inhalation of volatiles from household use of water.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.3 Pg. #: NA Line #: NA Code:
Original Comment #17

Comment: I did not see any incorporation of risk calculations based on a TEF approach for carcinogenic PAHs. The results of both the BBAP and TEF methods can be presented in the results sections and the uncertainties in both methods discussed in the Uncertainties section.

Response: The traditional "BaP" approach for the risk characterization of the B2 PAHs, (i.e., the application of the slope factors for BaP to all B2 PAHs). The TEF approach, however, is more defensible for two important reasons: 1) It reflects the empirical observation that there are considerable differences between the carcinogenicity of the different B2 PAHs; 2) It allows expression of the site-specific prevalence of the individual PAHs. The net effect of using the TEF approach is generally a reduction in total B2 PAH-associated cancer risk, compared with the traditional approach. Naturally, the magnitude of the difference depends on the relative proportions of the various B2 PAHs at the site. As a practical matter, the TEF approach would have no effect on risk management decisions when total PAH-associated cancer risk estimated by the traditional method is $< 10^{-6}$ or $> 10^{-4}$. Results of the TEF approach may be helpful to risk managers when the traditional approach yields total PAH-associated cancer risk estimates within this range.

Action: The TEF approach will be applied and the results compared with the results of the traditional approach for those receptor-media-pathway combinations for which cancer risk estimated by the traditional approach exceeds 10^{-4}.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.4 Table #: D.4-1 Line #: NA Code:
Original Comment #18

Comment: RfC values should be used for the inhalation route of exposure when available. I am not aware of the Region II memorandum on cobalt toxicity. Please restrict toxicity information to IRIS, HEAST and other Agency documents.

Response: It is unclear if this comment means that inhalation RfC values should be used instead of inhalation RfD values, or if it means that every reasonable effort should be expended to obtain available inhalation values. In response to the first case, inhalation RfC values, expressed in units of mg/m^3, are not compatible with the intake quantification equations in RAGS; these values must be converted into units of dose, RfD (mg/kg-day). Every effort was made to locate Agency-sanctioned inhalation toxicity values.

Action: An explanation of why and how an inhalation RfC is converted into an inhalation RfD, and the assumptions applied in this conversion, was added to Section D.4.1.1.

A similar appropriate discussion for conversion of an inhalation cancer unit risk to an inhalation cancer "slope factor" was added to Section D.4.1.2.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.4 Table #: D.4-4 Line #: NA Code:
Original Comment #19

Comment: I have commented previously on DOEs generation of oral absorption factors. EPA Superfund does not ask each contractor to develop their own set of values, but instead employs a contractor through the Environmental Criteria and Assessment Office (ECAO), Cincinnati, to perform literature searches and develop oral and dermal absorption values. The use of ECAO values give some consistency between risk assessments. The values in Table D.4-4 are not consistent with ECAO values. For example, ECAO determined a value of 100% absorption for barium based on data from Lisk et al., 1988, showing > 91% absorption from drinking water and food. The value listed here for barium is 5%, and RAGS is referenced. RAGS does not give oral or dermal absorption for specific chemicals.

Response: On 7/19/93 we received from EPA Region V a list of dermal and oral absorption efficiency values for seven inorganic and 13 organic chemicals. However, the values appear to have been derived for a specific site in Illinois, and no documentation was provided for their derivation. Although all the GAFs in Table D.4-4 are not precisely consistent with ECAO values, they are soundly derived and defensible. Reviewers have taken issue with two GAF values in Table D.4-4. The first, the GAF for antimony, is discussed in response to EPA comment # 65. The second, the GAF for barium, is discussed here. ECAO reviewed the pharmacokinetics data for GI absorption of various forms of barium by animals and humans. A single dose study in humans reported that the GI absorption of barium from Brazil nuts exceeded 90% (Lisk et al., 1988, Nutrition Reports International, 38: 183-191). Animal studies reviewed by ECAO showed that absorption of barium salts from drinking water followed the order of chloride > sulfate > carbonate. A study not reviewed by ECAO showed that the bio-availability of orally administered barium chloride was equivalent to that of barium chloride in Brazil nuts to young rats (Lisk et al., Nutrition Reports International, 38: 259-262). Other animal studies reviewed by ECAO yielded GI absorption efficiencies of ≈ 10% and 85%. The higher value was obtained with younger animals. Age appears to be a very critical factor in determining the efficiency of GI absorption of barium. Another literature review reported GI absorption efficiencies of barium from barium chloride in hamsters ranging from 11 to 32% (Friberg et al., 1986, Handbook on the Toxicology of Metals, Volume II). Of particular interest in this review is the observation that addition of sodium alginate to the diet of rats greatly enhanced barium absorption. Sodium alginate probably formed organic complexes with barium that facilitated GI absorption. Generally, chemical form is more important than animal species in evaluating pharmacokinetics. This is particularly true if the species compared are

both mammals (with the exception of comparing monogastric animals and ruminants), and if the chemical in question is an inorganic element (such as barium) that is not subject to species differences in biotransformation. The ATSDR profile on barium reported GI absorption values in humans of ≈ 5% and in adult animals of ≈ 7%. The human value of 5% was based on a paper by Tipton et al., 1969 (Health Physics 16: 455-462), which identified 5% absorption from the GI tract as a maximum figure for net retention of dietary barium in natural foodstuffs, evaluated over a 50-week period. ATSDR noted that the barium GAF for young animals is about 10-fold greater than that for adults. This is consistent with the ECAO review. The best study of barium absorption is the paper by Tipton et al., because the study evaluated net retention of barium chloride in adult humans over a 50-week period. The human study by Lisk et al. was based on a single dose with a form of barium probably quite different from that used in the study from which the RfD was derived. For these reasons, the GAF for barium of 5% (0.05) from the Tipton et al. study is derived and defensible value.

Action: None taken. See response to comment #65 for antimony discussion.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.5 Pg. #: D.5-2 section: D.5.2.1 Code:
Original Comment #20
Comment: This discussion is misleading. Actually EPA specifies the use of the linearized multistage model at low risk levels; when chemical intakes are high and risk levels exceed 0.01, the one-hit model is used instead.

Response: The text is revised to clarify the fact that the EPA specifies the one-hit model instead of the slope factor model when the carcinogenic risk using the slope factor exceeds 0.01.

Action: Revise line 30 on page D-5-2 to read: "When carcinogenic risk exceeds 1×10^{-2} using the slope factor methodology U.S. EPA (1989) specifies the one-hit equation:".

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.5 Pg. #: D.5-3 Line #: NA Code:
Original Comment #21
Comment: ICLR is used in the text without a definition.
Response: Agreed.
Action: On page D-5-3 line 7 place "ILCR" in parentheses and precede it with the phrase: "incremental lifetime cancer risk".

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.5 Pg. #: NA Line #: NA Code:
Original Comment #22

Comment: Summary ICLR and HQ tables have been prepared so that they address one medium at a time. It is not possible to determine how much each exposure pathway contributes to the adverse health effects from exposure to that medium. Media risks are segregated so that it is impossible to determine the total risks from carcinogens or noncarcinogens from exposure to multiple pathways for more than one media. What if the receptor population is exposed to several media? The tables as presented do not adequately summarize the risk to each receptor or provide information needed by the risk manager. All carcinogenic PAHs can be grouped to simplify the tabulation as the same toxicity values are used for each in this calculation.

Response: a) The risk contributed to a receptor from an individual pathway can be obtained by looking in Attachment D.II of the 4/19/93 draft OU4RI Appendix D. b) The reviewer is correct in noting that risks to a receptor from exposure to multiple media simultaneously are not presented in separate tables. These summary tables can be added to present risks to each receptor from simultaneous exposure to multiple media.

Action: Revise the format of risk results tabulated in Section D.5.0 to present risk results for individual exposure pathways and add tables that present for each receptor the cumulative risk from simultaneous exposure to multiple media.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.5.3.2.1 Pg. #: NA Line #: NA Code:
Original Comment #23

Comment: The CT scenario specified the on-site resident farmer, while the parameter table gives exposure values for an On-site resident. There is a disjoint here. The CT scenario does not explain that this calculation is an attempt to calculate the average exposure, but that 50% of the population can be expected to have a risk level greater than the CT risk level.

Response: We agree that there is a disjoint, created by inconsistent use of terminology to describe the CT and RME receptors. An appropriate statement regarding the CT-RME comparison should be included in the exposure assessment and the risk characterization sections.

Action: The receptors in question shall be named the "CT on-property resident farmer" and the "RME on-property resident farmer," respectively. The following was added to Section D.3.1.4.3 (page D-3-14, line 31) regarding the CT receptor: "Although the intent is to estimate an average exposure scenario, use of one or more upper-bound exposure parameters, uncertainty about the degree to which the CT parameters approximate average conditions, and use of the UCL on the mean for source-term

concentrations, compound to result in an exposure estimate somewhat greater than average." The following was added to Section D.4.1.1 (page D-4-1, line 19): "Noncancer toxicity values (RfDs) usually contain an uncertainty factor of 10 to provide protection for the most sensitive members of the human population. This results in a conservative estimate of a safe dose for the average member of the population." The following was added to Section D.4.1.2 (page D-4-1, line 27): "Cancer slope factors are usually the upper 95th percentile of the linearized function of the dose-response curve. If developed from animal data, which is the usual case, conservative methods for estimating an equivalent human dose compound the total conservatism of the cancer slope factor." The following was added to Section D.5.3.2.1 (page D-5-42, line 3): "The purpose of the CT evaluation is to provide a more nearly average risk estimate for the on-property resident farmer than that provided by the RME evaluation.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.6 Table #: NA Line #: NA Code:
Original Comment #24

Comment: I did not see any discussion of the uncertainties in the PAH calculations (lots here: methodology, dermal endpoints differ, etc.

Response: Agreed to discuss uncertainty regarding both the traditional and the TEF approach to risk assessment of the PAHs.

Action: The following was added to Section D.6.3, page D-6-7, line 4: "As a class of compounds, the PAHs present considerable uncertainty regarding cancer assessment. Benzo(a)pyrene has been studied extensively, and sufficient route-specific data are available to estimate oral and inhalation slope factors. Because route-specific data sufficient for slope factor derivation are not available for the other B2 PAHs, traditionally the slope factors for benzo(a)pyrene have been used. This assumes equal potency of the B2 PAHs, which is inconsistent with empirical data and introduces great uncertainty into the cancer assessment. The TEF approach (see Section D.4.2.17) attempts to fill this data gap by estimating slope factors for the other B2 PAHs based on potency relative to benzo(a)pyrene in short-term tests, or in other tests that are insufficient for slope factor derivation. Although there is uncertainty in extrapolating relative potencies across tests and species, the TEF approach to cancer risk assessment is reasonable and defensible for the following reasons: 1) The B2 PAHs appear to have the same mechanisms of action, independent of species or tissue (i.e., they are contact carcinogens); 2) The same cancer tests with the same endpoints were used to generate the TEFs for all of the B2 PAHs; and 3) The major advantages of the TEF approach include: The relative toxicity of each of the B2 PAHs is expressed in the risk assessment, and the relative proportions of individual B2 PAHs at the site is reflected in the risk assessment.

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Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.7 Table #: D.7-1 Line #: NA Code:
Original Comment #25
Comment: This table would be more useful if carcinogenic and noncarcinogenic risks were separated. Within the carcinogenic risk tabulation, radiological and chemical risks could be separated.

Response: The carcinogenic and noncarcinogenic results ARE presented separately in Tables D.7-1 and D.7-2. Within the carcinogenic risk tabulation the radiological and chemical risks ARE presented separately.

Action: No text change is required.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.1 Table #: Line #: NA Code:
Original Comment #26
Comment: We have discussed a number of changes to the Work Plan Methodology during the review of the SWCR. I do not see these changes noted here.

Response: The carcinogenic and noncarcinogenic results ARE presented separately in Tables D.7-1 and D.7-2. Within the carcinogenic risk tabulation the radiological and chemical risks ARE presented separately.

Action: No text change is required.

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OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT TECHNICAL COMMENTS

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #1

Comment: During the April 1993 Operable Unit 4 (OU4) site meeting, the U.S. Department of Energy (DOE) indicated that the environmental media associated with the K-65 Drum Staging Area would be investigated as part of the OU4 remedial investigation (RI). The OU4 RI report gives no indication that this area has been investigated as a potential source of OU4 contamination. The report should identify this issue as a remaining data gap or explain why surface and subsurface media have been screened from investigation.

Response: The K-65 Drum Handling Area lies partly within Operable Unit 4. The area external to Operable Unit 4 has been previously investigated to a limited degree as part of the Waste Pit Area Stormwater Runoff Removal Action. DOE, as stated previously, does intend to remediate the entire area to the same remedial action levels and contemplates this action as part of Operable Unit 4. As DOE has stated in past meetings, while an in situ remedial action alternative has been forwarded to the detailed analysis of alternatives phase of the selection process as required by NCP, DOE does not feel any in situ alternative for Silos 1, 2 and 3 is viable. Since the removal of the contents of these three silos is anticipated, any characterization of this and other surface soils in the area would be of little use following the significant activities required for contents removal. DOE does anticipate the complete characterization of this area at the appropriate state of the remedial action. While limited characterization for surface/soil and subsurface is available for this area, sufficient data is available to support determination of cost within the range specified by guidance. Further, sufficient data is available to demonstrate that, as a source term, the risk to the RME from soils of this area are overshadowed by the silo contents.

As indicated on Figure 4-6, surface soil samples were collected from the area of the former K-65 Drum Staging Area as part of the CIS. The collected samples were submitted to the on-site laboratory for screening level gamma spec. analysis. The Ra-226 activity concentrations in these samples ranged from 4.5 to 22.5 pCi/g for the o-6 inch depth increment. It should be noted that samples for on-site gamma spec. analysis were not subject to any sample preparation techniques, including drying. Thus, the analytical results on Table 4-23 should be reviewed from the perspective that the dry weight activity concentration would be approximately double the wet weight concentration.

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Action: The former K-65 Drum Staging Area will be shaded in Figure 4-6. The following text will be added to Section 4.2.1.1 under Radiological Constituents, "As indicated in Figure 4-6, a number of surface soil samples were collected from the former K-65 Drum Staging Area. While soils exhibiting elevated Radium concentrations were previously excavated from this area at the time the drum staging activity ceased, there remains the potential that residual activity concentrations of uranium and its daughters remain in the soils in this area. As can be seen from the figure and Table 4-22, the Ra-226 activity concentrations in the soils in this area, as determined on a wet weight basis by the on-site gamma spec. screening level analysis, ranged from 4.5 to 22.5 pCi/g. Radiological walkover surveys performed in this area under the CIS are considered inconclusive due to the interferences created by the elevated direct radiation field associated with the K-65 residues."

Add specific acknowledgment on Table 7-2 under Surface and Subsurface Soils of the limits of the available data set for the former K-65 Drum Staging Area.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #2

Comment: The area where the K-65 Drum Handling Building and associated storage tanks were located do not appear to have been investigated as potential source areas. A review of surface soil, subsurface soil, and groundwater sampling locations indicates that this area has not been sampled. DOE should identify this issue as a potential data gap or explain why this area has been screened from investigation.

Response: All facilities, with the exception of a concrete lined sump connected to the pipe trench, associated with the Drum Handling Building were located above grade on a concrete pad. As previously stated in the report, these facilities were demolished to support the installation of the second (extended) berm around Silos 1 and 2. While interviews with long-term employees did not reveal any known significant releases from the facility, DOE acknowledges that residual contamination could exist in the soils surrounding the pad which supported the former building. As discussed in the response to General Comment #1, DOE does not consider the remaining in-situ alternatives for Silos 1, 2, or 3 to be technically viable. Associated with any remedial alternative involving waste removal, is a commitment on the part of the DOE to excavated soils in the Operable Unit 4 area to the extent necessary to attain final remedial goals. Additionally, sampling will be performed in this area, and throughout the Operable Unit 4 area to support these excavations and to ensure final cleanup goals have been attained. DOE proposes to wait until the implementation of remedial actions to collect more data in this area. This analysis is discussed in Table 7-2 entitled "Data Limitation and Recommended Actions."

Action: Add following statement to Section 4.2.1.1 under Radiological Constituents:

"No specific samples were collected from areas adjacent to or under the existing concrete pad for the former drum handling building and the concrete pipe trench. While interviews with long-term employees did not reveal any known significant releases from the operation of these facilities, there is a potential that residual contamination could exist in the soils surrounding these facilities. Residual contamination in these areas is expected to be localized in discrete "hot spots" adjacent to the facilities or directly under cracks or seams in the concrete."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #3

Comment: Page 1-34, Lines 1 to 2 indicates that decant liquids were removed from Silo 3; however, all previous and subsequent discussions of Silo 3 processes and associated waste suggest that Silo 3 wastes were pneumatically emplaced and that no liquids were or are present in the silos. The presence of liquid waste in Silo 3 has great significance since remedial investigation/feasibility study (RI/FS) investigations have proceeded under the assumption that liquids were not present in Silo 3. Subsurface borings adjacent to or below the silo were not performed and Page 1-38, Lines 20 to 21 indicates that the base slabs of Silo 3 are cracked and deteriorated. DOE should thoroughly address whether the lack of Silo 3 subsurface sampling of soils and perched groundwater represents a data gap.

Response: The text in the RI Report on Page 1-34, Line 1, is incorrect. No decant liquid has been removed from Silo 3. Silo 3 has only received calcined or kiln dried cold metal oxides as indicated in Section 1.2.2.3.

Action: Delete "and decant liquid" from Line 1 of Page 1-34.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2 Pg. #: NA Line #: NA Code:
Original General Comment #4

Comment: Section 2 provides an overview of the various OU4 investigations and corresponding data and data uses. While most of the data used to support the RI appear to have been generated during the various RI investigations, much of the data were generated during removal actions (RA) and characterization investigation study (CIS)/environmental survey (ES) studies. DOE should more clearly present the data limitations and OU4 RI use of the RA/CIS/ES data, particularly with regard to the CIS/ES radiological data.

Response: The data collected as part of site removal actions were collected using protocols and quality assurance program as specified in the FEMP RI/FS QAPjP. For this reason, data from these sources are of equal quality as those sets collected under the FEMP

RI/FS Work Plan and are used within this context in the FEMP Operable Unit 4 RI Report.

Data sets from the CIS and the FEMP environmental monitoring program were not used to support determination of the "source term" within the risk assessment, although DOE feels these data were collected with a high degree of quality. These data are used to provide input parameters other than source term into fate and transport (e.g., wind speed and direction) and to support determination of the extent of contamination resulting from Operable Unit 4 sources. The only exception is in the case of silo headspace radon concentrations where the only available data is collected as part of the FEMP Environmental Monitoring Program.

Action: Insert the following paragraph following line 28 on page 2-2: As noted in Table 2-1, three major sources of data are relied upon for characterization of Operable Unit 4 in addition of the data set collected under the FEMP RI/FS Work Plan as amended. These sources are CERCLA removal actions, the CIS, and the FEMP Environmental Monitoring Program.

Data collected as part of CERCLA removal actions at FEMP were collected using the procedures and protocols within the entire quality program of the FEMP RI/FS QAPjP. These data were collected at ASL IV and V for chemical constituents and radiological constituents, respectively. These data are therefore used as any data collected under the FEMP RI/FS Work Plan as amended.

Data collected as part of the CIS and the FEMP environmental monitoring program are used as input parameters to fate and transport modeling and to determine the areal extent of contaminant movement from Operable Unit 4 sources. In general, these data are not used in the quantification of the "source term concentration" used in the baseline risk assessment with the exception of headspace radon concentration. Silo's 1 and 2 breathing rate estimates were calculated using headspace radon data collected as part of the FEMP Environmental Monitoring Program.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2 Pg. #: NA Line #: NA Code:
Original General Comment #5
Comment: The discussion in Section 2 of the various studies used to support the OU4 RI should clearly indicate which data were collected, analyzed, and validated under the approved Quality Assurance Project Plan (QAPjP). For instance, Page 2-27, Lines 9 to 10 states that the samples submitted for Hazardous Substance List (HSL) organic and inorganic analyses were analyzed in a manner consistent with U.S. EPA Contract Laboratory Program (CLP) procedures. The extent to which this data is usable in the context of the RI is unclear.

Response: See Response to Specific Comment #4 above.

Action: See Action associated with Specific Comment #4 above.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2 Pg. #: NA Line #: NA Code:
Original General Comment #6
Comment: Many of the figures in Section 2 do not indicate the sampling dates or the studies under which the sampling was performed. The figures should be revised to include this information.

Response: Agreed. Sampling dates are embodied in text of discussion on individual sampling program. Select figures will be revised to be more specific as to study being presented.

Action: The titles of Figure 2-9 and will be revised to clearly indicate the associated sampling program.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2 Pg. #: NA Line #: NA Code:
Original General Comment #7
Comment: Metals (including radionuclides) are the primary contaminants of concern at the Fernald Environmental Management Project (FEMP). The discussions of the various groundwater sampling activities conducted to support the RI (Section 2) should clearly indicate, for each study (and sample if applicable), whether groundwater samples were filtered or unfiltered prior to analysis. This information should also be provided in the data tables presented in Section 4.

Response: All water samples collected for metals analysis under the RI and environmental monitoring programs and used in the OU4 RI were filtered. All samples collected for radiological analysis were un-filtered.

Action: Footnotes will be added to tables in Section 4 indicating filtered or un-filtered samples.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3 Pg. #: NA Line #: NA Code:
Original General Comment #8
Comment: DOE should indicate whether the recently acquired data regarding the geology and hydrogeology of the glacial overburden, particularly with regard to the

lacustrine/deltaic sand body underlying much of OU4, have been presented in the OU4 RI report.

Response: The Geology and Hydrogeology presented in Section 3 is the "revised geological interpretation" developed at the FEMP in late 1992 and early 1993. The geological interpretation was first presented to the US and Ohio EPAs at a Technical Information Exchange (TIE) on January 27, 1993. The geological interpretation has not been revised since the TIE. Operable Unit 5 is currently conducting several field investigations, primarily to measure surface seeps of groundwater, install additional borings and monitoring wells, and to collect additional hydrogeologic data from the glacial overburden. The new Operable Unit 5 data is not yet available. It is not anticipated that the new Operable Unit 5 data will change the fundamentals of the "revised geological interpretation." The RI report is being edited in several places to state that "Operable Unit 5 is collecting new data, but the data are not yet available." See the comment responses for Ohio EPA Comment Numbers 15, 16 and 18.

Action: No action required. See the comment responses and actions for Ohio EPA comment numbers 15, 16 and 18.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 9 Pg. #: NA Line #: NA Code:
Original General Comment #9
Comment: The discussion of the OU4 geology and hydrogeology in Section 3.5.4 does not include calculations for the vertical and horizontal groundwater flow velocities in the perched groundwater or the Great Miami Aquifer (GMA). These calculations should be included in the OU4 RI report.

Response: A discussion of groundwater flow velocities would be a useful addition to the discussion of Hydrogeology in Section 3.5.4. The information can be easily calculated from hydraulic conductivity values and observed groundwater gradients; however, it is inappropriate to include the actual calculations in the text of Section 3.

Action: Section 3.5.4 will be modified in the following ways: 1) Groundwater flow velocities for the 2000-series level will be printed next to each flow arrow in Figure 3-20 (Figure title: generalized groundwater flow in the buried valley aquifer). Groundwater flow velocities will be calculated from hydraulic conductivities presented in the Fate and Transport Model (Appendix E) and the hydraulic gradients such as are shown on Figure 3-19 (Figure title: groundwater elevations 2000-series wells; December, 1989). 2) Groundwater flow velocities for perched groundwater in the large sand body beneath Operable Unit 4 will be shown on Figure 3-26 (Figure title: Groundwater table contours for OU 4 and surrounding area). Groundwater flow velocities will be calculated from hydraulic conductivities presented in the Fate and Transport Model (Appendix E) and the hydraulic gradients shown on Figure 3-26. 3)

The text in Section 3.5.4 will be edited to include a discussion of groundwater flow velocities illustrated on the maps.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Pg. #: NA Line #: NA Code:
Original General Comment #10
Comment: EPA did not perform a rigorous review of the fate and transport modeling in Appendix E because the future land use and current source term scenario resulted in risks greater than the target risk range and a hazard index greater than 1. In addition, using the future land use scenario and incorporating the modeling results to create a future source scenario greatly increases the risk, while the hazard index remains above 1. Therefore, the model does not need to be further refined to support the estimation of future risk.

Response: Comment noted.

Action: No action required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.11 Pg. #: NA Line #: NA Code:
Original General Comment #11
Comment: The discussion of radiological surface soil contamination does not include lead-210 and polonium-210, which were apparently not analyzed for. These radionuclides are considered indicator parameters for OU4 because they are daughters of radon. Due to the large volumes of radon emissions from the silos in the past, these contaminants are expected to be widespread in surface soils. Furthermore, DOE's conclusions regarding radionuclide surface soil contamination are vague, suggesting that the minor contamination currently characterized may be from waste sources outside OU4 (Page 4-51). The lead-210 and polonium-210 data would "fingerprint" much of the OU4 related surface soil contamination. This is a major omission and should be identified as a data gap.

Response: In surface soils, Pb-210 and Po-210 are expected to be present as a result of two release mechanisms, operational spills and through plate-out from radon-222 releases from the silos. This second release mechanism is a far smaller contributor and the only surface soil measurement where Pb-210 and Po-210 would serve as a fingerprint. Since releases of Rn-222 are well documented, the presence of Pb-210 and Po-210 are not necessary to "print" Operable Unit 4 as a contributor via this release mechanism.

Anticipated risk from the airborne release of radon is almost exclusively due to inhalation of radon daughters as opposed to the plating of radon daughters on to the soil surface with later uptake through the plant to man pathway. This is especially true for points very near a radon source. Elemental radon-222 is released as an inert gas from the silos. At the time of release, no radon daughter products are present but in growth starts based on the radon-222 half-life of 3.82 days. Even with very light wind speed, little in growth of daughters occur within the Operable Unit 4 area or within the plant boundary. If the radon were somehow contained within the operable unit boundary, it would still require approximately one month to achieve secular equilibrium with the decay products. In U.S. EPA's "Technical Support for Amending Standards for Management of Uranium Byproduct Materials" (EPA 402-D-93-001, May 1993), an equilibrium fraction of 0.013 is estimated for a 80 hectare tailings impoundment at 150 in downwind assuming a 3.5 m/s wind speed. During decay the transformed nucleus recoils with energy sufficient to strip away the outer elections leaving a positively charged ion. This ion with time attaches to suspended dust particles. These duct particles tend to remain suspended for a given wind speed allow travel to even greater distances from the silos before deposition. This is especially true due to the high release point relative to the surrounding topography for the K-65 silos. Any decay products which may be attached to dust and settle within the operable unit area may in turn be re-suspended or transported by surface runoff into Paddys Run and the Great Miami River. Here too the expected concentration within water is estimated to be small when averaged over a 70 year life span. For the above reasons, Pb-210 and Po-210 are not particularly useful as a "fingerprint" of Operable Unit 4 nor significant as a source of risk compared to the inhalation pathway.

Action: A discussion will be included in Chapter 1, based on the discussion above, to address the lack of surface soil data for Pb-210 and Po-210.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 7.6 Pg. #: 7-26 Line #: NA Code:
Original General Comment #12
Comment: According to the last technical meeting on OU4, non-removal actions were not going to be considered in the FS. This paragraph indicates non-removal actions are being considered making data gaps and deficiencies of much greater concern. This should be addressed.

Response: Consistent with the discussion presented in Chapter 1 of the RI and the approved ISA Report for Operable Unit 4, non-removal alternatives are being considered in the FS for the residues within Silos 1, 2, and 3. While these alternatives are not precluded at this time, current evaluations being performed under the FS show these alternatives not to be viable.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 7 Pg. #: NA Line #: NA Code:
Original General Comment #13
Comment: Section 7 should contain a table listing preliminary remediation goals (PRG) for the chemicals of potential concern (CPC). The levels of contamination in each medium should then be compared to the PRGs. It is not clear whether action is needed for all media, including surface soil, subsurface soil, perched groundwater, silos and contents, decant sump tank or radon treatment system units. This section could be greatly improved with the addition of specific remedial action objectives (RAO) per RI/FS guidance for each medium, CPC, and PRG. The RAOs are too general to be useful.

Response: Agree.

Action: A table summarizing the PRGs and specific RAOs will be incorporated into Section 7.

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OPERABLE UNIT 4 REMEDIAL INVESTIGATION REPORT
TECHNICAL COMMENTS

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section: Executive Summary Pg. #: ES-2 Line #: 3-4 Code:
Original Specific Comment #1
Comment: This section describes the environmental media associated with the OU4 RI. Groundwater in the GMA is not included and should be added to the discussions.

Response: Groundwater in the GMA is not addressed in Lines 3 and 4 on Page E.5-2 because no actions being considered for Operable Unit 4 could reasonably be expected to encounter this media. As EPA is aware, existing contamination in the GMA is being addressed in Operable Unit 5 RI/FS reports. The integration between Operable Unit 4 and Operable Unit 5 is discussed in Section 1.5.2.

The Executive Summary is intended to provide a broad summary of the results of the RI and does not necessarily identify all FEMP facilities or environmental media not within the scope of Operable Unit 4. A brief statement will be added to the Executive Summary specifically identifying that the GMA is not within the scope of Operable Unit 4.

Action: Add the following on Line 4 of E.5-2:
"(Groundwater within the Great Miami Aquifer underlying the silo area is not within the scope of Operable Unit 4. Groundwater in the Great Miami Aquifer is within the scope of Operable Unit 5.)

Commenting Organization: U.S. EPA Commentor: Saric
Section: Executive Summary Pg. #: ES-5 Line #: 24-25 Code:
Original Specific Comment #2
Comment: The text states that elevated contaminant concentrations in subsurface soils were "conspicuous by their absence at depths of more than a few feet below the silos." This is misleading since only one soil sample was collected below Silo 1 and none were collected below Silos 2 and 3. This conclusion lacks supporting data and should be removed from the text.

Response: Agreed. Statement will be removed from text.

Action: Delete "Elevated concentrations were conspicuous by their absence at depths of more than a few feet below the silos."

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Commenting Organization: U.S. EPA Commentor: Saric
Section: Executive Summary Pg. #: ES-6 Line #: 1-3 Code:
Original Specific Comment #3
Comment: The text summarizes surface water and sediment contamination in the vicinity of OU4; however, potential sources of this contamination are not discussed. This information should be presented in the Executive Summary.

Response: Agreed. Discussion potential sources of this contamination will be presented in the Executive Summary.

Action: Add the following statement to E.5-6, Line 3:
"The most probable source of the contamination in Paddy Run and the drainage swales is the resuspension of contaminated particles from surface soils within the Operable Unit 4 and 1 areas into stormwater."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 1.2.1.3 Pg. #: 1-19 Line #: 11-15 Code:
Original Specific Comment #4
Comment: This section discusses the concrete trench that contained the piping used to transfer waste to Silos 1, 2, and 3 from the FEMP refinery. The integrity of this trench is not discussed with regard to its potential as a source for surface or subsurface contamination. This should be addressed.

Response: Agreed.

Action: Add the following statement to Line 15 on Page 1-19.
"Interviews with long-term FEMP employees have not identified any known releases from the concrete pipe trench over the length of its operation life. While no releases are documented, it is reasonably expected that isolated areas of elevated contamination will exist adjacent to any cracks or construction joints in the concrete trench."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 1.2.2.1 Pg. #: 1-28 Line #: 10 Code:
Original Specific Comment #5
Comment: The text describes the operations of the K-65 Drum Handling Building and indicates that silo decant liquids were stored in a filtrate storage tank. The text should indicate whether this storage tank was above or below the ground. Its former (or current) location should also be indicated on the appropriate figures.

Response: The filtrate storage tank was located above grade within the Drum Handling Building. The text will be modified to address this issue.

Action: Add the following statement to Line 10 on Page 1-28:
"The filtrate storage tank was located within the Drum Handling Building on the concrete pad, forming the floor of the structure."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Pg. #: 1-30 Line #: 16-17 Code:
Original Specific Comment #6
Comment: This sentence incorrectly converts 0.5 kilogram (kg) to 4 pounds (lb). The text should be corrected to indicate that 0.5 kg is equivalent to 1.1 lb.

Response: The units are correct. The reviewer is referred to the units involved. 0.5kg/l is approximately equivalent to 4 lbs/gallon.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 1.2.2.3 Pg. #: 1-34 Line #: 1-2 Code:
Original Specific Comment #7
Comment: This sentence indicates that decant liquids have been removed from Silo 3. The procedures associated with this operation (removal, transfer, storage, and disposal) should be discussed. It is not clear whether the decant sump tank associated with Silos 1 and 2 was used for OU3 decant liquids. This omission should be addressed because the discussions regarding contamination associated with the decant sump tank and its sources are based on the assumption that only decant liquids from Silos 1 and 2 were handled by this tank.

Response: The text on Page 1-34 is incorrect. No decant liquids were removed from Silo 3.

Action: Delete "and decant liquid" from Line 1 on Page 1-34.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.5.2.1 Pg. #: 2-28 Line #: 14 Code:
Original Specific Comment #8
Comment: The RI report states that 24 systematic soil samples were collected from Paddys Run but does not provide the locations. The locations should be presented on a figure within the RI.

Response: Exact locations of the collected samples were not surveyed for the 1986 sampling program. Samples were collected along the shaded 1200 foot length of Paddys Run (represented by stationing in the final report on the 1986 study). Samples were collected at 25 foot intervals separately along the east and west sides of the creek.

These discrete samples were then composited so as to yield one sample representing 100 foot intervals (individually for the east and west sides) of the original 1200 foot length of the creek.

Action: Add the following to Line 12 of Page 2-28:
"To complete the sampling, discrete samples were collected at 25 foot intervals along both the east and west side of the creek along the 1200 foot stretch of the creek. These discrete samples were composited so as to yield one sample representing each 100 foot section of both the east and west sides of the creek. Discrete sample locations were not surveyed as part of this study."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.5.2.1 Pg. #: 2-28 Line #: 17-18 Code:
Original Specific Comment #9
Comment: The RI report refers to four samples exhibiting unusual gamma activity levels but does not provide the locations of these samples. These locations should be provided on a map.

Response: Two samples were collected from locations on Paddy's Run exhibiting elevated gamma radiation fields. The list of these samples was taken from a location 50 feet upstream of where Stormsewer Outfall Ditch meets Paddy's Run. The second of these samples was taken from a point approximately 600 feet upstream of the confluence of Paddy's Run with the Great Miami River.

Action: The location of these samples will be indicated on Figure 2-4.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.5.2.2 Pg. #: 2-30 Line #: 4 and 9 Code:
Original Specific Comment #10
Comment: The RI report refers to several sediment samples but does not provide the location of these samples. The locations should be provided on a map.

Response: See U.S. EPA *Specific* Comments #8 and #9.

Action: See U.S. EPA *Specific* Comments #8 and #9.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.5.2.3 Pg. #: 2-31 Line #: 4 Code:
Original Specific Comment #11
Comment: The sediment samples described in this section are located so far up and down gradient of the silos that they can be affected by several source areas. The RI should

acknowledge this as a data gap. Therefore, the described sediment samples are inadequate to determine if the silos are the source of surface water or sediment contamination.

Response: DOE agrees that consideration of the RI/FS sediment data above is insufficient to make this determination. However, the reviewer is requested to consider the data presented from the 1986 Radiological Survey and Analysis of Sediment Samples from Paddys Run as described in Section 2.5.2.1 and summarized in Section 4.4. In this survey sediment samples were collected at 25-foot intervals along the stream bed and composited, to form one sample per 100 feet from each side of the stream bed. This sampling produced 24 samples along the 1,200-foot stream section adjacent to slightly up stream and slightly down stream from the Operable Unit 4 Area (see Figure 2-4). DOE feels that consideration of this data in conjunction with samples collected as part of the CIS and RI/FS will lead the reviewer to the conclusion that sufficient data is available to determine any impact Operable Unit 4 sources may have on surface water and sediment in the area.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.6.4 Pg. #: 2-40 Line #: 5-7 Code:
Original Specific Comment #12

Comment: The text states that the 36- to 42-inch sample set represents the till and glaciofluvial sediments which are at the maximum depth of significant weathering. However, the text and cross sections provided in Section 3 indicate that this weathering extends to 20 feet below ground surface (bgs). This discrepancy should be addressed.

Response: In Section 3, the "depth of weathering" depicted on cross sections is the maximum depth of observed oxidation. The depth of weathering discussed in the CERCLA/RCRA Background Soil Study is soil weathering. There is a major difference between the two types of weathering. DOE regrets that similar terms were used for different processes. The "weathering" discussed for soils refers to the process of soil development. Three significant processes occur in FEMP soils, and these "weathering" processes are generally confined to the upper 36-inches of material. First, organic matter is added to the surface by processes associated with plant growth and decay. Second, bases are added to the soil. Third, bases are lost from the soil; for instance, carbonate dissolution (i.e. loss of carbonate by dissolving) is significant for the top few feet of many FEMP soils. The approximately 36-inch zone of soil development can result in significant modification of the bulk chemical composition of soil. The "weathering" discussed in the cross sections for Section 3 refers to the observed maximum depth of occurrence of brown clays in the glacial overburden. The brown clays are brown because a portion of their iron and manganese has been oxidized, imparting a red/brown hue. The amount of material

that must be oxidized to result in a red/brown hue is low, and the bulk chemical composition does not change noticeably. The maximum depth of visible oxidation probably represents infiltration of oxygenated groundwater, or perhaps a past groundwater elevation during a dry climate.

Action: The text will be reviewed to ensure that there is no chance for confusion in use of the term "weathering."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Pg. #: 2-47 Line #: 9-10 Code:
Original Specific Comment #13
Comment: The text states that the described subsurface soil sample locations are shown on Figure 2.5. Figure 2.5 shows CIS surface soil locations. This discrepancy should be addressed.

Response: The figure to be referenced is Figure 2-9 not 2-5.

Action: Text will be changed to reference Figure 2-9.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Pg. #: 2-47 Line #: 24-28 Code:
Original Specific Comment #14
Comment: The first bullet states that soil samples were submitted for "full radiological analyses" while the following bullets describe additional radionuclides analyzed for. The additional radionuclides include lead-210 and polonium-210. It is not clear why these radionuclides are not included in the "full radiological analyses" since they are considered indicator parameters for OU4. The term "full radiological analyses" should be defined.

Response: DOE agrees. The use of the phase "full radiological analysis" has historically been used to define a suite of analyses listed in the FEMP QAPjP. Later addenda to the FEMP Work Plan has added and deleted from this list. Pb-210 and Po-210 were added to target analyte lists for Operable Unit 4 in investigations targeting the silo contents and adjacent subsurface soil samples which were expected to potentially have received radon decay products assisted in transport by the gaseous state of radon.

Action: Replace line 24 on page 2-47 with the following: Isotopic uranium; Sr-90; Isotopic thorium; Tc-99; Total uranium; Am-241; Cs-137; Isotopic plutonium

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Pg. #: 2-50 Line #: 32-33 Code:

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Original Specific Comment #15

Comment: This bullet states that one objective of the OU4 groundwater investigation is to determine the rate and direction of groundwater flow in the GMA. However, it is not clear whether determining the rate and direction of groundwater flow in the perched groundwater is an objective of the OU4 RI. This issue should be clarified.

Response: Several objectives of the investigation of the groundwater system are to 1) create a conceptual picture of the hydrogeologic system, 2) provide input parameters (hydraulic conductivity, precipitation, physical boundaries, etc.) for the groundwater portion of the fate and transport model, and 3) provide a real picture that the model can be checked against and calibrated against. Though it was not specifically stated as an objective in Section 2, the groundwater discussions in Section 3 and Appendix E do present the rate and direction of groundwater flow in the glacial overburden. See also the response to US EPA Original General Comment number 9.

Action: See "Action" as noted in U.S. EPA *General* Comment #9.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.1.1 Pg. #: 3-1 Line #: 31-33 Code:
Original Specific Comment #16

Comment: These lines indicate that Silo 4 contains infiltrated rainwater. DOE should indicate whether the other three silos are suspected (or known) to have received infiltrated rainwater.

Response: The potential exists for infiltration of incident precipitation into all Operable Unit 4 silos.

Action: Add the following after line 33 of page 3-1: (NOTE: All silos are subject to some degree of rainwater infiltration via the silo dome. Silos 1 and 2 are also subject to infiltration of rainwater entering the void between the berm soils and the silo sidewalls).

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 3-2 Pg. #: 3-7 Line #: NA Code:
Original Specific Comment #17

Comment: The volumes of total waste and bentonite appear to be inaccurate and transposed between columns. The table should be checked for accuracy.

Response: Agree.

Action: The total waste and bentonite data presented in Table 3-2 were inadvertently transposed due to error in source document. The metric numbers presented will be

corrected so that the values presented for Silos 1 and 2 are 3640 and 3160 m^3, respectively.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 3-7 Pg. #: 3-17 Line #: NA Code:
Original Specific Comment #18

Comment: None of the contour lines are labeled, making the usefulness of this map limited. Contour lines should be labeled for every 5 feet in elevation change.

Response: DOE agrees with the comment. Note that the contours are labeled, but with small type face, such that the labels are not readily visible. Many of the problems with the figure can be solved by changing the map scale from 1:2400 to 1:1200.

Action: The topographic map will be modified as follows: 1) elevation data for individual survey locations will be deleted from the map, 2) the topographic contours will be labeled with larger typeface, and 3) every fifth contour (five foot intervals) will be shown in a heavier line weight. In order to accomplish these changes, the map may be printed at a scale of 1:1200 on 11x17 inch paper.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 3-4 Pg. #: 3-23 Line #: NA Code:
Original Specific Comment #19

Comment: The mineralogic data contained in Table 3-4, as currently presented, is not very useful. Stratigraphic units or sample depths should be provided along with the sample numbers. Averages for the stratigraphic units should also be presented.

Response: DOE agrees that the data will be more instructive if each sample is identified by depth and grain size. DOE agrees that comparisons of averages for grain size groupings in the glacial overburden would be interesting.

Action: Two columns will be added to Table 3-4. The columns will list depth of sample below ground surface and grain size (Unified Soil Classification System: CL, ML, etc.). In some instances, laboratory classifications of grain size are available for splits of the mineralogy samples. If laboratory classifications are unavailable, then field descriptions will be included in the table. Per standard conventions, laboratory classifications of grain size will be printed in upper case letters (e.g. CL) and field classifications will be printed in lower case letters (cl). If sufficient data exist for each grain size grouping (cl, ml, sm/sc, sp/sw, gc/gm and gw/gp), then averages will be presented for each grouping.

Commenting Organization: U.S. EPA Commentor: Saric

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Section #: Table 3-5 Pg. #: 3-24 Line #: NA Code:
Original Specific Comment #20
Comment: A footnote should be added to the Iron and Manganese columns indicating that the results are for leachable surface coatings.

Response: DOE agrees with the comment.

Action: The titles of columns 5 and 6 in Table 3-5 will be changed to "Leachable Iron (ppm)" and Leachable Manganese (ppm)," respectively. A footnote will be added to each column to state "The leaching method was the Determination of Oxide Coatings on Sediments, published by Janet Nuter Wille, in GROUNDWATER GEOCHEMISTRY AND THE POTENTIAL MIGRATION OF CONTAMINANTS IN THE HUALAPAI BASIN, NORTHERN ARIZONA, Colorado School of Mines, April, 1992.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 3-13 Pg. #: 3-40 Line #: NA Code
Original Specific Comment #21
Comment: This figure presents a generalized preconstruction geologic map of the FEMP. A description of the geologic unit represented by the cross-hatched pattern in the upper reaches of Paddy's Run should be included in the legend. Also, the presentation of the surface expression of the recessional and terminal moraines is confusing. The map should clearly indicate the locations and widths of the moraines.
Response: The legend of Figure 3-13 did not contain an explanation of the symbol used to portray eroded till in the upper reaches of the Paddys Run valley, the legend will be corrected. Moraines are not always distinct geologic entities. A moraine is a topographic high that occurs where a retreating glacier deposits a relatively greater amount of sediment at the toe of the glacier (hence, the relatively greater topography). A moraine typically takes the form of an arcuate ridge oriented at right angles to the direction of ice flow. The method of sediment deposition does not necessarily differ between moraine sediments and non-moraine sediments. At Fernald, the terminal moraine is a broad feature on the order of 1000- to 1500-feet-wide. The recessional moraines are on the order of several-hundred-feet-wide. The symbol used to portray the recessional moraines on Figure 3-13 does include a representation of the width of the topographic expression of the moraines; however, the legend did not explain the symbol.

Action: The legend of the map will be revised to make the symbols distinct and easy to understand. In order to thoroughly explain the glacial overburden and moraines, lines 23 through 31 of page 3-38 will be deleted and replaced with the following text: "During the Wisconsin glaciation (approximately 20,000 years ago), the front of ice sheet advanced southward as far as the south side of the FEMP, perhaps as far as one to two miles south of Wiley Road. As the glacier advanced south across the glacial outwash deposits of the Great Miami Aquifer, it deposited till beneath its moving ice

sheet. All of the sediment that lies above the sand and gravel of the Great Miami Aquifer is referred to as glacial overburden. The glacial overburden consists of till deposited beneath the moving ice sheet, but the bulk of the glacial overburden consists of deposits of debris flows and streams that were shed off the ice margin as the glacier retreated. The unsorted clay deposits of debris flows are referred to as till and the stream deposits are referred to as glaciofluvial sediments. As the ice retreated, the glacier deposited a terminal moraine (Figure 3-13), a ridge of glacial overburden composed primarily of till (i.e. debris flow deposits). The topographic basin that lay behind the terminal moraine filled with debris flow deposits and lake deposits. The lake deposits are called lacustrine in later text. The glacier deposited a second ridge of glacial overburden, a recessional moraine[1], in the vicinity of the waste storage area (Figure 3-13). Finally, following the retreat of the glacier, a blanket of wind-blown silt, loess, was deposited across the area." **Footnote** "[1] Moraines are not always distinct geologic entities. A moraine is a topographic high that occurs where a retreating glacier deposits a relatively greater amount of sediment at the toe of the glacier (hence, the relatively greater topography). A moraine typically takes the form of an arcuate ridge oriented at right angles to the direction of ice flow. The method of sediment deposition does not necessarily differ between moraine sediments and non-moraine sediments. At Fernald, the terminal moraine is a broad feature on the order of 1000- to 1500-feet-wide. The recessional moraines are on the order of several-hundred-feet-wide."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.5.3 Pg. #: 3-41 Line #: 4-35 Code:
Original Specific Comment #22
Comment: This section reports hydraulic conductivity values in gallons per day per square foot (gpd/ft^2) and in feet per day (ft/day). Hydraulic conductivities should be reported in consistent units.

Response: DOE agrees that all measurements should be reported in consistent units.

Action: All hydraulic parameters will be reported in english units (ft/day for hydraulic conductivity) with the metric equivalent immediately following in parentheses (cm/s for hydraulic conductivity).

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 3-16 Pg. #: 3-45 Line #: NA Code:
Original Specific Comment #23
Comment: The groundwater contour maps presented as Figures 3-18 and 3-19 indicate that recharge from Paddy's Run is farther north than indicated on Figure 3-16. Figure 3-16 should be modified to be consistent with the interpretations of Figures 3-18 and 3-19.

Response: The area of streambed infiltration and groundwater mounding do not coincide. Significant infiltration occurs only where the low permeability glacial overburden is absent from the bed of Paddys Run. The groundwater mound that grows due to infiltration during the wet season grows vertically and laterally away from the area of infiltration. The groundwater mound has a greater areal extent than the area of infiltration. The extent and slope of the mound are determined by a combination of the hydraulic properties of the aquifer and the rate and duration of infiltration. An analogous situation is a pumping well. The cone of depression for the pumping well extends laterally away from the point of pumping.

Action: No action required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 3-19 Pg. #: 3-49 Line #: NA Code:
Original Specific Comment #24
Comment: The nature and causes of the trough-like depression in the upper GMA just north of OU4 should be discussed in the RI report.

Response: DOE agrees with the comment.

Action: The following paragraph will be added to the end of Section 3.5.3.2: The groundwater mound is apparently present year round. The mound is refreshed during events that lead to flow and infiltration along Paddys Run. The mound may disappear entirely in periods of no or little precipitation. Note that in May and December of 1989 (Figure 3-18 and 3-19), the groundwater mound is less than one-foot above the surrounding water levels. Figures 3-18, 3-19 and 3-21 show an east-west trending, eastward sloping trough centered about monitor well 2043, west of the waste pit area. This trough is an expression of the intersection of the south sloping gradient of the Shandon trough and the north sloping gradient of the Paddys Run groundwater mound.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.5.4.1 Pg. #: 3-59 Line #: 6-7 Code:
Original Specific Comment #25
Comment: The text indicates that the depths reported in Table 3-12 are not true depths but rather the distance at which the samples were taken along the borings. Table 3-12 should be revised to give true depths (or elevations) of the soil samples.

Response: DOE agrees with the comment, it is appropriate to reference the geotechnical data by elevation. If data are referenced by elevation, then comparisons to geologic cross sections and diagrams of the slant borings will be made easier.

Action: Tables 3-11 and 3-12 will be revised; such that samples in vertical borings will be reported by elevations and depth below ground surface, and samples from slant borings will be reported by elevations only. In Table 3-11, a column titled "Elevation" will be inserted between the columns titled "Depth" and "Water Content." Similarly, in Table 3-12, a column titled "Elevation" will be inserted between the columns titled "Depth" and "Water Content."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.5.4.2 Pg. #: 3-59 Line #: 26-29 Code:
Original Specific Comment #26

Comment: The text summarizes the glacial lacustrine deposits. The terminology is confusing. It is not clear whether the discussion refers to the fine grained lacustrine deposit, the coarser deltaic unit, or both. The discussion should be clarified.

Response: The text refers to both lacustrine and deltaic sediments. The deltaic sediments are one part of the lacustrine sediments.

Action: The text will be reviewed for clarity and potential confusion in use of terms. Edits will be made as appropriate.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.0 Pg. #: 4-1 Line #: 20-25 Code:
Original Specific Comment #27

Comment: The text states that the ratio of activity concentrations between uranium-238 and radium-226 or between uranium-238 and thorium-230 can be used to "fingerprint" the K-65 and mixed oxide silo wastes, and that these ratios can be used to determine whether observed soil contamination originated from the silos. However, DOE acknowledges (in Section 4.2.3.1) that the soil and groundwater mobilities of uranium, radium, and thorium isotopes differ greatly. This phenomenon tends to negate DOE's assertion that the observed soil isotopic ratios can be used to identify sources, especially at depth. Unless specific isotopic retardation factors are use to calculate anticipated concentrations in soil and groundwater, direct comparisons of isotopic ratios in environmental media to silo wastes should be avoided.

Response: DOE agrees that the statement made may lead to the false conclusion that the absence of the "fingerprint" negates Operable Unit 4 as a source. As noted in the comment this is not the case. Clarifying text is warranted.

Action: Add the following paragraph following line 28 of page 4-1: Care should be taken not to infer that the absence of the U-238/Ra-226 or U-238/ Th-230 "fingerprint" indicates that Operable Unit 4 can be excluded as a source of the contamination. Such is not the case. The mobility of radium, thorium and uranium differ greatly when

transported via groundwater through soil. This phenomenon can lead to a disruption of the ratios identified as fingerprints. Simply stated the "fingerprint" if present is useful in establishing Operable Unit 4 impacts but their absence doesn't exclude Operable Unit 4 as a source.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.0 Pg. #: 4-1 Line #: 32-33 Code:
Original Specific Comment #28

Comment: The text states that compounds associated with silo waste include kerosene. The specific organic compounds expected to be present in silo residues and contaminated media due to the presence of kerosene should be described.

Response: The specific organic compounds expected to be in the silo waste due to the presence of kerosene will be described.

Action: Revise text per response.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-1 Pg. #: 4-3 to 4-5 Line #: NA Code:
Original Specific Comment #29

Comment: The reported background concentrations of several metals (arsenic, beryllium, cadmium, lead, nickel, and selenium) in groundwater are above maximum contaminant levels (MCL). This situation is highly unlikely and was noted in previous U.S. EPA reviews of the site-wide characterization report and the OU2 RI report. DOE should justify its insistence on using statistical outliers to calculate background concentrations while routinely dismissing such outliers observed in site environmental media.

Response: DOE agrees. The Operable Unit 4 RI Report was issued prior to the completion of the Background Study for FEMP Groundwater and Surface Water. The table will be updated to include the summary information recently approved by U.S. EPA in the subject report.

Action: Revise all groundwater concentrations in Table 4-1 to be consistent with the new summary statistics for perched groundwater and the Great Miami Aquifer.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-1 Pg. #: 4-3 to 4-5 Line #: NA Code:
Original Specific Comment #30
Comment: Table 4-1 should be checked for accuracy. It is unlikely that aluminum and zinc are not present in background groundwater samples.

Response: See comment #29 also. DOE has submitted and EPA has approved pending incorporation of comments, summary tables of groundwater constituent concentrations. These tables report upper tolerance limit values for aluminum and zinc of 0.208 and 2.03 mg/L, respectively, in the Great Miami Aquifer. Comparable values for the perched zone are 0.123 and 0.032 mg/L.

Action: As noted in comment #29

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-4 Pg. #: 4-14 to 4-16 Line #: NA Code:
Original Specific Comment #31
Comment: When compared against the oil and grease and HSL organic results, the total organic carbon (TOC) values reported for Silos 1 and 2 indicate that a large amount of carbon in the silo residues is unaccounted for. This is particularly evident in Silo 2 where average TOC values are 6,000 milligrams per kilogram (mg/kg), average oil and grease values are 301 mg/kg, and HSL organic values are negligible. DOE should further explain these observations since an understanding of the organic composition of the silo wastes will be required when selecting the remedy,

Response: It is not appropriate to compare or do a mass balance for carbon obtained from the TOC test against the carbon from the other tests (Oil and Grease, HSL -Vols and Semi Vols, Pesticides/PCBs, etc.). These tests are intended to analyze specific target compounds that are hazardous or potentially hazardous. The TOC test measures all the organic carbon present in the sample including nonhazardous organic compounds which do not respond to the standard SW-846 tests. For example any humic material present in the sample can be measured by the TOC test but not the other standard methods. Thus the measured TOC value will be higher than the sum total of the organic compound results. Consequently there wont be a materials balance from the results.

The carbon forms measurable by the TOC analysis, used on the silo residues, method 9060 SW-846, include: soluble non-volatile carbon e.g. natural sugars; soluble volatile organic carbon e.g., alkanes, mercaptans, low molecular alcohols; insoluble partially volatile carbon e.g. low molecular weight oils; insoluble particulate carbonaceous materials e.g. cellulose fibers; soluble or insoluble carbonaceous materials adsorbed or entrapped on insoluble inorganic suspended matter. However, any material not

readily combustible or oxidizable will not be detected by this method and the amount of organic carbon will only be an estimate.

The oil and grease analysis, method 9071 SW-846, measures extractable matter using trichlorotrifluoroethane as an extractant. If the substance is not extractable using this extractant, it will not be detected. The low oil and grease values in the silo residues, indicate the lack of heavy organic compounds, such as diesel fuel. The results of this method are percentage calculations and are not additive with the specific HSL analyses results.

Therefore, in order to do a mass balance for the carbon, an extensive analysis of the waste streams of the silo residues and how they respond to the standard SW-846 methods needs to be done. Then an elemental analysis for each of the detected compounds be performed to determine the amount of carbon in each compound. Then the sum total of the carbon content for all the detected compounds be compared against the TOC value. This extensive analysis is un-necessary because all the required tests have been done and the results are adequate to support the selection and evaluation of remedial alternatives.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.1.1.2 Pg. #: 4-20 Line #: 23-24 Code:
Original Specific Comment #32

Comment: The text indicates that the toxicity characteristic leaching procedure (TCLP) extracts of silo residues were analyzed for radiological constituents. This information should be discussed in this section of the RI report since the radiological constituents in the silo leachate are the primary source term for OU4.

Response: DOE agrees.

Action: Add a summary table of TCLP radiological results and add the following text after line 24 on page 4-20: Delete "Appendix E." and insert "Appendix A and summarized in Table 4-12. Three samples each, one from each zone, were analyzed from Silos 1 and 2. Based on original activity, Pb-210 was constituently more leachabile than other radionuclides. This is consistent with the finding of TCLP analyses for elemental lead." A comparison was made between the TCLP radiological results and the results from sampling of the decant sump tank and is presented in Table 4-13. Actinium-227 was not detected in the decant sump (<91.1 pCi/L) but was present at an average concentration of 4990 pCi/L in the combined Silos 1 and 2 TCLP results. Lead-210 was present in the TCLP leachate at over 60 times the concentration present in the decant sump. The results for Th-230 in the decant sump tank were rejected during data validation, however, the report value showed good

agreement with the TCLP result. Only uranium isotopes showed higher concentrations in the decant sump liquid. Because the tanker from which the decant sump liquid was sampled had been used elsewhere on-site prior to receiving the liquids, some uncertainty exists in all reported values.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.1.2 Pg. #: 4-27 Line #: 14-15 Code:
Original Specific Comment #33
Comment: The text states that the analytical results of a single decant sump tank sludge sample are included in Appendix A. They are not. This information should be discussed in the RI report, and the data should be included in Appendix A.

Response: The results of the sludge sample are included in Appendix A page A-238.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-14 Pg. #: 4-30 Line #: NA Code:
Original Specific Comment #34
Comment: The analytical results reported for sodium are in error (millions of part per million) and should be corrected.

Response: Agree.

Action: The units for sodium were correctly reported. The value will be changed to 5950 mg/L.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.1.2.1 Pg. #: 4-31 Line #: 20-26 Code:
Original Specific Comment #35

Comment: The text suggests that the presence of strontium-90 and technetium-99 in the decant sump tank liquids results from either laboratory contamination or sample preservatives. However, in all other instances throughout Section 4, DOE claims that the presence of these radionuclides in environmental media is from atmospheric fallout. It seems more likely that the presence of these radionuclides in the decant sump tank liquids represents the infiltration of meteoric water. DOE should address the inconsistent interpretation.

Response: DOE agrees that several mechanisms may account for the analytical results indicating the presence of Tc-99 and Sr-90 in the decant sump. It should be noted that both of the radionuclides are analyzed by chemical separation followed by beta counting in gas-flow proportional counters. Both are difficult analytical procedures with the potential for false-positive results when high levels of other beta emitters are present in the sample matrix. Very high concentrations of U-238 and by inference its short half-life decay products (Th-234 and Pa-234m) are present in the decant sump liquids (~23,000 pCi/L). Both daughter products are beta emitters and even very small carry-over fractions in the chemical separation process could lead to false positive results. These daughters are present in concentrations over 500 times that reported for Sr-90 and Tc-99.

The laboratory was requested to review the results for these analyses. The laboratory noted that the range statistically encompassing the CRDL for Tc-99 and Sr-90 are 10-50 pCi/L and 4-6 pCi/L, respectively. This assumes equal 5% type alpha and beta errors (false positive and false negative errors). The subject analyses all lie within this range.

In addition to these analytical possibilities, the two radionuclides may have been introduced in the tanker which was used to transfer liquids from the decant sump to the main plant for processing. The samples reported as from the decant sump tank were actually taken from the transport tanker. No information is available on the radiological status of this tanker prior to its receipt of decant sump liquids.

Also, as noted in the comment, the introduction of these contaminants could potentially be made not from the site contents but from infiltration of meteoric water. Finally, it is possible that these contaminants could enter the tank from perched groundwater transported from elsewhere on-site.

In any case the presence of these two radionuclides are highly unlikely to originate from the silo contents based on process knowledge of FEMP operations.

Action: Insert the following after "Table 4-13 and r-14." in line 13 on page 4-27:

It should be noted that the samples discussed were not collected directly from the decant sump tank but rather from the tanker used to transport the liquid to the main plant for processing. The radiological status of this tanker prior to introduction of the decant liquids is unknown. Because the tanker had been used elsewhere on-site for the transport of liquids, radiological and chemical contaminants may have been present in the tanker at the start of filling. Delete the sentence on lines 25 and 26 of page 4-31 and replace with the following: The presence of these nuclides may have come from a number of sources other than the leaching of radionuclides from the silo contents. These sources included: Carry-over of other beta emitters during the laboratory chemical separation process; Infiltration of meteoric water into the decant sump tank; Cross-contamination of the sample within the transport tanker prior to sample collection; or Infiltration of perched groundwater into the decant sump tank. Delete lines 27-30 on page 4-31.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.1.2.2 Pg. #: 4-32 Line #: 6-14 Code:
Original Specific Comment #36

Comment: DOE claims that the results of the TCLP analyses on silo residues compare favorably with the analyses of the decant sump tank liquids, thereby confirming that silo leachate is the source of the tank liquids. While most of the data seem to confirm this, the anomalous lead results should be further explained since lead is the most leachable metal in the silo residues.

Response: TCLP analyses on Silos 1 and 2 material yield lead concentrations that are about 1000 times greater than lead concentrations in the decant sump liquor. This anomaly is most likely due to the presence of sulfate ion in the decant sump liquor and its absence in the acetic acid that is used for the TCLP extraction. The mean sulfate concentration of 6,590 mg/l in decant sump liquor (Table 4-14 of OU4 RI) would allow about 1 mg/L of lead to be present in the decant sump liquor, based on the $PbSO_4$ solubility product. As the lead concentration in the decant sump liquor is a function of the sulfate concentrations higher sulfate concentrations would lower the lead value and lower sulfate concentrations would increase the lead value. Reported lead values in decant sump liquor range from 0.138 to 0.602 mg/L, and this range is within an order of magnitude of the predicted lead solubility limit (also, see discussion in Appendix E-3, Section E.3.6, and Figure E.3-8).

Action: Add the above response starting with the second sentence to Page 4-32 line 13.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.1.1 Pg. #: 4-47 to 4-62 Line #: NA Code:
Original Specific Comment #37

Comment: The surface soil data indicate that little, if any, surface soil sampling was performed downwind (east and northeast) of Silos 1 and 2. This suggests that surface soil contamination in these areas has not been characterized. DOE should address this data gap.

Response: Please refer to the response to U.S. EPA Technical Comment, General Comment #1.

Action: As indicated in the referenced comment.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 4-6 Pg. #: 4-48 Line #: NA Code:
Original Specific Comment #38
Comment: Figure 4-6 contains several errors. Surface soil sample location SS-46-204 is depicted at two distinct locations. Also, data from sample locations SL-46-326 and SL-46-327 are not included in Table 4-22. These discrepancies should be addressed.

Response: Agree with comment.

Action: SS-46-200 has been erroneously identified as SS-46-204 on Figure 4-6. This error will be corrected. Also, radionuclide data from SL-46-326 and SL-46-327 will be added to Table 4-22.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 4-7 Pg. #: 4-52 Line #: NA Code:
Original Specific Comment #39
Comment: Figure 4-6 should indicate the source of the uranium-238 data.

Response: The source of the U-238 data is RI/FS database.

Action: Revise Figure 4-7 to indicate the source of the data.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.1.1 Pg. #: 4-51 Line #: 21-22 Code:
Original Specific Comment #40
Comment: DOE states that the radionuclide surface soil data indicates that contaminant concentrations decrease rapidly with depth. The data do not appear to show any discernable trends with depth. This discrepancy should be addressed.

Response: Agree. While some data does indicate that the samples taken from the 0-6 inches does have lower concentrations of Uranium-238 than the samples taken at 0-2 inches,

the overall data does not indicate that this is consistently true throughout the OU4 area.

Action: Delete the sentence "Further, the concentrations of these radionuclides decrease rapidly this depth."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Section 4.2.1.1 Pg. #: 4-47 Line #: 26-32 Code:
Original Specific Comment #41

Comment: DOE states that CIS off-site laboratory data in Table 4-22 are similar. This is not the case. Radiological data from the off-site laboratory detected radium-226 and uranium-238 at levels twice as high as the on-site laboratory. This discrepancy should be addressed.

Response: Disagree. The results from the off-site lab showed U-238 concentrations to range from 9.3 to 23.0 pCi/g and Ra-226 concentrations ranging from 7.0 to 17.02 pCi/g. These results fall within the range of the data obtained from the on-site lab which yielded results ranging from 2.6 to 37.4 pCi/g for U-238 and from 0.3 to 35.8 pCi/g for Ra-226.

Action: No further action is required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 4-8 Pg. #: 4-56 Line #: NA Code:
Original Specific Comment #42

Comment: This figure shows eight surface soil locations with no corresponding sample numbers or analytical results. They are simply labeled NA (not available). This unnecessary information should be removed from the figure.

Response: Agree.

Action: Only sample locations where samples were collected and analyzed for U-238 will be presented. As suggested, locations identified by NA (where soil samples were collected and analyzed for other radionuclides such as radium or thorium) will be removed from Figure 4-8. All references to NA in the legend will be deleted as well.

- DRAFT -
U.S. EPA Comments
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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.1.2 Pg. #: 4-59 Line #: 15-22 Code:
Original Specific Comment #43
Comment: This paragraph apparently discusses sediment contamination in the OU4 drainage ditch. This discussion is more appropriate in Section 4.4.1. Also the word "southwest" on line 17 should be changed to "southeast."

Response: It is appropriate to discuss these data in this section because the soils in the drainage ditches were sampled as part of the surface soil characterization. The word "southwest" will be replaced with "northwest-southeast."

Action: Revise text per response.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-26 Pg. #: 4-60 to 4-62 Line #: NA Code:
Original Specific Comment #44
Comment: This table and the corresponding text indicate that no surface soil samples were analyzed during the Waste Pit Area Runoff Control Project. The only samples submitted for analysis were collected from depths between 1.5 feet and 2.0 feet bgs. Therefore, any conclusions drawn from this data regarding the lateral extent and vertical trends of surface soil contamination are misleading at best. This issue should be addressed.

Response: Disagree. The sampling plan to collect theses samples, approved by EPA, only required organic analysis of the samples collected between 1.5 and 2 feet. Organics, particularly volatiles and semivolatiles would very probably not be present in samples taken at lesser depths.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.2.1 Pg. #: 4-70 Line #: 12-21 Code:
Original Specific Comment #45
Comment: This paragraph discusses the results of the berm soil TCLP analyses. The sample from boring 1620 at 16 feet bgs showed very high TCLP results for cadmium, chromium, and silver. DOE suggests that these results should not be used to characterize berm soils because a split sample collected from this interval showed HSL metals at concentrations comparable to the other berm borings. However, the data tables in Appendix B.1 indicate that HSL metal analyses were not performed on the corresponding split sample. DOE has not provided any information to justify their claim that this sample does not represent a hot spot within the berm soils. This issue should be addressed further.

Response: As can be seen in the boring log for Boring 1620 (Appendix B, page B-54), samples 99488, 99490, 99491, and 99496 were all collected from the interval between 15 and 16 feet of subject boring. Sample 99488 was analyzed for mercury, 99491 was analyzed for cyanide, and 99490 was analyzed for the remaining HSL metals. Sample 99496 was analyzed using the TCLP. The HSL metals results for sample 99490 were compared with the comparable split samples analyzed for HSL metal at the interval where TCLP analyses were performed on Borings 1621, 1622, and 1623. The table below is a comparison of these samples for cadmium chromium and silver.

	Boring 1620	Boring 1621	Boring 1622	Boring 1623
Analyte	99490	99542	99609	99661
Cadmium	5.4	4.3	7.5 J	4.3
Chromium	16.6	18.7	20.8	17.5
Silver	8.2	7.5	19.2	5.8

While cadmium and silver concentrations fall outside the distribution for the background soil study, all samples report similar values for all three constituents. It is for this reason that DOE suspects the TCLP analysis performed on sample 99496. If these constituents are elevated in sample 99496 leachate, why would they not be in samples 99563, 99612, and 99663, given the soils are all of a similar nature. The argument for one amomolous result (instead of three) is further supported by the fact that all four chromium results (99490, 99542, 99609, and 99661) lie within the distribution of results from the background soil study conducted at FEMP. It is for these reasons that DOE feels the sample results do not represent a hot spot within the berm soils.

Action: Text will be revised to include the above discussion.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-28 Pg. #: 4-71 Line #: NA Code:
Original Specific Comment #46

Comment: Table 4-28 summarizes the inorganic results of the berm soils analyses. The data and corresponding text should be presented in terms of depth (instead of mean) so that any trends can be evaluated.

Response: An additional table will be included that presents the data by sample depth to facilitate evaluation of trends in the distribution of contaminants.

Action: Add table or figure showing data results by depth of sample.

- DRAFT -
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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.3.1 Pg. #: 4-76 Line #: 14-16 Code:
Original Specific Comment #47
Comment: The text states that radiological concentrations significantly above background were detected in slant borings 1615 and 1616. This is misleading. Significant (above background) contamination was seen in all slant borings. This discrepancy should be addressed.

Response: Agree.

Action: Text in Section 4.2.3.1 (page 4-76, lines 14 & 16) will be revised to read "Although concentrations significantly greater than background for these constituents were detected in samples collected from all slant borings, slant borings 1615 and 1616 have relatively higher concentrations of certain radionuclides than those in the other borings.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.3.1 Pg. #: 4-83 Line #: 12-13 Code:
Original Specific Comment #48
Comment: This sentence lists the inorganics that were detected above background concentrations in the slant borings. Copper, cyanide, and sodium should be added to this list.

Response: Agree.

Action: Copper, cyanide, and sodium will be added to the text in Section 4.2.3.1 (page 4-83, line 12). These inorganics will also be added to text in Section 7 (page 7-8, lines 14 and 15).

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.3.1 Pg. #: 4-87 Line #: 14-21 Code:
Original Specific Comment #49
Comment: This paragraph proposes that OU4 subsurface soil contamination may have sources outside of the OU4 study area. Two of these potential sources include the waste pits, and contaminated surface runoff from other areas of the site. It is not clear how the waste pits north of the OU4 study area could contribute to subsurface soil contamination at OU4. Also, any site related runoff would be limited to the drainage areas north and south of OU4. These areas are unlikely to contribute to the subsurface soil contamination observed at OU4. This issue should be addressed.

Response: There is evidence that the waste pits north of OU4 are leaking. Part of the contamination is migrating into Paddys Run. As it is transported along Paddys Run,

it percolates into the soils below and migrates eastward through groundwater movement. Also, the drainage from the clearwell running north and east of OU4 is a potential source.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.2.3.2 Pg. #: 4-89 Line #: 11-16 Code:
Original Specific Comment #50

Comment: The text states that the radiological contamination seen in boring 1072 is the likely result of atmospheric deposition. DOE should indicate whether an on-site or off-site source is being suggested.

Response: DOE agrees.

Action: Insert the following after the work "deposition" in line 16 on page 4-89: "of materials release during production activities at FEMP."

- DRAFT -
U.S. EPA Comments
- DRAFT -

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.1.1 Pg. #: 4-93 to 4-96 Line #: NA Code:
Original Specific Comment #51

Comment: This section describes several distinct perched water zones encountered in the slant borings. Accurate cross sections depicting the subsurface hydrogeology in the silo area should be prepared to aid the reader in data interpretation. The cross sections provided in Section 3 do not indicate two distinct water bearing zones in the glacial overburden.

Response: DOE did not mean for the text to imply that there are multiple distinct and separate perched groundwater zones in the glacial overburden beneath the silos. The glacial overburden in the OU 4 Study Area comprises low permeability clay, overlain by a laterally continuous silty clayey sand, in turn overlain by clay and/or loess. The silty clayey sand is conceptualized as a continuous unit with relatively little horizontal or vertical variation in hydraulic conductivity. However, the silty clayey unit does contain scattered and discontinuous thin lenses of clay. During drilling of the slant borings, the low drilling angle created a false illusion of separate water bearing zones. In some cases, a groundwater sample would be collected because water had collected in the open boring. Subsequently, the boring would be advanced through a thin non-water-bearing low permeability lense (note that a 5-inch-thick clay lense would be 57 inches of core in a 5-degree slant boring) and then into an apparent second water yielding zone. Multiple samples were collected in slant borings ?? and ??, because of a scenario similar to that outlined above. Despite the presence of a number of small discontinuous low permeability lenses in the clayey silty sand unit, DOE believes that the unit is a distinct hydrogeologic unit that is best conceptualized as one large perched groundwater zone.

Action: DOE will review and edit discussions of the multiple groundwater samples collected in slant borings ?? and ?? to ensure that the text does not imply that there are multiple distinct perched groundwater zones.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.1.1 Pg. #: 4-96 Line #: 9 Code:
Original Specific Comment #52

Comment: The text indicates that borings 1617 and 1618 encountered perched groundwater below Silo 1. Boring 1617 did not. This discrepancy should be addressed.

Response: The use of the term "below" appears to be the issue since perched groundwater was encountered by Boring 11617 at an elevation lower than the bottom of Silo 1 but offset by 24 feet from the vertical projection of Silo 1. This imprecise term should be replaced.

Action: Change "below" to "near" in line 9 on page 4-96.

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- DRAFT -

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-39 Pg. #: 4-98 Line #: NA Code:
Original Specific Comment #53
Comment: The data presented in this table does not indicate that groundwater samples were - analyzed for lead-210 or polonium-210. These radionuclides are used as indicator parameters for K-65 silo related contamination. The results of any lead-210 or polonium-210 should be presented in the RI report.

Response: Lead-210 and polonium-210 were not analyzed for in the samples included in Table 4-39. Therefore, data is not available.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.1.2 Pg. #: 4-107 Line #: 8-10 Code:
Original Specific Comment #54
Comment: The text states surface and subsurface data suggest that radium is not a concern outside of the silos. This is inaccurate since radium was detected in relatively high concentrations in both surface and subsurface soils. This statement should be revised.

Response: Agree. The statement is inaccurate, it will be removed from the text.

Action: Delete the inaccurate statement per response.

- DRAFT -
U.S. EPA Comments
- DRAFT -

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.1.2. Pg. #: 4-107 Line #: 16-17 Code:
Original Specific Comment #55

Comment: This sentence states that the "lower perched groundwater zone" encountered below the decant sump tank was found to have relatively low concentrations of uranium and progeny, which suggests that this is an unimpacted zone. This discussion again highlights the need for detailed hydrogeologic cross sections showing stratigraphic and water bearing units, sample locations and sample results. Additionally, sample 64021, located approximately 75 feet west of the decant sump tank, is located in the same "zone" mentioned above. This sample exhibited high (439 μg/L) total uranium suggesting that the "lower zone" is indeed impacted. This issue should be clarified.

Response: Please refer to Table 4-37 in the report. As can be seen two samples were collected from Boring 1616, one from an upper perched zone and a second from a lower perched zone. The sample referred to in the comment, 64021, came from the upper perched zone not the lower as indicated by the commentor. The elevation of the boring at the time of collection was 563.8 feet above mean sea level (see Table 4-35). The boring elevation at the time of collection of sample 64052 from the lower zone was 550.9 feet above mean sea level. As to the need for a pictorical representation, DOE feels that Figure 4-15 adequately displays the relative elevation of these two samples in reference to the base of the glacial overburden, the decant tank and Silo 1. Further the requested summary of analytical results is on this figure.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.1.2 Pg. #: 4-107 Line #: NA Code:
Original Specific Comment #56

Comment: General chemistry parameters were found at concentrations above background in Well 1032. The text states that since these compounds are not unique to the silo materials, the data do not assist in identifying the contaminant source. This argument is not very convincing since none of the material stored in the silos is unique to the silos themselves. All groundwater data should be evaluated in terms of upgradient and downgradient concentrations when attempting to characterize sources.

Response: Agree. Source identification will be discussed in terms of upgradient and downgradient concentrations.

Action: Replace the fifth paragraph, page 4-107, line 18, with: General chemistry parameter such as chloride, calcium, sodium and sulfate were found to have higher concentration in Well 1032, downgradient of the silos, than the up gradient Well 1033.

- DRAFT -
U.S. EPA Comments
- DRAFT -

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.2.2 Pg. #: 4-113 Line #: 12 Code:
Original Specific Comment #57

Comment: The reasoning used in this paragraph to indicate that sources other than OU4 may be the source of groundwater contamination in the GMA is not completely supported. Potential pathways from OU4 through Paddy's Run indicates OU4 may be a source of contamination. The RI should be revised to consider these potential routes of contaminant migration.

Response: DOE agrees that the statement is poorly worded and not adequately supported.

Action: Replace the sentence starting on line 12 and ending on line 13 of page 4-113 with the following: The isotopic ratio of U-234 and U-238 would suggest a natural uranium ratio in these samples. Such a ratio may be expected from Operable Unit 4 but is not a "fingerprint" for this source. The presence of uranium up gradient is the aquifer from an Operable Unit 4 source could be explained by leachate travel in the perched groundwater zone of the glacial overburden with emergence to Paddys Run. Here the diluted leachate could enter the aquifer via stream bed infiltration or flow at the perched zone/stream channel interface. No evidence is available to support or preclude this potential route, however, investigation of sources other than Operable Unit 4 should be investigated.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.2.2 Pg. #: 4-113 Line #: 30 Code:
Original Specific Comment #58

Comment: The presence of technetium-99 in environmental media does not suggest a non-OU4 source because Appendix A of the RI report indicates none of the silo samples were analyzed for technetium-99. Because this conclusion lacks supporting data, it should be deleted from the report.

Response: DOE disagrees with this comment. Based on process knowledge, no Tc-99 was placed within Operable Unit 4 nor was it detected in samples of perched groundwater collected below and near the silos. A far more credible source of Tc-99 is the waste pits of Operable Unit 1 which is located upstream (Paddys Run) from the subject well location. Large quantities of Tc-99 are present in the leachate samples collected from the waste pits.

Action: None.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3.2.2 Pg. #: 4-116 Line #: 8 Code:
Original Specific Comment #59
Comment: The RI report states that a direct link between groundwater contamination in the GMA and OU4 cannot be made. The report should also state that OU4 cannot be eliminated from consideration as a source of contamination in the GMA.

Response: Noted.

Action: Add the following phrase at the end of the sentence on line 9 of page 4-116: nor can it be disproven.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.6.2 Pg. #: 4-132 Line #: 8 Code:
Original Specific Comment #60
Comment: The RI report states that because technetium-99 is not present in silos 1 or 2, the silos are an unlikely source of the technetium-99 in the decant sump tank liquid. However, the silo 1 and 2 materials were not analyzed for technetium-99. DOE should provide additional justification for this statement.

Response: See responses to EPA Technical Comments, Specific Comment #35.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 5.4.3 Pg. #: 5-31 Line #: 2 Code:
Original Specific Comment #61
Comment: Table 5-5 presents results which indicate the maximum uranium concentration in the GMA at the FEMP boundary is about 10 μg/L; Figure 5-32 indicates the maximum uranium concentration at the FEMP boundary is about 1 μg/L. Figure 5-6 and should be checked for accuracy.

Response: Disagree. Table 5-5 and Figure 5-6 present the modeling results for two different situations. Table 5-5 presents vadose zone modeling results concerning constituents of concern that will reach the aquifer in 1000 years from silos 1 and 2. Figure 5-6 presents the modeling results for groundwater beneath the FEMP after 400 years due to loading from Silos 1 and 2. The concentrations presented in this figure account for many different factors including but not limited to dilution by groundwater. As a result, the concentration contours in Figure 5-6, (groundwater) are not expected to match the concentrations presented in Table 5-5 for the vadose zone.

Action: No action required.

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U.S. EPA Comments
- DRAFT -

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 7.3.4 Pg. #: 7-9 Line #: 8 Code:
Original Specific Comment #62

Comment: The RI report states that perched groundwater with U-238 contamination in the range of 69 to 77 pCi/L is present under the silos. However, Section 4.3.1.1 presents data indicating much higher levels of uranium contamination in the perched groundwater in the OU4 area. Section 7.3.4 should be changed to be consistent with data presented earlier.

Response: DOE agrees.

Action: Replace "77" in line 8 on page 7-9 with "3816."

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OHIO EPA COMMENTS
ON THE
OU 4 RI REPORT

1. Commenting Organization: Ohio EPA Commentor:
Section #: 1.2.2.3 Pg #: 1-34 Line #: 1 Code: c
Original Comment #:
Comment: This sentence suggests decant liquids had been removed from Silo 3, whereas the rest of the document states that only dry materials were placed in Silo 3. The sentence needs to clarify when/if decant liquids were removed.

Response: The indicated RI Report text on Page 1-34 is incorrect. No decant liquids have been removed from Silo 3. Silo 3 received only dried, cold metal oxides as indicated in Section 1.2.2.3.

Action: Delete "and decant liquid" from Line 1 of Page 1-34.

2. Commenting Organization: Ohio EPA Commentor:
Section #: 1.5.3.3 Pg #: 1-52 Line #: 8-12 Code: C
Original Comment #:
Comment: One-hundred more gallons of leachate were removed from the decant sump during the second pumping than during the initial pumping. Prior to the initial pumping, the leachate level was 4 feet above the tank within the standpipe. The level at the second pumping was 80 percent of the tank, reportedly. The document fails to discuss the discrepancies in volume and level within the decant tank and the implications thereof. DOE must address the decant sump tank as a potential preferential migration pathway for silo 1 and 2 leachate.

Response: There is an error in the volume of water reported to be pumped from the decant sump during the 1993 maintenance action. Review of field measurements of water level in the decant sump tank reveal that the estimated volume of material removed from the decant sump during the 1993 maintenance action was approximately 6550 gallons.

With regard to addressing the decant sump tank as a preferential migration pathway for Silo 1 and 2 leachate, sample results beneath the decant sump tank do not support this theory. Soil samples (64032 and 64041) and a perched water sample (64052) collected within five to ten feet of the base of the decant sump tank (Figure 4-15) show no evidence of elevated concentrations of radionuclides or other potential constituents of concern. Moreover, the assumptions made in the fate and transport model regarding migration of leachate from Silos 1 and 2 are such that any potential contribution through the decant sump tank would be accounted for. In brief, in the future scenario, both the walls and flooring of Silos 1 and 2 are assumed to partially fail to the point where cracks and openings allow silo leachate to escape. This direct pathway for silo leachate would overshadow any potential contribution through the decant sump tank.

Action: Lines 10 and 11 revised to read "Approximately 24,826 L (6550 gallons) of liquid were again pumped....". No further action is required relative to the decant sump tank potentially serving as a preferential leachate migration pathway.

3. Commenting Organization: Ohio EPA Commentor:
Section #: 2.2.3 Pg #: 2-11 Line #: 20-31 Code: C
Original Comment #:
Comment: As reported in Appendix B, DOE failed to analyzed for Cs-137, Tc-99, Ru-106, Np-237 and Sr-90 in a number of berm samples. DOE should revise the text to discuss deviations from the sampling requirements defined in this section. DOE should also discuss the potential effects of these missing data.

Response: The radiochemical laboratory inadvertently adopted the radiological parameters employed for the K-65 content analysis for many of the berm subsurface soil samples. This action led to the noted exclusion of the fission and transuranic radionuclides from the list of completed analyses on many of the berm soil samples. The identified radiological parameters represent fission products and transuranic radionuclides generated through operation of a nuclear reactor and therefore are not present in natural uranium ores. The residues in Silos 1, 2, and 3 were generated during processing of natural uranium ores. Therefore, none of these constituents would be present as a result of Operable Unit 4 waste storage activities. These constituents could only be present in the berm soils through atmospheric fallout (CS-137, Sr-90) on the soils prior to emplacement as berms or through contact with FEMP waste streams generated during operations on recycled reactor tailings (i.e., improper disposal, air re-suspension of pit materials, or stack releases). Processing of reactor tails was initiated on a limited basis in 1962 (see Page 1-10 in the RI). As previously identified in Section 1.2.1.4, the soils comprising the berms were placed in two distinct operations, one in 1964, and the other in 1983. No known waste disposal activities occurred in any of the locations from which soil was obtained to construct the berms. Further, it is highly unlikely any significant deposition of wastes from the processing of reactor tails occurred so as to affect the soils used to construct the 1964 berm.

The soils employed to create the 1983 berm extension were excavated from two locations: 1) in the area now occupied by the biodenitrification surge lagoon and 2) a pre-existing borrow pit location west of Pit 5. Top soils at these locations were first stripped prior to excavation of the underlying clays used to construct the compacted berms. This action minimized the potential for the identified radiological constituents to be present in the berm soils in any significant quantity. DOE considers that the absence of the identified analytical data does not constitute a significant limitation. DOE considers that available data are sufficient to proceed with the RI/FS process with no additional analyses necessary on new or archived samples.

Action: Revise <u>Sampling and Analysis</u> portion of Section 2.2.3 to include the following: A number of collected subsurface soil samples were not analyzed by the radiochemical laboratory for the listed fission and transuranic radionuclides (Tc-99, Cs-137, Sr-90, Ru-106, Np-237, and isotopic plutonium). Technical review of this deviation from the work plan lead to the conclusion that the available data was sufficient to evaluate the contribution of these constituents, and thus no additional sampling or analysis was deemed appropriate.

4. Commenting Organization: Ohio EPA Commentor:
Section #: 2.3.2 Pg #: 2-19 Line #: 6-16 Code: C
Original Comment #:
Comment: a) As reported in Appendix B.7, DOE failed to analyze the decant sump liquid or sludge for all the radiological contaminants described in this section. DOE should revise the text to discuss deviations from the sampling requirements defined in this section. DOE should also discuss the potential

effects of these missing data.

b) The text should state that inappropriate QA/QC was used during sampling of the decant sump liquid thus rendering the data unusable for the baseline risk assessment (See Section E.3.5).

c) The section should reference appendix A.7 for results of the decant sump sampling.

Response:

a) The collected water and sludge samples were not analyzed for all parameters identified in the removal action work plan. Additionally, uranium-234 could not be reported by the laboratory in a number of samples due to the presence of too much uranium in the samples. The absence of this data is not considered a significant limitation.

b) The intent of the sampling conducted on the liquid phase of the decant sump contents, as defined in Section 2.3.2., was focused on determining the necessary wastewater treatment requirements prior to discharge to the receiving stream. To accomplish this, the liquid was transferred to a tanker truck where the contents were sampled. No attempt was made to decontaminate the tanker truck prior to transferring the decant liquid. On this basis, it was determined that use of the analytical results from the decant sump to support quantitative risk assessment was inappropriate.

c) Agreed. Reference will be added to text.

Action:

a) Add the following statement to Analysis portion of Section 2.3.2: "A number of the collected samples were inadvertently analyzed for several of the radiological parameters identified in the removal action work plan including Ac-227, Pb-210, and isotopic plutonium. Additionally, the laboratory could not report results for U-234 in a number of samples due to interference related to high overall uranium concentrations in the samples"

b) Add following statement to Methodology portion of Section 2.3.2. "The transport tanker was not decontaminated prior to transfer of the decant liquids. While this did not affect the ability to determine appropriate wastewater treatment requirements for the decant liquid, this sampling methodology limits the usefulness of the analytical results in supporting quantitative risk assessment."

c) Add following statement to Analysis portion of Section 2.3.2: "Results of the Decant Sump Tank Sampling can be found in Appendix A.7."

5. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 2.3.3 Pg #: Line #: Code:
Original Comment #:
Comment: A contour map of uranium concentrations in the 2000-3000 series aquifer which illustrates the horizontal extent of the plume should be included in the RI.

Response: It is assumed that the comment is intended to refer to Section 4.3.3 versus 2.3.3. Section 4.3.3 addresses the level of constituents in five 2,000 series wells and four 3,000 series wells. The number of data points

available within this limited area is insufficient to develop a contour map. As discussed in Section 4.3.3, both upgradient and downgradient wells exhibit uranium concentrations above background. Based upon this finding, Operable Unit 4 is not the sole contributor to elevated concentrations of constituents in the Great Miami Aquifer.

The Great Miami Aquifer, including the area beneath Operable Unit 4, will be addressed as part of Operable Unit 5. Based on the wider extent of that study and the larger number of wells utilized, preparation of groundwater contour maps will be possible at that time.

Action: No revision made at this time.

6. Commenting Organization: Ohio EPA Commentor:
Section #: 2.3.4 Pg #: 2-21 Line #: 27 Code: e
Original Comment #:
Comment: The sentence should reference Section A.6 rather than A.5.

Response: Comment acknowledged.

Action: Modify reference in Section 2.3.4 to Section A.6 of Appendix A.

7. Commenting Organization: Ohio EPA Commentor:
Section #: 2.5.1.2 Pg #: 2-27 Line #: Code: c
Original Comment #:
Comment: The section should direct the reader to the section within the appendices which provides surface water sampling data.

Response: Comment acknowledged.

Action: Add following statement to Sampling and Analysis portion of Section 2.5.1.2. "Section C.2 of Appendix C provides the results of the RI/FS sampling of surface water pertinent to Operable Unit 4."

8. Commenting Organization: Ohio EPA Commentor:
Section #: 2.5.2.1 Pg #: 2-28 Line #: Code: c
Original Comment #:
Comment: The section should direct the reader to the section within the appendices which provides sediment sampling data.

Response: Comment acknowledged.

Action: Add following statement to Sampling and Analysis portion of Section 2.5.2.1. "A summary of the analytical results of the sediment sampling conducted as part of this study are presented in Section 4.4.1 under Radiological Constituents in Sediments."

9. Commenting Organization: Ohio EPA Commentor:
Section #: 2.5.2.3 Pg #: 2-31 Line #: 12-16 Code: c
Original Comment #:
Comment: The section should direct the reader to section B.6 for RI/FS sediment sampling data.

Response: Comment acknowledged.

Action: Add following statement to Sampling and Analysis portion of Section 2.5.2.3: "The analytical results of RI/FS sediment sampling in Paddy's Run can be found in Section B.6 of Appendix B."

10. Commenting Organization: Ohio EPA Commentor:
Section #: 2.6.3 Pg #: 2-38 Line #: 8-14 Code: c
Original Comment #:
Comment: a) The section discusses the fact that sampling was conducted for radiological and chemical contaminants, yet no reference is made to the radiological sampling data within the RI. The text should discuss the radiological sampling data and include it within the appendices for locations relevant to OU4.

b) The section should direct the reader to section B.4 for HSL data.

Response: a) Radiological results from the surface soil samples collected as part of the Waste Pit Runoff/Control Removal Action are present in Table 4-24 of the RI.

b) Comment acknowledged.

Action: a) See last sentence of Action item b.

b) Add following statement to Sampling and Analysis portion of Section 2.6.3: "Analytical results for the HSL parameters for the collected samples are presented in Section B.4 of Appendix B. The results of the screening level radiological analysis on the collected samples are presented in Table 4-24.

11. Commenting Organization: Ohio EPA Commentor:
Section #: 2.7.3 Pg #: 2-47 Line #: 19-28 Code: c
Original Comment #:
Comment: As reported in appendix B.2 DOE failed to analyze all 16 samples for the radionuclides described in this section. Additionally, TCLP analyses were not conducted for all HSL parameters. DOE should revise the text to discuss deviations from the sampling requirements defined in this section. DOE should also discuss the potential effects of these missing data.

Response: Twelve of 16 samples were not analyzed for transuranic radionuclides and fission products on the full radiological parameter list. These parameters are not associated with the stored residues within Silos 1, 2,

or 3, and as such, the absence of this data does not present any adverse impact to the RI or FS. Additionally, 4 of the 16 samples were not analyzed for Po-210, Ac-227, and Pa-231. Available results are considered adequate to support the RI and FS. The work plan for the slant boring program required TCLP organic and inorganic analysis, not TCLP for HSL analysis.

Action: Add following statements to Sampling and Analysis portion of Section 2.7.3: "Select samples (4 of 16) were also analyzed for transuranic radionuclides and fission products on the full radiological parameter list. Due to an oversight, 4 of the 16 samples were not analyzed for Po-210, Ac-227, and Pa-231. Available results were deemed sufficient to support RI and FS requirements, eliminating the need to re-analyze archived samples for these parameters." Modify following statement in Sampling and Analysis portion of Section 2.7.3 as indicated: "Soil samples submitted for radiological analysis were analyzed for the following constituents: Isotopic Radium, Isotopic Thorium, Isotopic Uranium, Ac-227, Pb-210, Po-210, and Pa-231. Change Line 22, Page 2-47 to "completed for organic and inorganic parameters."

12. Commenting Organization: Ohio EPA Commentor:
Section #: 2.9.1 Pg #: 2-53 Line #: 9-10 Code: c
Original Comment #:
Comment: Section C.3 does not include 3 HSL analyses. Data for well 1072 are not provided in the appendix. Either correct this section or add missing data into Section C.3

Response: Appendix C.3 does contain HSL analysis for the following three groundwater samples. Sample 3076 was analyzed for HSL inorganic, organics, and pesticides/PCB's. Samples 3223 and 3224 were analyzed for HSL inorganics, organics, pesticides/PCB's and organophosporous pesticides. Additionally, Sample 4061 was analyzed for organophosporous pesticides to supplement Sample 3076. No groundwater data was available for Monitor Well 1072. Monitor Well 1072 is a dry well. Any reference to groundwater results from Monitor Well 1072 will be deleted.

Action: Delete 1072 [which became dry] from Line 6, Page 2-53. Delete Well 1072 from Tables 4-39 (page 4-98) and 4-42 (Page 4-105 and 4-106). Revise Line 17, Page 4-102 to read, "Twelve perched water samples were collected from four of the five 1000 series monitoring wells for the RI/FS program." Line 28, Page 4-107 change, "five shallow wells" to "four shallow wells".

13. Commenting Organization: Ohio EPA Commentor:
Section #: 2.9.2 Pg #: 2-53 Line #: 28-31 Code: c
Original Comment #:
Comment: As reported in appendix C.1, DOE failed to analyze any of the six groundwater samples for full radiological parameters as described in this section. DOE should revise the text to discuss deviations from the sampling requirements defined in this section. DOE should also discuss the potential effects of these missing data.

Response: One of Six samples was analyzed for full radiological parameters (Sample 64007). The remaining five samples were not analyzed for the transuranics and fission products on the "Full Radiological Parameters list." These parameters are not associated with the stored residues within Silos 1, 2, 3, and 4. Transuranic and fission product results for Sample 64007 are non-detects. Available results are considered adequate to

support the RI and FS.

Action: Revise Section 2.9.2 Sampling and Analysis paragraph. Add at Line 31, "One of the six samples was not analyzed for transuranic radionuclides and fission products."

14. Commenting Organization: Ohio EPA Commentor:
Section #: 2.11 Pg #: 2-57 Line #: 10-12 Code: c
Original Comment #:
Comment: The previous sections of the document and comments above suggest a number of sampling events failed to analyze samples for the proper contaminants. These would seem to be significant deviations that impacted the amount and quality of data achieved. DOE should discuss these non-conformities and their impact on determining the nature and extent of contamination associated with OU4.

Response: In all instances where the required sampling parameters were not analyzed for, the missed parameters were for transuranic radionuclides and fission products. While important, they are not parameters that were associated with the contents of Silos 1, 2, 3, and 4. In the instance where these parameters were analyzed for (7 berm soil samples, 4 slant boring samples, and 1 perched water sample) the results were non-detects. Based on these results and process knowledge of the silo residues, the available data is considered sufficient to fulfill the data requirements for the OU4 RI and FS.

Action: None.

15. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 3.5.4 Pg #: 3-61 Line #: 22 Code:
Original Comment #:
Comment: This statement understates the potential impact that fractures in the lower till may have upon ground water flow.

Response: Yes, the paragraph does understate the potential that fractures may play in groundwater flow. The role of fractures in groundwater flow in tills has only recently been studied at a few sites in North America. Fractures in till have not been quantified at the FEMP. Fractures need not be quantified to obtain measured values of hydraulic parameters in the glacial overburden. The DOE contends that obtaining accurate field measurements of glacial overburden materials is of greatest importance. The FEMP has abundant hydraulic data collected by traditional means, such as slug tests, grain size analyses and laboratory permeability tests of cores. These existing data have been used to arrive at the hydraulic conductivity values used for glacial overburden materials in the groundwater model for fate and transport. Operable Unit 5 is currently conducting a suite of sophisticated hydraulic tests in the glacial overburden and will obtain higher quality hydraulic data for the Operable Unit 5 RI report. The OU5 data will not be available for the Operable Unit 4 RI report. As OU5 hydraulic conductivity data become available, they will be incorporated into site documents.

Action: No action required.

16. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 3.5.4 Pg #: 3-61 Line #: 25 Code:
Original Comment #:
Comment: Does the information gathered in recent investigations support this claim?

Response: Measurements of seeps by Operable Unit 5 are ongoing, and the data are unavailable at this time.

Action: No action required.

17. Commenting Organization: Ohio EPA Commentor:
Section #: 3.5.4.2 Pg #: 3-62 Line #: Code: c
Original Comment #:
Comment: Figure 3-26 uses ground water elevation data from dates separated by two months. Unless ground water elevation data is available and analyzed to show that temporal variability does not occur in this area, it does not seem prudent to use such data to develop groundwater flow maps.

Response: The primary reason Figure 3-26 was created is to show a groundwater elevation map that includes all data from permanent monitor wells and all slant boring water level measurements. Only one set of water level measurements was collected from the slant borings, that of August 1991. The only complete and contemporaneous set of water level measurements for the permanent OU 4 area monitor wells in the site database is October 1991 (construction projects blocked access to many wells in the area, preventing collection of monthly water level measurements). The hydrographs of 1000-series wells in the area show that the most significant trends in water level fluctuation occur over a 6-month time scale. Hydrographs of monthly measurements in the K-65 area show that water levels fell 1 to 2 feet in several wells between July 1991 and November 1991. If these changes are posted on the existing Figure 3-26 and the elevation contours are redrawn, the map remains almost identical. The existing map should remain as is, because it is a complete and relatively accurate depiction of groundwater flow in the Operable Unit 4 area.

Action: No action required.

18. Commenting Organization: Ohio EPA Commentor:
Section #: 3.5.12 Pg #: 3-63 Line #: 6 Code: c
Original Comment #:
Comment: The statement that, "no seeps have been noted recently" should be deleted. Seeps have been noted and the text should discuss the fact that an investigation of these seeps is currently being conducted.

Response: Seeps have recently been noted on the ground surface upgradient from the silos, in the drainage swale that flows west from the Pilot Plant. No seeps have been noted, recently, downgradient of the silos.

Action: The second paragraph of page 3-63 will be rewritten to read: "In the Operable Unit 4 study area, surveys have been conducted to identify seeps along Paddys Run adjacent to the silos and along small drainageways in the vicinity. No seeps have been noted along the banks of Paddys Run adjacent to the silos; however, it is likely that the fill zone located between the silos and Paddys Run would intercept any seasonal seeps,

preventing the seeps from having a visible surface expression. Seeps have been identified in the drainageway located south of silo 1, running from the pilot plant to Paddys Run. The drainageway has been noted to flow continuously. The seeps are all located upgradient of Operable Unit 4. Operable Unit 5 is currently collecting periodic measurements of the flow in the drainageway, and conducting periodic surveys of the seeps. The data are not yet available."

19. Commenting Organization: Ohio EPA Commentor:
Section #: 3.7.2 Pg #: 3-76 Line #: 14-19 Code: c
Original Comment #:
Comment: It is unclear whether Figure 3-36 presents wetlands delineation from February, 1993, or a previous delineation. The text and figure should be clarified. The most recent wetland delineation should be included in the RI. In addition, February seems to be an inappropriate time to conduct a wetlands delineation. What justification did DOE have for conducting it in February?

Response: Figure 3-36 presents a preliminary figure showing the results of the 1993 Delineation. A figure showing the final results of the delineation will be provided in the next version of the RI. The Louisville District of the Army Corps of Engineers has no provisions as to when a wetlands delineation should be conducted. In addition, the Louisville District of the Corps was consulted concerning conducting the delineation in February and their position was that if an experienced wetlands scientist was used, there should be no problem obtaining the correct results. The lead scientist on the delineation had approximately 14 years of experience and; therefore, was determined to be qualified to conduct the delineation in February.

Action: A new figure will be provided and text will be clarified as appropriate.

20. Commenting Organization: Ohio EPA Commentor:
Section #: 3.7.3.1 Pg #: 3-78 Line #: 12-18 Code: c
Original Comment #:
Comment: It should be noted that the initial study of Indiana bats on the FEMP were inconclusive due to low capture success and echolocation detector data suggesting the presence of bats from the same genus. The data suggest additional studies should be conducted to determine the bats use of FEMP property. Such information will become more important during remedy selection and design phases of all operable units.

Response: It is correct that there were problems with interpreting the data from the initial Indiana Bat survey. This will be noted in the text. Additional surveys are being implemented as a follow up to the initial survey. This will also be noted in the text.

Action: Text will be modified as appropriate.

21. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-1 Pg #: 4-4 Line #: Code: e
Original Comment #:
Comment: Neither DOE 1993(a) nor 1993(b) are included in the References section. The documents need to be added

to this section.

Response: Agree, DOE 1993(a) and DOE 1993(b) should be added to reference section.

Action: Add the background and groundwater reports to the referenced section.

22. Commenting Organization: Ohio EPA Commentor:
Section #: 4.0 Pg #: 4-7 Line #: 2-4 Code: c
Original Comment #:
Comment: Postponement of the determination of background conditions until the OU5 RI is not acceptable. Prolongin this determination could result in the under or over estimation of risk for all other operable units. Such a result could lead to an unprotective remedy and the need to change the remedy for any given OU. The potential costs of such a delay in background determination most certainly outweigh any potential benefits DOE believes may be gained.

Response: DOE agrees. Please see response to EPA Technical Comment, Specific Comment #29.

Action: N/A.

23. Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.1.2 Pg #: 4-17 Line #: 24-25 Code: c
Original Comment #:
Comment: The meaning of the sentence stating, "...7 mg/kg, significantly higher than any other constituent" is unclear considering the following sentence reports a mean concentration of 29 mg/kg of TBP which is obviously higher. Please review and revise the paragraph.

Response: Agree.

Action: The words "significantly higher than any other constituent" will be deleted from text in Section 4.1.1.2 (page 4-17, line 25).

24. Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.2 Pg #: 4-27 Line #: 16-18 Code: c
Original Comment #:
Comment: As stated in a previous OEPA comment, the initial pumping of the decant tank yielded 8000 gallons yet the second pumping yielded 8,100 gallons. The removal action required the second pumping at 80% of the tanks capacity. The document fails to discuss this discrepancy in liquid levels and volumes pumped or the implications thereof. DOE should discuss this within the text and incorporate data from the second pumpin if available at the time of revision of the RI.

Response: There is an error in the volume of water reported to be pumped from the decant sump during the 1993 maintenance action. Review of field measurements of water level in the decant sump tank reveal that the

estimated volume of material removed from the decant sump during the 1993 maintenance action was approximately 6550 gallons.

Action: Line 17 is revised to read "Approximately 6550 gallons of liquid was...."

25. Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.2.1 Pg #: 4-31 Line #: 27 Code: c
Original Comment #:
Comment: It is unclear what theory the sample results from nearby areas support. A positive hit in a downgradient well certainly doesn't support a laboratory contaminant theory. Due to the large proportion of Tc-99 and Sr-90 data which were rejected and the number of samples which were not analyzed for these radionuclides within the OU4 sampling, it is unclear how DOE believes they can conclude the results are laboratory contaminants. Sr-90 and Tc-99 are contaminants of concern for OU4 and their presence in the decant sump tank suggests either they are present within the K-65 silos or some additional migration pathway exists within the decant sump system.

Response: See response to U.S. EPA Technical Comments, Specific Comment #35.

Action: As indicated in the referenced comment response.

26. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-16 Pg #: 4-34 Line #: Code: c
Original Comment #:
Comment: The range for 4-Methyl-2-petanone is reported as 0.002-0.003 and the standard deviation as 0.007. The standard deviation is thus 7 times the range of results. The table, supporting statistics and any subsequent uses of these data should be reviewed and corrected where necessary (see chloroform also).

Response: Agree.

Action: Some of the statistics in Table 4-16 were erroneously reported. The mean and standard deviation for 4-methyl-2-pentanone will be corrected to be 0.003 and 0.0007, respectively. The mean and standard deviation for chloroform will be changed to 0.004 mg/L.

27. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.1.1 Pg #: 4-47 Line #: 18 Code: c
Original Comment #:
Comment: Appendix B.5 provides the CIS surface soil sampling data. The data include no qualifiers. Have these data been validated?

Response: CIS data was not validated for this report. This data was used for Nature and Extent discussions only and validation was not required. CIS data is being validated for use in the OU1 RI.

Action: None required.

28. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-22 Pg #: 4-49 Line #: Code: c
Original Comment #:
Comment: The table is missing data for several locations (e.g., SL-46-326, SS-46-196). The table should be revised tc include all data points on Figure 4-6.

Response: Agree, some data is missing.

Action: Missing data for SL-46-196, SL-46-326, SL-46-197, SL-46-571, SL-6-572, and SL-46-327 will be added to table.

29. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.1.1 Pg #: 4-51 Line #: 12-14 Code: c
Original Comment #:
Comment: Data from the Waste Pit Runoff RA sampling do not support the conclusion that surface soil is consistent with waste sources outside OU4. The Ra-226 concentration of 88 pCi/g suggests at least some areas of surface soil contamination are associated with OU4 activities.

Response: DOE agrees.

Action: Delete the sentence starting on line 12 and ending on line 14 of page 4-51.

30. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.1.1 Pg #: 4-51 Line #: 24 Code: c
Original Comment #:
Comment: Page 2-78, line 11 states that nine samples are included in the OU4 Study Area. DOE should review the data and text and clarify this discrepancy.

Response: Ten samples were included for inorganic and pesticide/PCB analysis.

Action: Page 2-38 has been revised to clarify the number of samples sent for analysis.

31. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-24 Pg #: 4-54 Line #: Code: c
Original Comment #:
Comment: The table should include data from location RC-162 identified on Figure 2-7. It is unclear if these data have been validated or are validatable. The text or table should be modified to state whether data have been validated.

Response: Agree.

Action: Radionuclide data from location RC-162 will be added to Table 4-24. Text will be revised to indicate the validation status for this data.

32. Commenting Organization: Ohio EPA Commentor:
Section #: Figure 4-8 Pg #: 4-56 Line #: Code: c
Original Comment #:
Comment: The figure as presented is not very useful or readable. Actual concentrations would be more useful. Additionally, the locations on this figure do not correspond to locations provided on Figure 2-7. Figures 4-8 and 2-7 should be compared to actual sampling locations and revised to be comparable.

Response: Agree.

Action: Figure 4-8 will be compared to 2-7 and erroneous sampling points will be corrected. Figure 4-8 will be upgraded to include actual U-238 concentrations observed.

33. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-25 Pg #: 4-57 Line #: Code: c
Original Comment #:
Comment: The table should be revised in accordance with Appendix B.4 (e.g., WPA15 Hg is "R", no "J" qualifiers fo Cd, Be, etc.). Additionally, footnote "c" the B qualifier does not stand for "Analyte found in associated blank" for inorganic constituents. This table should be reviewed and revised accordingly.

Response: Agree.

Action: The table will be revised in accordance with Appendix B.4.

34. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.2.1 Pg #: 4-70 Line #: 19-21 Code: c
Original Comment #:
Comment: The failure of a TCLP test can not simply be discounted by three other samples. The sample failed TCLP for three metals thus determining that the material sampled is a hazardous waste. DOE may not overlook this data point. DOE must take into account RCRA as an ARAR when addressing the berm soils. Additionally, these data suggest the berms may be a source of groundwater contamination which should be addressed in the RI.

Response: See response to U.S. EPA Technical Comments, Specific Comment #45. DOE disagrees that these soils should be classified as RCRA waste based on a single TLCP analysis. Based on the analysis for radionuclides and HSL metals, no support can be given to groundwater contamination by the berms.

Action: None planned.

35. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-29 Pg #: 4-72 Line #: Code: c
Original Comment #:
Comment: The table and summary statistics should be reviewed for accuracy and revised (See Di-n-octylphthalate Mea > Range; Toluene SD > Range). Additionally, any use of these statistics within the risk assessment shoul be reviewed and corrected as appropriate.

Response: Agree.

Action: Statistics for di-n-octylphthalate and toluene in Table 4-29 will be corrected. The mean for di-n-octylphthalate will be corrected to 0.066 mg/kg and the range for toluene will be corrected to read 0.001 - 0.2 mg/kg.

36. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.2.2 Pg #: 4-75 Line #: 6-28 Code: c
Original Comment #:
Comment: DOE can not simply discount the impacts of the TCLP results from the berm soils. The extent of inorganic contamination of berm soil is not negligible in comparison to radiological contamination with regard to the implications of the TCLP data. DOE should revise the summary to recognize the impacts of the TCLP data

Response: See response to U.S.EPA Technical Comments, Specific Comment #45.

Action: None planned.

37. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.3.2 Pg #: 4-92 Line #: 21-23 Code: c
Original Comment #:
Comment: It is unclear to which location the paragraph is referencing. DOE should review the paragraph and revise it to be more clear to the reader.

Response: This paragraph was inadvertently included in this section and should be deleted.

Action: Delete the fourth paragraph under <u>Overall Summary for Surface and Subsurface Soils</u> in Section 4.2.3.2.

38. Commenting Organization: Ohio EPA Commentor:
Section #: 4.2.3.2 Pg #: 4-92 Line #: 24-30 Code: c
Original Comment #:
Comment: DOE should revise the summary to recognize the impacts of the berm soils TCLP data.

Response: DOE will acknowledge in the uncertainty section any impacts associated with not modeling berm soil impacts on groundwater. See response to U.S. EPA Technical Comment, Specific Comment #95

Action: Add a discussion to the uncertainty section of Chapter 6.

39. Commenting Organization: Ohio EPA Commentor:
Section #: Figure 4-19 Pg #: 4-94 Line #: Code: c
Original Comment #:
Comment: The figure appears to inconsistently (highest conc. for 1616, 1033 lowest for 1615, 1617, 1034) contain data from a number of sources. DOE should footnote the figure to provide a justification for each data point selected. Additionally, no data to support the concentration of 28 ug/l in well 1032 could be found. Appendix C.3 reports total uranium concentrations of 230 and 276 for well 1032.

Response: DOE agrees that Fig. 4-19 is inconsistent in its representation of data.

Action: The figure will be revised to show the Uranium concentrations at each analyzed depth.

39. Commenting Organization: Ohio EPA Commentor:
Section #: Table 4-41 Pg #: 4-104 Line #: Code: c
Original Comment #:
Comment: Footnote "c", the B qualifier does not mean "analyte found in associated blank" when used for inorganic data. Review data qualifiers provided with data in the appendices and correct the footnote.

Response: Agree.

Action: Footnote c will be changed to read as follows:
"Reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRQL) but greater than or equal to the Instrument Detection Limit (IDL)."

40. Commenting Organization: Ohio EPA Commentor:
Section #: 4.3.2.2 Pg #: 4-113 Line #: 28-31 Code: c
Original Comment #:
Comment: DOE should provide the data concerning Tc-99 concentrations in MW 2108 if referencing it to support an argument. Additionally, Tc-99 was detected in the decant sump tank liquid, which may be acting as a source of groundwater contamination.

Response: Agree. Complete analytical results for Well 2108 were inadvertently excluded from the RI appendix.

Action: Add data for Well 2108 to Appendix C.

41. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 4.3.2.2 Pg #: 4-116 Line #: 1-2 Code:
Original Comment #:
Comment: Ground water table contours should be included in the RI which illustrate the change in gradient.

Response: DOE considers that this topic is adequately covered in the Site Wide Characterization Report and can be referenced for purposes of the Operable Unit 4 RI Report. A more detailed presentation of groundwater flow will again be made as part of the Operable Unit 5 RI Report.

Action: No Further Action planned.

42. Commenting Organization: Ohio EPA Commentor:
Section #: 4.3.3 Pg #: 4-117 Line #: 11-14 Code: c
Original Comment #:
Comment: The last sentence seems to suggest that OU4 is the source of contamination in the 2000 and 3000 series wells. Whereas the last sentence is Section 4.3.2.2 suggests it is not the source. It seems data are insufficient to make a determination either way. The text of both sections should be revised to clarify whether OU4 can be ruled out as a source of this contamination.

Response: DOE intended to state the data do not suggest Operable Unit 4 as a source nor do they exclude it as a source. It can be stated if Operable Unit 4 is contributing uranium to the upper zone of the Great Miami Aquifer it can not be the only source since up gradient values are equal or greater than those values in adjacent or downgradient wells.

Action: Delete the last sentence of line 13/14 and replace with the following: "Uranium concentrations in the upper portion of the Great Miami Aquifer suggest that Operable Unit 4 is a very small or noncontributor of uranium to the aquifer since upgradient concentrations equal or exceed down gradient concentrations."

43. Commenting Organization: Ohio EPA Commentor:
Section #: 4.6.1 Pg #: 4-132 Line #: 8-9 Code: c
Original Comment #:
Comment: Tc-99 and Sr-90 were not analyzed for during the sampling of the K-65 silos, thus their presence may not be completely ruled out. The detections of Tc-99 and Sr-90 in the decant sump could possibly be from some material within the silos. The sentence should be revised to state it is not likely Tc-99 and Sr-90 are present in the K-65 silos.

Response: As discussed in Chapter 1, Tc-99 and Sr-90 are fission products. These radionuclides can only be generated in a reactor or as a result of a nuclear explosion. Their pressure at the FEMP is due to the processing of reactor returns, which was initiated at the FEMP on a limited basis in 1962.

The last K-65 slurry was added to Silos 1 and 2 in January, 1959. Following completion of K-65 processing operations at the FEMP, approximately 150 drums of radium-contaminated material, consisting of soil from the drum staging area, clean-up material and excess K-65 samples, were placed into Silo 2 in June, 1960. Use of Silos 1 and 2 was complete prior to receipt of the first reactor returns at the FEMP two years later in 1962. Since there was no physical means by which Tc-99 or Sr-90 could have been introduced into Silos 1 and 2. These radionuclides were not tested for during analysis of the silo contents.

Action: No further action is planned.

44. Commenting Organization: Ohio EPA Commentor:
Section #: 4.6.2 Pg #: 4-134 Line #: 13-24 Code: c
Original Comment #:
Comment: This summary paragraph should discuss the fact that a berm soil sample failed TCLP analyses and the potential implications of these data.

Response: Based on the agreement presented in EPA Technical Comment #45, DOE does not feel the referenced TCLP analysis is reliable. Therefore the requested statement is unwarranted.

Action: No further action is planned.

45. Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg #: 5-1 Line #: Code: c
Original Comment #:
Comment: It is unclear from review of this section, how or if the berm soil TCLP data were used in Fate and Transport modelling. The TCLP data would suggest the berm soils may provide a more significant source of some inorganic contamination to the aquifer than the K-65 silos (i.e., Average TCLP for berm soils fails for some inorganics whereas the K-65 material didn't for the same inorganics). DOE should evaluate the berm soils as a potential source of groundwater contamination. DOE may want to examine historical records concerning were berm soils originated. There were at least two separate efforts to berm the silos.

Response: See previous OEPA comments on this subject and EPA Technical Comments #45. DOE feels that this comparison (K-65 inorganics vs. Boring 1620 TCLP results) again support its assertion that the subject TCLP results are unreliable.

Action: No further action planned.

46. Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg #: 5-2 Line #: 5-7 Code: c
Original Comment #:
Comment: The text should either describe the difference between the resident farmer and the typical resident farmer or rename the typical farmer as the central tendency evaluation of the resident farmer. The text as written can result in some confusion to the reader.

Response: DOE agrees that the text as written is confusing regarding the CT or typical farmer and the RME farmer, largely because of inconsistency in the use of terms. The differences between the CT and RME on-property resident farmer receptors are described in Section D.3.1.4.3.

Action: The document was revised to clarify that the typical and the RME farmers are described only as the CT on-property resident farmer and the RME on-property resident farmer, respectively.

47. Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg #: 5-2 Line #: 28-29 Code: c
Original Comment #:
Comment: The tables do not include UTL values as stated in this sentence. The tables or the text should be corrected to correspond.

Response: Agreed.

Action: On page 5-2, lines 28 and 29 of the RI the sentence should read: "Summary statistical parameters tabulated in these tables include mean and UCL site-related values."

48. Commenting Organization: Ohio EPA Commentor:
Section #: 5.2.3 Pg #: 5-9 Line #: 6-8 Code: e
Original Comment #:
Comment: DDT is not degraded to dichloroethene and dichloroethane. Correct the text to reference dichlorodiphenyldichloroethene and dichlorodiphenyldichloroethane.

Response: Agree. The text will be changed as indicated.

Action: Replace dichloreothene and dichloroethane with dichlorodiphenydichloroethene and dichlorodiphenuldichloroethane in the referenced sentence.

49. Commenting Organization: Ohio EPA Commentor:
Section #: 5.3.3.2 Pg #: 5-14 Line #: Code: c
Original Comment #:
Comment: DOE must discuss in this section the reasoning for not considering the liquid within the decant sump tank as a leachate sample for the K-65 silos in fate and transport modelling. Additionally, the liquid within the decant sump tank could be considered as leachate B given the fact that the tank resides within the saturated zone. DOE fails to address the decant sump tank as preferential migration pathway for leachate into the ground water.

Response: DOE considered the use of decant sump liquid as a source term for fate and transport modeling of releases from the K-65 Silos. DOE agrees that the reasoning for its exclusion should be discussed in this section. In reality, DOE did use a modified pathway for assessing the risk to a drinking water receptor in the perched water scenario. In this scenario the leachate from the K-65 Silos is assumed to travel directly to the perched groundwater without geochemical interaction with the soil.

Action: Add the following to the end of line 34 on page 5-14:
"DOE considered use of the K-65 Decant Sump liquid as representative of K-65 leachate in fate and transport modeling. Its use was discounted since its representativeness was questionable. This is primarily due to the sampling methods employed in the collection of the sample a transport tanker instead of from the sump directly."

50. Commenting Organization: Ohio EPA Commentor:
Section #: 5.3.3.2 Pg #: 5-14 Line #: Code: c
Original Comment #:
Comment: The section fails to discuss the berm soils as a source of contamination and the use of TCLP data for fate and transport modelling. The berm soils as a source of contamination should be addressed.

Response: The issue of the modeling of the berm soils as a source of contamination is discussed in response to U.S. EPA Technical Comments - Specific Comment #45. DOE feels that the soils used in construction of the berms was uncontaminated material and that no significant migration of contaminants from the silos has occurred. For purposes of the baseline risk assessment, even if the TCLP results were not discounted as anomalous, the contribution to a groundwater receptor from the silo berms is insignificant in comparison to that contribution of the K-65 Silos.

Action: Insert the following in line on Page 5:
"The berm soils have not been demonstrated, in sampling results, to contain significant concentrations of any constituent of potential concern when compared to the silo source term. For this reason the berm soils were not included as a source of any constituents for groundwater transport modeling."

51. Commenting Organization: Ohio EPA Commentor:
Section #: Table 5-2 Pg #: 5-23 Line #: Code: e
Original Comment #:
Comment: The footnotes "b" and "c" appear to be mixed up within this table. The footnotes should be corrected.

Response: Footnotes "b" and "c" were revised in the table.

Action: The footnotes will be corrected.

52. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 5.4.3 Pg #: 5-29 Line #: Code:
Original Comment #:
Comment: How will the results of the ground water modeling be affected by the current ground water model update efforts? The predictions presented in this section could be changed significantly, depending upon the characterization of colloidal transport and attenuation at the site.

It is the opinion of Ohio EPA that the ground water model results cannot be used until the model update project is completed and approved.

Response: The current efforts towards updating the groundwater model for the FEMP concentrate on the solute transport model. The OU4 RI fate and transport results are heavily linked to the flow portion of the solute transport model, but are only loosely dependent on the solute transport portion. Since future source terms are developed based on seepage modeling from the silos, prior source terms used by the model to calibrate to present day conditions do not affect the results of the fate and transport analysis. Thus, changes to the solute transport portion of the groundwater model do not influence model predictions for fate and transport.

Action: None necessary.

53. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: 5.4.3 Page: 5-31 Line: 34-36 Comment Code: C
Comment No.

Comment: There appears to be a discrepancy in the volume flux calculations. It is difficult to verify the calculations as the area is not reported. Using the lower reported value of hydraulic conductivity the back-calculated area is 1.25×10^6 ft^2. The area for the lower conductivity is 6.27×10^5 ft^2. These differ by a factor of two. Furthermore, if one assumes the cross-sectional area for flow is 2000 feet wide, the height is calculated to be an unrealistic 625 feet.

Response: The values for volume flux given in the text are incorrect. Using a cross sectional area of 4000 ft^2 for the sand lens underneath the silos, the volumetric flow rates are 0.0057 to 57 ft^3/min for hydraulic conductivities of 1×10^{-5} and 1×10^{-1} cm/s respectively.

Action: Correct values stated in the text and state the sand lens area, 4,000 ft^2.

54. Commenting Organization: Ohio EPA Commentor:
Section #: Figure 5-6 Pg #: 5-32 Line #: Code: c
Original Comment #:

Comment: It is interesting to note that this is the second OU RI report that DOE has submitted predicting relatively minor impacts on the Great Miami Aquifer from sources within the OU, yet significant ground water contamination exists beneath and beyond the facility. Hopefully, DOE is not heading down a path that will result in the OU5 RI pointing out sources of ground water contamination that were discounted in previous RI reports and respective RODs.

Response: The commentor will be interested in the upcoming RI report for Operable Unit 1 which demonstrates curren impacts on the aquifer. The commentor should note that future impacts on the Great Miami Aquifer are predicted.

Action: No further action planned.

55. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: 5.4.4.3 Page: 5-35 Line: 30 Comment Code: C
Comment No.

Comment: The statement that "uranium loading concentrations from Silos 1 & 2 are only one order of magnitude higher than those for Silos 3" does not appear to be consistent with the "maximum loading concentration" presented in Tables 5-5 and 5-6. The ratio appears to be two orders of magnitude greater for Silos 1 & 2.

Response: Agree. The sentence should read two orders of magnitude.

Action: Change text to read:

"The uranium loading concentrations for Silos 1 and 2 (K-65 Silos) are two orders of magnitude higher than those for Silo 3."

56. Commenting Organization: Ohio EPA Commentor:
Section #: 6.4 Pg #: 6-5 Line #: 16-18 Code: e
Original Comment #:
Comment: Neither EPA 1992b nor EPA 1992c are included in the Reference section. The Reference section should be revised.

Response: The reference for IRIS is currently U.S. EPA, 1991c; the reference for the Health Effects Assessment Summary Tables is currently U.S. EPA, 1992b.

Action: The reference for IRIS was updated to 1993; the reference for the Health Effects Assessment Summary Tables was revised to include the acronym "HEAST" and to include the November, 1992 Supplement.

57. Commenting Organization: Ohio EPA Commentor:
Section #: Table 6-1 Pg #: 6-6 Line #: Code: c
Original Comment #:
Comment: Numerous errors occur within this table. Risks don't equal the addition of constituents within Appendix D.5 from table therein (e.g., OPRF = 9.7×10^{-7} Table D.5-10 = 1.0×10^{-6}, etc.). Total risks don't equal sum of rad risk and chem risk from within Table 6-1 (e.g., OPUSW 10^{-8} + 10^{-7} = 10^{-3}?, etc.). Sums aren't as reported in Appendix D.5 (e.g., TC HI = 0.48 Table D.5-1 HI = 0.12, etc.). Source of some values are not identifiable within Appendix D.5 (e.g., TC Rad risk 2.4×10^{-1}, chem risk 4.1×10^{-4}, HI 32.2, etc). The number of basic errors within this table raises concerns about all calculations in the risk assessment. DOE should review the calculations used in this table and in the risk assessment and correct as appropriate.

Response: As noted in other comment responses, DOE plans a revision of the reporting/summary tables for the baseline risk assessment. Clarification of the tables should assist the reader in evaluating the potential risks from Operable Unit 4.

Action: Revise tables as appropriate.

58. Commenting Organization: Ohio EPA Commentor:
Section #: 6.5.1 thru 6.5.5 Pg #: 6-7 to 6-8 Line #: Code: c
Original Comment #:
Comment: These sections should be revised in accordance with Table 6-1 and any corrections to Appendix D.5.

Response: These sections of the RI are being revised to reflect all corrections to the baseline risk assessment in Appendix D.

Action: Revise of the risk characterization results in Sections 6.5.1 to 6.5.5 of the RI.

59. Commenting Organization: Ohio EPA Commentor:
Section #: 6.6.3 Pg #: 6-9 to 6-11 Line #: Code: c
Original Comment #:
Comment: DOE should incorporate the corrections discussed within this section into the revision of the RI and Baseline Risk Assessment.

Response: The additional considerations identified in Section 6.6.3 and their impacts discussed in Attachment D.III to the risk assessment are incorporated into the RI and Appendix D.

Action: Incorporate these additional considerations in the revision of the RI and Appendix D, delete Section 6.6.3 from the RI, and delete Attachment D.III from Appendix D.

59. Commenting Organization: Ohio EPA Commentor:
Section #: 7.2.2 Pg #: 7-4 Line #: 31-32 Code: c
Original Comment #:
Comment: Previous discussions within this document suggested infiltration was the source of Tc-99 and Sr-90. These data were subjected to validation and were not rejected or qualified during validation. DOE can not simply discount data, which does not easily fit into their vision of the OU, as laboratory problems. DOE should revise the text.

Response: DOE stands by the statements made in the response to EPA Technical Comment #35.

Action: No additional action is planned.

60. Commenting Organization: Ohio EPA Commentor:
Section #: 7.3.2 Pg #: 7-7 Line #: 15-32 Code: c
Original Comment #:
Comment: The section fails to discuss TCLP data from the berm soils. DOE should incorporate a discussion of these data into the section.

Response: See response to comment #59.

Action: No additional action is planned.

61. Commenting Organization: Ohio EPA Commentor:
Section #: 7.4.3 Pg #: 7-12 Line #: Code: c
Original Comment #:
Comment: The section should be revised upon review/correction of the Appendix D.5 and Table 6-1.

Response: DOE notes this comment and will take action as necessary.

Action: Revise Section 6 to the extent Appendix D is revised.

62. Commenting Organization: Ohio EPA Commentor:
Section #: Table 7-1 Pg #: 7-13 Line #: Code: e
Original Comment #:
Comment: Revise per comment on Table 6-1.

Response: DOE notes this comments and will review/correct the table following changes to Appendix D.5 and Table 6-1.

Action: Revise Table 7-1.

63. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.2.-1 Pg #: D-2-2 Line #: Code: c
Original Comment #:
Comment:

a) What subsurface soil samples were used from the waste pit runoff sampling? These data were for surface soils down to two feet. DOE should clarify the use of waste pit runoff sampling.

b) Which berm soil samples were excluded from use in the baseline risk assessment? Table D.2-5 does not include higher concentrations of radionuclides detected in the berm soil sampling (See pg. 4-134, line 20).

Response:

a) Samples numbers used from the waste pit runoff sampling effort are identified in Figure D.2-2 on page D-2-6, and are mentioned in Section D.2.1.1.3. These data are included as they represent samples taken between 0 and 2 feet depth within the study area. While it is uncertain what the exact depth of each sample is, they provide a reasonable assessment of surface soil conditions.

b) Table D.2-5 does not include the data discussed on page 4-134 line 20 because, as discussed on page 4-134, those results are likely to represent soil that is not part of the berms, which is not subject to surface soil exposure pathways.

Action: No text change is required.

64. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.2-2 Pg #: D-2-12 Line #: Code: e
Original Comment #:
Comment: Beryllium should be footnoted with a "g".

Response: Agreed.

Action: Footnote "g" was applied to beryllium.

65. Commenting Organization: Ohio EPA Commentor:
Section #: Figure D.3-2 Pg #: D-3-3 Line #: Code: c
Original Comment #:
Comment: Footnote (5) states soils were not included as a source term for ground water modelling. The TCLP data from the berm sampling suggests the berm soils should have been used in the ground water modelling. DOE should evaluate the potential impacts of the berm soils on ground water.

Response: The potential impact of the berm soil, particularly in comparison to the potential impact of the silo materials themselves, is minor as discussed in the conceptual model. Thus, the berm soil is not included as a source term in groundwater transport modeling. The noted TCLP data represents only a single sample, which is not consistent with other TCLP sample results for the berm soil.

Action: No text change is required.

66. Commenting Organization: Ohio EPA Commentor:
Section #: D.3.1.1. Pg #: D-3-4 Line #: 27-28 Code: c
Original Comment #:
Comment: The completion of the removal action on the decant sump does not render it a minor potential source term. In effect the removal action had no effect on the long term action of this unit as a source. The sump has refilled and continues to have the potential to be a source to ground water. The sump will continue to collect leachate from the silos and potentially allow this leachate to migrate to ground water so long as the silos are in place. DOE should evaluate the decant sump tank as a potential source of Leachate B in modelling of ground water contamination.

Response: The impact of leachate from the K-65 material (such as might be found in the decant sump tank) is quantitatively evaluated for exposure of the RME on-property resident farmer consuming perched water contaminated by the leachate as drinking water. Also see responses to Ohio EPA Comment #2 and #49.

Action: Revise the sentence on page D-3-4 lines 27 and 28 to read:
"Completion of this removal action temporarily eliminates the decant system as a potential source term; however, the impact of leachate directly from the K-65 material on the perched water in the vadose zone is quantitatively evaluated for exposure of the RME on-property resident farmer consuming perched water as drinking water."

67. Commenting Organization: Ohio EPA Commentor:
Section #: D.3.1.1.2 Pg #: D-3-6 Line #: 1-4 Code: c
Original Comment #:
Comment: Upon review of the berm soil TCLP data, the berm soils may have a potentially significant impact on the ground water in relation to the silos. DOE should evaluate the potential impact of subsurface soils on ground water.

Response: The potential impact of the berm soil, particularly in comparison to the potential impact of the silo materials themselves, is minor as discussed in the conceptual model. Thus, the berm soil is not included as a source

term in groundwater transport modeling. The noted TCLP data represents only a single sample, which is not consistent with other TCLP sample results for the berm soil.

Action: No text change is required.

68. Commenting Organization: Ohio EPA Commentor:
Section #: D.3.1.4.1 Pg #: D-3-13 Line #: 13-16 Code: c
Original Comment #:
Comment: The RME on-property farmer scenario does not properly evaluate the current risks of on-property grazing. A more appropriate method of incorporating the current on-property grazing would be in the off-property farmer scenario using on-property grazing under current conditions. DOE should consider a scenario other than the on-property farmer scenario for evaluation of the risks of current grazing practices.

Response: While it is true that cows currently graze on FEMP property, they do not graze on the Operable Unit 4 study area. The impact on receptors from cows potentially grazing on the Operable Unit 4 study area is quantitatively evaluated for the RME on-property resident farmer.

Action: Revise page D-3-13 lines 13 to 14 to read: "This scenario considers the risks associated with off-property use of animal products produced by cattle grazing on the Operable Unit 4 study area."

69. Commenting Organization: Ohio EPA Commentor:
Section #: D.3.1.4.2 Pg #: D-3-13 Line #: 35-37 Code: c
Original Comment #:
Comment: This scenario could incorporate current on-property grazing conditions if properly revised. DOE should evaluate the potential incorporation of the on-property grazing scenario required in the RAWPA with the off-property farmer scenario.

Response: While it is true that cows currently graze on FEMP property, they do not graze on the Operable Unit 4 study area. The impact on receptors from cows potentially grazing on the Operable Unit 4 study area is quantitatively evaluated for the RME on-property resident farmer.

Action: No text change is required.

70. Commenting Organization: Ohio EPA Commentor:
Section #: D.4.2 Pg #: D-4-15 Line #: Code: c
Original Comment #:
Comment: This section fails to provide toxicity profiles for all the contaminants of concern (e.g. cyanide, boron, numerous organic compounds). Toxicity profiles should be added for these contaminants.

Response: The introduction to Section D.4.2 states clearly that toxicity profiles are provided only for chemicals that contribute significantly to unacceptable risk, or for which toxicity issues require clarification. In addition, the RAWPA requires cancer and noncancer information for each chemical in tabular format, but does not

specify that toxicity profiles will be provided for each chemical. The RAWPA does specify that detailed toxicity information will be provided for uranium; this was done.

Action: None required.

71. Commenting Organization: Ohio EPA Commentor:
Section #: D.5.3.1.1 Pg #: D-5-5 Line #: Code: c
Original Comment #:
Comment: It is unclear as to why DOE has not added risk across pathways such as air (Table D.5-5), surface water (D.5-3), sediment (D.5-4) and soil (D.5-1). It would seem the only way to evaluate the risk to the trespassing child is to add the values in the four tables listed. DOE should clarify the summation of risks to the trespassing child under the present conditions and under the future failure of Silo 3 scenario.

Response: The risks across media to each receptor were not presented in separate tables; however, the information needed to determine the risk to each receptor across media is contained in the tables in Section D.5. New tables are added to Appendix D to present risks to each receptor summed across media.

Action: Produce and add the tables and associated text to Appendix D.

72. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.5-1 Pg #: D-5-6 Line #: Code: c
Original Comment #:
Comment:

a) DOE should provide a justification within the text for the contaminants used in and excluded from this table. The contaminants used in Table D.5-1 do not match those listed as contaminants of concern in Table D.2-5. Ra-226, Pb-210, ancenaphthylene, arsenic, benzo(g,h,i)perylene, copper, phenanthrene, and vanadium are shown as contaminants of concern but not listed in this table. Ra-228 is shown as not being a contaminant of concern in Table D.2-5 yet is included here.

b) The total chemical ILCR is shown as 6.8×10^{-5} yet when the ILCRs are added the total ILCR equals 6.5×10^{-5}. DOE should review calculations and clarify the table.

Response: The discrepancies between lists of COC's in Tables D.5-1 and D.2-5 will be resolved.

Action: Perform recalculation of risks in D.5 tables and QC COC's against tables in Section D.2.

73. Commenting Organization: Ohio EPA Commentor:
Section #: D.5.3.1.1 Pg #: D-5-8 Line #: 19-26 Code: c
Original Comment #:
Comment: DOE should clarify which table incorporates the risks due to direct radiation from silos and contaminated soils. Where is the total risk to the trespassing child, including that from direct radiation, presented?

Response: The risks from direct radiation from the intact silos are added to the tables presenting risks from the silo

structural failure scenario with the notation that these risks are separate from and not in addition to the risks in those tables.

Action: Revise tables with silo structural failure scenario to also present separately the direct radiation risk from the silos when they are still intact.

74. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.5-2 Pg #: D-5-9 Line #: Code: c
Original Comment #:
Comment: The number of contaminants in the risk calculations decreased from Table D.5-1 to D.5-2. It would seem rational that the trespassing child would still be exposed to the contaminants present in the soil but with the addition of contaminants present in the Silo 3 material. DOE should clarify this in the text.

Response: The receptor will no longer be exposed to the contaminants in the surface soil under the silo structural failure scenario addressed in Table D.5-2 because the scenario assumes that the contents inside Silo 3 spread out over and cover the surface soil. Thus, the soil is no longer available for exposure.

Action: No text change is required.

75. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.5-3 and D.5-4 Pg #: Line #: Code: c
Original Comment #:
Comment: See previous comments concerning Tables D.5-1 and D.5-2.

Response: The approach presented in response to comment 74 applies here regarding the source term available for surface water erosion for Table D.5-3 (soil for silo intact scenario and Silo 3 material for silo failure scenario). Table D.5-4 addresses receptor exposure to contaminated sediment. The assumed means of sediment contamination is from seepage of perched water into Paddys Run from beneath the silos. The perched water is in turn assumed to be contaminated by the silo material source terms. Thus, assumed routes of contaminant transport are different in Tables D.5-3 and D.5-4.

Action: No text change is required.

76. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.5-6 Pg #: D-5-22 Line #: Code: c
Original Comment #:
Comment: a) See previous comments concerning contaminants of concern on Table D.5-1.

b) Addition of the chemical ILCRs presented equal 7.4×10^{-5} compared to the 7.1×10^{-5} reported. DOE should justify this discrepancy.

Response: a) The discrepancies between lists of COC's in Section D.5 tables and Section D.2 tables will be

resolved.

b) The discrepancies in risk sums will be resolved.

Action: Perform recalculation of risks in D.5 tables and QC COC's against tables in Section D.2. Recalculate risk sums and QC sums in Section D.5 tables.

77. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.5-10 Pg #: D-5-33 Line #: Code: c
Original Comment #:
Comment: Addition of the chemical ILCRs presented equal 1.0×10^{-6} compared to the 9.7×10^{-7} reported. DOE should justify this discrepancy.

Response: The discrepancies in risk sums will be resolved.

Action: Recalculate risk sums and QC sums in Section D.5 tables.

78. Commenting Organization: Ohio EPA Commentor:
Section #: Figure D.7-1 Pg #: D-7-6 Line #: Code: c
Original Comment #:
Comment: Upon review of Figures E-2-10 thru E-2-15 it would seem the off-property resident maximum receptor via ground water should be located off the east-southeast corner of the property. The figure and any subsequent risk assessment calculations should be revised to place the receptor at the maximum ground water concentration.

Response: The figure is revised.

Action: Revise Figure D.7-1 to place the location of the off-property resident maximum receptor via the groundwater pathway off of the east-southeast corner of the FEMP property, consistent with the depiction of groundwater transport modeling results presented in Appendix E, Figures E.2-10 through E.2-15.

79. Commenting Organization: Ohio EPA Commentor:
Section #: Table D.II-1 Pg #: D-II-1 Line #: Code: c
Original Comment #:
Comment: DOE should provide justification for not adding risks from inhalation with the risks from soil ingestion and penetrating radiation to achieve a total pathways risk.

Response: The total pathways risk is calculated as requested in the comment.

Action: Add the inhalation risk to the risk from ingestion and direct radiation to calculate the combined risk from all three pathways. Examine remaining risk and HQ tables in Attachment D.II for a similar pattern of correction.

80. Commenting Organization: Ohio EPA Commentor:
Section #: D.III Pg #: D-III-1 Line #: 26-28 Code: c
Original Comment #:
Comment: If time was available to correct the risk assessment for a contaminant that reduced overall risk, the risk assessment should have also been corrected for contaminants increasing risk. The revised RI should incorporate the revision of the text to correct for all contaminants of concern.

Response: The risk assessment was revised to account for corrected values of benzo(a)pyrene prior to transmittal to EPA. This was done because the incorrect values which were originally used for benzo(a)pyrene were "driving" the total chemical risk values in certain instances. This change was considered essential in order to provide a true reflection of those constituents which have the greatest impact upon risk.

Other constituents which were added to the list of COC's were found to have little impact on the total risk value. Based upon schedule limits, the determination was made to correct the calculations only for those constituents which resulted in a significant impact on the total risk values.

The revised risk assessment will be corrected for all COC's, regardless of their relative impact on risk.

Action: Recalculate risks to incorporate the considerations discussed in Attachment D.III. Delete Attachment D.III.

81. Commenting Organization: Ohio EPA Commentor:
Section #: E.2.0 Pg #: E-2-1 Line #: Code: c
Original Comment #:
Comment: The discussion in the ground water fate and transport modelling section does not clearly state how perched ground water concentrations were determined for the resident farmer. The section should include a discussion of this modelling effort and a table showing concentrations used.

Response: Agree. A section addressing the derivation of perched groundwater concentrations for the resident farmer from the ODAST results will be added.

Action: Add as third paragraph in Section E.2.1: "The fate and transport models were used to generate exposure concentrations via the groundwater pathway for both the on-site resident farmer and the off-site receptor. Exposure concentrations for the on-site farmer were determined from the results of the vadose zone model prior to diluting the leachate into the Great Miami Aquifer. The maximum concentration for each contaminant was used in the risk calculation. Maximum off-site exposure concentrations were taken as the maximum contaminant concentrations at the FEMP boundary during the 1000-year simulation."

82. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.5.3 Page: E-2-23 Line: 16 Comment Code: C
Comment No.
Comment: There appears to be a discrepancy between the reported net recharge flux from the help model and the seepage velocities in Table E.2-1. For example the Help model is used to calculate a recharge rate for Silos

1 & 2 of 3.99 inches per year in Table E.2-7. This converts to 3.2 x 10^{-7} cm/sec. The corresponding seepage reported in Table E.2-1 (Vadose model) is 1.25 x 10^{-6} cm/sec.

There is dilemma here. The vadose zone model (Table E.2-1) results in a calculated flux nearly equal to zone 1 (till) conductivity. In other words, the till is very close to 100% water saturation, as one would expect. But the Help model produces seepage of about 1/4 as much. This is close to the porosity. Possibly there is some confusion between Darcy and seepage flux definition?

Response: The reported valued for seepage velocities used in Table E.2-1 were derived from HELP model results but did not calculate seepage velocity by dividing by porosity. Seepage velocity was calculated as an empirical function of the percolation rate from the HELP model, the porosity, and the saturated hydraulic conductivity. The empirical formula used was as described by U.S. EPA, 1988, "Superfund Exposure Assessment Manual". Text will be added to reference this source.

Action: Add text to reference source of formula for seepage velocity.

83. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E2.5.3 Page: E-2-24 Line: Comment Code: C
Comment No.
Comment: The values chosen for porosity in layers 2 and 3 are significantly larger than reported. In particular, the values are not consistent with the vadose model (Table E.2-2). In general, the impact on the predicted transport using different values of porosity is important. The porosity affects time of arrival and concentration loading concentration and flux predictions.

Response: The reported porosity values used in the HELP model were for the wastes present in the silos and not for the glacial overburden. Thus, the values used in the HELP and ODAST models are not the same. Values used in the HELP model are based on default waste layer values used by HELP and were chosen based on their similarity in grain size and hydraulic conductivity to the wastes in the silos.

Action: None.

84. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.5.3 Page: E-2-28 Line: Comment Code: C
Comment No.
Comment: The mass loadings from Figure E.2-3 and Table E.2-8 do not appear to be consistent. From Figure E.2-3, at 320 years, the U-238 loading to the GMA is 0.01 lb/day. From Table E.2-8, the maximum concentration of U-238 is 6.69 x 10^{-2} mg/L. Thus the water flux is calculates as 1.5 x 10^{5} lb/day = 2395 ft^3/day = 12.5 gpm. Using a recharge of 3.99 inch/yr (Table E.2-7), the area is calculated as 2.62 x 10^{6} ft^2 or 1621 by 1621 feet. This area is not realistic for Silos 1 & 2.

Response: The results shown in Figure E.2-3 are from a previous result, and are incorrect. The values in Table E.2-8 are correct. The figure will be revised and the other figures checked to ensure the most recent simulation results are used.

Action: Update Figure E.2-3.

85. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.5.3 Page: E-2-23 Line: Comment Code: C
Comment No.
Comment: The time of arrival is not clear. For example, at Silos 1 & 2 the reported time of arrival is 140 years (Table E.2-8), but this is not clear from Figure E.2-3. In this figure the loading rate mid-value appears to occur at approximately 240 years. Possibly the time of arrival needs to be better defined. For convective transport (no dispersion or decay) the value is around 240 years. The report suggests that time of arrival is defined at some "breakthrough" flux, i.e. the leading edge on the breakthrough curve. This conceivably might be 140 years, but the determination of what constitutes time of arrival needs to be better defined.

Response: See comment #84. Figure E.2-3 is from a previous result and is incorrect.

Action: Update Figure E.2-3.

86. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.6.1 Page: E-2-20 Line: 34 Comment Code: C
Comment No.
Comment: The version number of the SWIFT code used, Version 2.25, is not consistent with the reference, Version 2.32 (Page E-2-61, line 22).

Response: The reference will be changed.

Action: Change SWIFT reference to read, "..., Release 2.25".

87. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2. Page: E-2-26 Line: 32 Comment Code: C
Comment No.
Comment: It is not clear how the dilution factors are developed and on what basis. For Silos 1 & 2 the dilution factor is 260, for Silo 3 the factor is 483. This is the dilution between water traveling downward through the till and unsaturated GMA and then is somehow diluted upon entering the GMA. (This is not the dilution for lateral flow in the silty-clayey sand lenses - 180 on P. 5-36 and P. E-2-53,54). Is this dilution simply the simulated concentration from the SWIFT model using the source term from ODAST? If so, then why woul the dilution factor vary between the two cases? The same SWIFT grid is used for both silo scenarios. It would appear that the predicted level of dilution would point out that the saturated model grid is extremely coarse when attempting to represent source input from the Silos. In other words, the SWIFT model accepts a mass flux from the vadose model and immediately mixes/dilutes this with 260/483 times as much water from the regional flow field. This assumes the process indeed takes place over the entire thickness of the top-most model layer thickness (40 ft?). In short, the coarse vertical discretization of the model artificially causes a significant overprediction of the local "dilution". What this means is that the saturated zone model creates excessive vertical mixing and underpredicts the extent of lateral transport.

Response: The dilution ratio calculated from Table E.2-8 and E.2-9 is based on the results of the SWIFT model. The differing ratios come from both the discretization of the model and from the results of the SWIFT model, which were only evaluated on 100 year intervals. This may account for some of the difference in dilution ratios. Given that the main purpose of the SWIFT model is to evaluate the risk to an off-site receptor through the groundwater pathway, this discrepancy directly underneath the silos will not affect the risk analysis calculations.

Action: None.

87. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.6.2 Page: E-2-34 Line: 22 Comment Code: C
Comment No.
Comment: The source area in the text (15,625 ft^2) is not consistent with Table E.2-20 where a value of 10,054 ft^2 is reported. The text appears to show the correct value.

Response: The areas shown in Table E.2-10 represents the physical area of the silos and not the modeled area, which is listed in the text. A foot note will be added to the table to explain this.

Action: Add footnotes to table: "a- Area given is based on silo footprints. b- Area of each model cell is 15,625 ft^2."

88. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2 Page: Line: Comment Code: M
Comment No.
Comment: The use of the local transport model to predict transport on a local scale is subject to significant uncertainty due to overconfidence in resolution of model details which warrant further evaluation, specifically:

- Assumption of steady-state flow conditions used to represent Paddy's Run recharge.
- Coarse approximation of the 32 in/yr recharge used along Paddy's Run.
- Coarse zonation of hydraulic conductivity distribution, with very limited site-specific field calibration data.

Response: For the purpose of evaluating groundwater pathway risk to an off-site receptor, the model is adequately detailed and calibrated. The factors listed may affect the solute transport system in the region directly around the silos, but will have very little influence, if any, on contaminant migration off-site.

Action: None.

88. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2 Page: Line: Comment Code:
Comment No.

Comment: If most of the mass is U-238 (approximately 98 percent by mass, p. E-2-34, line 30), then why is sensitivity performed using U-234?

Response: The choice to use U-234 as input for the sensitivity analysis was done based on the availability of source loading terms early on in the fate and transport modeling. U-238 was not available for use at this time and was still being modeled geochemical. As no hydrologic or geochemical difference between the isotopes exists for the fate and transport modeling, the results for both will be the same.

Action: None.

89. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.8.2 Page: E-2-55 Line: 32 Comment Code: C
Comment No.
Comment: It is not clear why in the sensitivity analysis that a doubling/halving of velocity and thickness would yield breakthrough other than exactly double/half. With no retardation and no decay, there are simply two layers in the model. Zone/Layer 1, the till has the highest residence time (probably greater than 99%) and Zone/Layer 2 is the unsaturated GMA with very fast travel or short residence time. Thus the 50% (C=50 ml/L) breakthrough for the sensitivity should exactly factors of two greater and less than the base case. Thi is indicated in the results presented in Figures E.2-23 and E.2-24. Without an explanation, the validity of the model results is in question.

Response: There are three figures dealing with sensitivity analysis; E.2-22 through E.2-24. The current figures were based upon calculations performed with an earlier version of the ODAST code. The calculations are being re-performed and the figures will be corrected.

Action: Re-run calculations using current version of ODAST. Revise figures E.2-22 through E.2-24.

90. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.8.2 Page: E-2-59 Line: 24 Comment Code: E
Comment No.
Comment: Change "co-efficient" to "coefficient".

Response: Requested change will be made.

Action: Change co-efficient to coefficient.

91. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.8.2 Page: E-2-59 Line: 14 Comment Code: C
Comment No.
Comment: The peak concentration for U-234 is reported as 2.1375 x 10^{-5} mg/L, but this does not appear to be consistent with Figure E.2-22 to 24 where a 100 mg/L is presented, nor the maximum loading concentratio presented in Table E.2-8 where a 1.049 x 10^{-3} mg/L is reported. Furthermore, the test cases are also

referenced as 100 μg/L on line 28, p. E-2-55. It appears that the sensitivity cases runs used a nominal 100 ppm or ppb source, but the conclusion and discussions are not presented clearly.

Response: The source concentration chosen for the sensitivity runs is incorrect in the text and should be 100 mg/L. This value was chosen to be of similar order to the U-238 concentrations from Silos 1 and 2, but was not set identically since the sensitivity was used for other Operable Unit fate and transport modeling at the FEMP.

Action: Change 100 ug/L to 100 mg/L.

92. Commenting Organization: Ohio EPA Commentor: GeoTrans
Section: E.2.8.2 Page: E-2-59 Line: 21 Comment Code:
Comment No.
Comment: It is not valid to conclude that the model is insensitive to porosity as sensitivity was performed using non-retarded conditions.

Response: The sensitivity analysis did vary porosity with a retarded contaminant (U-234).

Action: No action required.

93. Commenting Organization: Ohio EPA Commentor:
Section #: E.3.3 Pg #: E-3-2 Line #: Code: c
Original Comment #:
Comment: DOE should evaluate the ability of leachate to migrate via the preferential flow pathway provided by the decant sump tank. The tank resides within the saturated zone thus allowing contaminants to migrate to ground water without contacting the till.

Response: DOE did use a modified pathway for assessing the risk to a drinking water receptor in the perched water scenario. In this scenario, the leachate from the K-65 silos is assumed to travel directly to the perched groundwater without geochemical interaction with the soil. Also see responses to Ohio EPA Comment #2 and #49.

Action: Add to Section E.2.7 after first sentence: "Leachate entering the silty/clayey sand lens could be derived directly from the silos or could enter via an alternate pathway such as through the decant sump."

94. Commenting Organization: Ohio EPA Commentor:
Section #: E.3.5 Pg #: E-3-6 Line #: 17-25 Code: c
Original Comment #:
Comment: DOE should assess the potential impact upon the risk assessment and ground water modelling of using the decant sump liquid results rather than the TCLP data for the K-65 silos. Additionally, DOE should discuss the prior uses of the tank truck and any contaminants which may have been introduced by it. No reference to the failure to decon the truck is made in the Decant Sump Tank Final Report (3/93). In fact the document describes the QA/QC procedures as being met. A number of samples were collected prior to the

removal action from the decant sump itself. What justification did DOE employ to discount these data?

Response: The integrity of the decant sump analyses remain in question due to lack of knowledge on the contaminants that may have been present in the tank truck prior to filling and subsequent sampling. Although all QA/QC procedures associated with the collection of samples from the tank truck are described as being met in the Decant Sump Tank Final Report, the representative nature of the samples is questioned due to the possible presence of contaminants in the tank truck. At this time, there is no basis for stating that the decant sump analyses are representative of leachate present in Silos 1 and 2.

Action: No action required.

95. Commenting Organization: Ohio EPA Commentor:
Section #: Table E.3-1 Pg #: E-3-7 Line #: Code: c
Original Comment #:
Comment: **a)** The format of the table should be converted to standard scientific notation (e.g., 1.0×10^{-3} vs. 0.1×10^{-2}).

b) The calculation of thallium leachate A of 0.6×10^{2} exceeds all other contaminants but lead. This concentration seems to be disproportionate compared to silo contents. DOE should review the table and all subsequent modelling calculations.

Response: **a)** The format of the table will be changed to appropriate scientific notation.

b) The reported thallium concentration in Table E.3-1 is incorrectly reported as 0.6×10^{2}, the power superscript should be -2 (i.e., thallium = 0.600×10^{-2}). This typo will not affect subsequent modeling calculations as the correct concentration was used in the fate and transport modeling.

Action: **a)** Revise Table E.3-1 to change numerical presentation format from "0.100×10^{0}" to "1.00×10^{-1}". Ensure proper adjustment of exponents.

b) Revise the Leachate A concentration for thallium from "0.600×10^{2}" to "6.00×10^{-3}". Ensure proper adjustment of the exponent.

96. Commenting Organization: Ohio EPA Commentor:
Section #: E.3.6 Pg #: E-3-13 Line #: 1-5 Code: c
Original Comment #:
Comment: This paragraph references figures throughout but provides no figure numbers. The paragraph should be clarified to detail which figures are being discussed.

Response: The text is revised to refer to figure numbers.

Action: Rewrite line 1 to read: "Figures E.3-1 through E.3-19 contain theoretical ..... "Rewrite line 4 to read: "....contaminant transport in fluid medium. Finally, Figures E.3-1 through E.3-25 contain the modeling

result reported in ...."