G-000-105.31

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RESPONSES TO U.S. EPA AND OHIO EPA TECHNICAL COMMENTS ON THE SITE-WIDE CHARACTERIZATION REPORT NOVEMBER 1992

11/30/92

DOE-FN/EPA
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RESPONSES

[redacted]

G-000-105.31

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RESPONSES TO

U.S. EPA AND OHIO EPA

TECHNICAL COMMENTS

ON THE

SITE-WIDE CHARACTERIZATION REPORT

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GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
1 Original Comment # 1
Comment: The SWC does not include adequate interpretation of data. Section 4.0 of Part I includes a presentation of data (primarily in tabular form), Part II contains the risk assessment, and Part III contains the FS. However, the SWC contains no discussion of the nature and extent of contamination. As an example, the report should identify ground-water plumes, contaminant sources (to the extent practicable), and key data gaps that will need to be addresses in subsequent reports or investigations.

Response: The purpose of the SWCR is to provide a summary of FEMP site data as of December 1, 1991, rather than discuss the nature and extent of contamination at the site. The nature and extent discussions will be provided in the operable unit RI reports which will contain the validated data required for remedial action decision making. For example, groundwater plumes and contaminant sources will be identified in the RI report for Operable Unit 5. It is impractical to use the SWCR to identify data gaps because the document does not contain all the data which will presented in the RI reports, due to the data cutoff date.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
2 Original Comment # 2
Comment: The HSL (hazardous substance list) and any other analytical grouping should be defined by listing specific analytical compounds. The HSL has not been used since 1988. The Site-Wide Characterization (SWC) should be evaluated to determine whether the appropriate reference is actually the HSL or other analytical groupings such as the target compound list (TCL), target analyte list (TAL), or Appendix IX constituents.

Response: Comment noted. The approved RI/FS Work Plan (Revision 3) was finalized in March 1988 and presents the groups of analytical parameters in terms of the Hazardous Substance List (HSL) parameters. The RI/FS effort has been conducted using the Work Plan and the Sampling Plan documents which identify the constituents as HSL parameters; subsequent references to this list should continue this nomenclature for the purposes of consistency. A listing of the HSL constituents for surface water and sediment is presented in Table 3-13.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
3 Original Comment # 3
Comment: Many of the citations in the text referencing specific tables and figures do not correspond to the correct tables and figures. This is particularly evident in Section 4.0, which references tables in Section 3.0. These discrepancies should be corrected.

Response: There are some deliberate references to Section 3.0 tables in Section 4.0. The final text will be checked for any inadvertent discrepancies.

Action: Check final text for correct table and figure references.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
4 Original Comment # 4
Comment: The rationale used to determine which analyses would be performed on various media during the various studies cited is unclear. Often, similar media from identical locations were analyzed for different contaminants over time, making direct comparisons difficult (the surface water investigations provide a good example). A thorough discussion of the rationale used to determine analytical schemes should be presented for each study discussed in the report. The report should also explain whether these studies met their individual objectives; if not, then data gaps should be clearly identified.

Response: The SWCR presents data from a wide variety of sources which do not always clearly state the rationales for analyzing various contaminants or the particular objectives of the study. Further, it is not the purpose of the SWCR to determine whether the studies cited met their objectives or had appropriate rationales. The intent of the SWCR is to summarize the available data. As stated in the response to Comment 1, it is impractical to use the SWCR to identify data gaps because the document does not contain all the data which will be presented in the RI reports, due to the data cutoff date.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
5 Original Comment # 5
Comment: The description of various studies performed by U.S. Department of Energy (DOE) and its contractors does not indicate whether the DOE project plans and the subsequent reports were subject to external U.S. Environmental Protection Agency (U.S. EPA) or Ohio Environmental Protection Agency (OEPA) review or approval. This information should be provided for each report cited.

Response: The information requested will be added to the methods section in Part I, Section 3.

Action: In the first listing of each study described in Part I, Section 3, it will be indicated whether the project plan and any extant reports were subject to U.S. EPA or OEPA review or approval.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
6 Original Comment # 6
Comment: Cyanide analyses are not mentioned in many of the discussions of surface water and ground-water studies. it is not clear whether this is a simple omission or these analyses were not performed in accordance with the March 1988 quality assurance

project plan (QAPjP). If these analyses were not performed, this issue should be evaluated as a potential data gap.

Response: As stated in the response to Comment 1, it is impractical to use the SWCR to identify data gaps because the document does not contain all the data which will be presented in the RI reports, due to the data cutoff date. Section 4.2.1.5 of the approved work plan for the RI/FS program (Revision 3, March 1988) at the FEMP presents the objectives, scope, and rationale for the sampling of surface water bodies. This section of the work plan identifies the number and location of surface water and sediment samples for the RI/FS program. Table 4-3 of the work plan document explains which groups of constituents would be analyzed for each general sampling location for the RI/FS effort. The inorganic analyses were only conducted for those samples that were evaluated for extended hazardous substance list constituents. The RI/FS surface water and sediment sampling program was designed to make use of ongoing WEMCO monitoring programs; the majority of the collected samples were typically analyzed for total uranium, gross alpha, gross beta, and a full radiological analysis. The extended hazardous substance list constituent analyses, which included cyanide analyses, were only performed for a small subset of the surface water and sediment samples collected for the RI/FS program.

Cyanide was identified as an analyte that would be evaluated for a single round of sediment samples and for specifically identified surface water samples. A preliminary review of the data indicate that there were no detectable concentrations of cyanide.

Groundwater samples collected from selected monitoring wells in accordance with the RI/FS Work Plan and subsequent addenda were analyzed for cyanide. The SWCR uses the data available in the referenced reports or in the Fernald database. The cyanide analytical results of these samples are summarized in Tables 4-55, 4-61, and 4-62, and tables in Appendix M.

Action: Additional discussion of existing cyanide data will be presented in the revised SWCR where these tables are referenced.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
7 Original Comment # 7
Comment: Pages 3-90 through 3-96 were not submitted with the original report. Therefore, these pages were not reviewed. Pages 3-90 through 3-96 should be submitted.

Response: These pages contain foldout figures which were inadvertently omitted from the report and were submitted separately.

Action: Check future submissions to be sure foldout figures are included.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
8 Original Comment # 8
Comment: The titles of all figures and tables showing sampling locations should include sampling dates.

Response: Specific sampling dates are not always known for non-RI/FS data. However, as much as possible, sampling dates will be added to the titles of figures and tables showing sampling locations.

Action: Add sampling dates to figures and tables showing sampling locations wherever possible.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
9 Original Comment # 9
Comment: The adequacy of background surface water and sediment locations along the Great Miami River is suspect. The SWC often compares downstream results against background locations with higher radionuclide concentrations (refer to Table 4-11). Most background location cited in the report are directly downwind of the Fernald Environmental Management Project (FEMP). The reasons for elevated background levels are not discussed. U.S. EPA believes that a data gap is evident. The results for background samples are often higher upstream of the site than downstream; this suggests that background locations have been contaminated by the site. DOE should provide further information on the elevated background concentrations. If an upstream contaminant source is apparent, it should be identified. If the results are due to natural variation, then appropriate supporting evidence should be provided.

Response: WEMCO had an active monitoring program for surface water quality on Paddys Run and the Great Miami River in 1988 prior to the initiation of the RI/FS program. The Sampling Plan for the RI/FS stated that the existing monitoring points on the Great Miami River (3), Paddys Run (6), the Storm Sewer Outfall Ditch (1), and the Main Effluent Line at Manhole 175 (1) would be sampled quarterly for one year for RI/FS purposes. In addition, four sampling points on the Great Miami River were added by the RI/FS to augment the established monitoring points. These fifteen points were shown in the Sampling Plan (Figure 5.1, p.5-6, DOE, 1988) and were subsequently approved by the U.S. EPA. Sampling Points W1 on the Great Miami River and W9 on Paddys Run are sufficiently upstream so that surface water or groundwater from the FEMP is not entering the stream and influencing water quality at these points. This may or may not also be true of Sampling Points W5 on Paddys Run and GMR1 on the Great Miami River (Figure 3-10).

It is possible that some airborne contaminants may have been deposited in the watersheds of Paddys Run upstream of Sampling Point W9 and the watershed of the Great Miami River upstream of Sampling Point W1. However, this does not necessarily mean that this potential source has a measurable effect on water quality in those streams, particularly the Great Miami Aquifer which has a very large upstream drainage area.

In the case of Sampling Point W1, there may be other upstream sources of radionuclides unrelated to the FEMP (e.g., Mound Laboratory). Also, the data for Sampling Points W1 and W9 have not been validated. Thus, it is possible that some anomalously high values of radionuclides or other constituents in the background stream sample data may be due to errors. For example, the one high value of Tc-99

found at Sampling Point W1 in 1984 may be invalid (see Response to EPA Specific Comment #105).

Action: All of the background stream water and sediment data will be validated and thoroughly evaluated during the preparation of the Operable Unit 5 RI Report. These data will also be compared against other water quality data collected upstream (e.g., USGS data from Hamilton gaging station) in order to establish legitimate stream water and sediment background concentrations.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
10 Original Comment # 10
Comment: Instead of referencing sampling location maps in Section 3.0, Section 4.0 should include isoconcentration or data presentation maps summarizing significant data. This may not be necessary for all media, but ground-water, surface water and sediment, surface soil, and subsurface soil results should be graphically displayed. In addition, it would be appropriate to include composite maps or graphs comparing results from successive sampling rounds to evaluate possible trends over time.

Response: As stated in the response to Comment 1, it is not the intent of the SWCR to provide the detail necessary to discuss the nature and extent of contamination at the FEMP. The requested maps should be based on a complete and validated database which will be available for the operable unit RI reports, but was not available for the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
11 Original Comment # 11
Comment: Many of the data tables in the text present what appear to be incomplete lists of analytes (particularly with regard to organics). It is not clear whether the analytes presented represent only those compounds detected in a more comprehensive analytical scan or whether these analytes presented represent all compounds analyzed for during a particular sampling round (see Tables 4-19 and 4-20). This issue should be clarified for each study cited in the report.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected for the FEMP as of December 1, 1991. For the purposes of data summarization, many of the data tables for non-RI/FS monitoring efforts only present those constituents that were detected. In several instances, this level of information was equivalent to that presented in the source document. When applicable, table titles (such as those for Table 4-19 and Table 4-20) will be modified to indicate that the listed data represent the detected analytes, rather than the entire list of analyzed parameters.

Action: Modify data table titles to indicate when only detected parameters are presented, rather than the entire comprehensive set of analyzed parameters.

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Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

12 Original Comment # 12

Comment: Many of the surface water and sediment studies discussed in the report use data from sampling points whose closest downstream locations are 3 or 4 miles downstream from the FEMP. Large reaches of the Great Miami River located immediately downstream of the FEMP were apparently not studied. This should be discussed as a possible data gap.

Response: It is not the purpose of the SWCR to identify potential data gaps. A review of some of the more recent and comprehensive sampling efforts at the FEMP indicates that an appropriate Great Miami River sampling location, downstream of the confluence of Paddys Run, has usually been included as part of the program. For example, the 1986 "Interim Report" by IT Corporation used a sampling location on the Great Miami River (R-4) that was located approximately 1500 feet downstream of the Paddys Run confluence (see Figure 3-6). The 1988 "FMPC Sampling and Analysis Report" also contained similar downstream sampling locations (see Figure 3-8, sample locations 0420 and 0421). The RI/FS sampling effort included a downstream sampling point (GMR-4, Figure 3-10) that coincides with the location in the two reports identified above.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

13 Original Comment # 13

Comment: Much of the data included in the various study summaries in Section 4.0 is not presented in tables, nor is the appropriate appendix referenced. All data discussed in the report should be included in tables or appendices, and the appropriate appendices should be referenced.

Response: Some data were felt to be brief enough to be presented only in the text, rather than in tables. However, these data will be moved to tables and the tables will be referenced in the text.

Action: For studies with data presented only in the text, move the data to tables and reference them in the text.

Commenting Organization: Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

14 Original Comment # 14

Comment: The report inconsistently and routinely compares data to known standards, background values, or applicable or relevant and appropriate requirements (ARAR). For instance, for on-site and off-site ground water, contaminant concentrations are compared to maximum contaminant limits (MCL), DOE dose-related exposure limits, method detection limits, or varying background criteria for the same media. The current format seems to represent the data in a biased manner, with the method of comparing data being chosen without any apparent rationale. Specific regulatory criteria should

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be defined, the significance of these criteria should be explained, and the comparison of data should be consistent.

Response: The text will be examined and rewritten to provide consistent comparisons to reference locations and only limited ARARs, i.e. MCLs for water. Any other comparisons will be justified in the text. For example, non-RI/FS studies often compare their data to a variety of standards and the SWCR text has reproduced these comparisons.

Action: Review the text for consistent comparisons of data with reference locations and limited ARARs. Explain clearly where an inconsistent comparison has been made by a cited study rather than by the authors of the SWCR.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
15 Original Comment # 15
Comment: The report often uses annual average values instead of single rounds of ground-water data and compares these annual average values with one of the many "control" values. The use of the annual average value can be misleading because this approach ignores the potential for seasonal or transient variations in ground-water contamination. Although it may be appropriate to compare data using annual averages, the reader should be able to evaluate data for tends made apparent by seasonal sampling rounds. The report should evaluate data from individual sampling rounds and compare this data to annualized data in order to identify possible seasonal effects. The report should also compare data from successive sampling rounds to evaluate variation of contamination over time. This is important for predicting future contaminant trends, evaluating plume migration, and identifying continuing sources of release.

Response: The requested analyses and descriptions will be provided in the Operable Unit 5 RI report and are currently available in part in the Groundwater Report. It is not the intent of the SWCR to predict future contaminant trends, evaluate plume migration, or identify continuing sources of release.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
16 Original Comment # 16
Comment: Various statistical methods have been applied to the analytical data without providing the rationale for this data manipulation. The statistical methods used should be referenced and should include statistical methods published in U.S. EPA Remedial Investigation and Feasibility Study (RI/FS) and risk assessment guidance documents.

Response: Comment noted. When appropriate, a brief discussion of the rationale for the statistical methods applied to the RI/FS analytical data will be included with the appropriate EPA guidance documents and applicable references correctly cited.

Action: Brief descriptions of the statistical methods applied to the RI/FS analytical data, along with proper citation of applicable references, will be added to the text where appropriate.

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Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
17 Original Comment # 17
Comment: Isoconcentration maps specific to individual operable units should be prepared for specific target compounds and suites of compounds, including total Volatile Organic Compounds (VOC). Such maps should be prepared for the various ground-water units and for surface soil.

Response: Please see the response to General Comment 10.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
18 Original Comment # 18
Comment: The geochemistry of the subsurface media, including soils and ground water, should be discussed. The major ion and cation pairs should be evaluated for trends. For example, ground-water data should be evaluated using trilinear diagrams. Also, geochemical interaction of leachate and ground water in the subsurface soil should be discussed, particularly its relation to fate and transport of site-related contaminants.

Response: A general discussion of groundwater chemistry is presented in Section 4.1.4.4 of the SWCR.

Action: A detailed evaluation of trends, seasonal fluctuations, and geochemical interactions with other media will be presented in the Operable Unit 5 RI Report.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
19 Original Comment # 19
Comment: Many of the summaries of the various ground-water contamination studies are very limited in scope, typically describing only the average or range of concentrations detected during a given sampling round. The nature and extent of ground-water plumes associated with various waste units and operable units are rarely discussed in a coherent, easily understandable manner. Discussions based on detailed isoconcentration maps depicting the configurations of plumes over time should be included.

Response: Please see the response to General Comment 10.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
20 Original Comment # 20
Comment: Details of how background concentrations in surface soils were established should be provided in the report.

Response: Descriptions on background data sources for each medium, including surface soil, are given in Section 2.1.2, Part II. Since no site-specific background soil concentrations were available as of December 1, 1992, regional data obtained from Myrick et al. (1983) for radionuclides and Shcklette et al. (1984) for chemicals were used. However, a sampling plan for establishing the site-specific background soil concentrations has been conducted in 1992, and the results will be used in the risk assessments for subsequent operable unit RIs.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
21 Original Comment # 21
Comment: Based on the data collected, the sections discussing subsurface soils should state, whether identified contaminant sources such as Silos 1, 2, and 3 are leaking contaminants to subsurface soils.

Response: As stated in the response to General Comment 1, it is not the intent of the SWCR to provide the detail necessary to discuss the nature and extent of contamination at the FEMP. That analysis should be based on a complete and validated database, which will be available for the operable unit RI reports, but was not available for the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
22 Original Comment # 22
Comment: The migration pathways for contaminants are not well defined. In particular, the discussion of subsurface geology and hydrogeology is limited and general in nature. Cross sections should include detailed evaluations of the saturated and unsaturated horizons, particularly in areas of known contamination (the production area, the waste pit area, the K-65 silo area, the sewage treatment plant area, the south field area, and other impacted areas). The sources of contamination should be defined by detailing indicator parameters, and graphics should be provided that show the distribution of contaminants in affected media.

Response: Please see the response to General Comment 10.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
23 Original Comment # 23
Comment: The risk assessment portion of the SWC generally complies with current risk assessment guidance and provides a thorough examination and summary of both the human and environmental risks associated with the site.

Response: Agreed.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
24 Original Comment # 24
Comment: In the risk assessment, the human health risk exposure for lead in different media is determined through use of a reference dose (RfD) calculated by the authors of the document. However, the U.S. EPA Uptake Biokinetic Model (Version 0.61) is currently the only acceptable method for assessing human health risk from lead exposure. The U.S. EPA Office of Health and Environmental Assessment has determined that there may not be any safe level of exposure to lead. For this reason an RfD for lead is inappropriate. Lead should be removed from the calculation of risk by the hazard index (HI) method and should be replaced with results from the Uptake Biokinetic Model.

Response: It is acknowledged that the June 1992 work plan states that "lead toxicity will be evaluated with the EPA Uptake/Biokinetic Model. There are, however, several limitations with the use of this model. First, the Uptake/Biokinetic model is available only in draft form. Second, because a child is recognized to be the most sensitive receptor to lead, the model applies only to a child receptor from birth to seven years of age, not to any adult receptors. There are several receptor scenarios in the SWCR with an adult receptor. Finally, the model provides output in the form of blood lead levels; additional information would be needed to evaluate "risk" from this output (i.e., some measure of health risk as a function of blood lead levels).

Action: The latest available version of the Uptake/Biokinetic model (version 0.5) will be used for the child receptor in the current land use scenarios with and without access controls. For model parameters where site-specific values are not available, default parameters in the model will be used. Recognizing that the model is in draft form, blood lead levels for the child receptors will be presented in the revised Site-Wide Characterization Report and HI values deleted from the results. HI values estimated for lead will be deleted in the Site-Wide Characterization Report for adult receptor/scenarios and lead will be evaluated qualitatively.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
25 Original Comment # 25
Comment: In most instances, the total HI or cumulative cancer risk is not calculated for the total medium risk or total population or scenario risk per medium or for all media. Except for a limited number of instances, only the individual hazard quotients or cancer risk value for each analyte within a medium is provided. The absence of this information makes it difficult to assess risk for the medium or population or scenario in question.

Response: Agreed.

Action: Cancer risks and hazard quotients will be summed across all chemicals in a scenario and the sum presented in the Section 5 tables. In addition, chemicals that are major contributors to the HI and their target organ(s) will be noted for those scenarios with a total HI greater than 1.

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Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

26 Original Comment # 26

Comment: The FS portion of the SWC identifies risk-based preliminary remediation goals (PRG). Some PRGs may require remediation of contaminated media to less stringent levels than those required by ARARs. For example, in Table 2-2, the risk-based PRG for 1, 1, 1,-trichloroethane in the Great Miami River Aquifer is 0.7 milligrams per liter (mg/L). However, the MCL, which is an ARAR, is 0.2 mg/L. The report should indicate that a PRG cannot be less stringent than an ARAR unless an ARAR waiver is anticipated.

Response: Agreed.

Action: The following statement will be added to Line 29, page 2-14 of Part III: "In the event that a risk-based PRG is less stringent than an ARAR, the ARAR will be used, unless an ARAR waiver is obtained."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

27 Original Comment # 27

Comment: Section 3.0 of the FS includes final remedial technologies only in the identified Leading Remedial Alternative (LRA). It would normally be appropriate to include the screening process used to evaluate technology effectiveness, implementability, and cost. However, because the initial screening of alternatives (ISA) documents have previously provided this information, it would be appropriate to reference then and to include a summary of ISA findings.

Response: It should be noted that the title of Part III of the SWCR is "Feasibility Study Support," not "Feasibility Study." The purpose of Part III is to provide the preliminary remediation goals for the FEMP and to provide, in Section 3, a <u>list</u> of the Leading Remedial Alternatives to be used in writing the FS Comprehensive Response Action Risk Evaluations. There is no intent to define "final remedial technologies" or to screen alternative remedial actions. This will be done in the operable unit feasibility studies and proposed plans.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

28 Original Comment # 28

Comment: Section 3.0 of the FS includes the LRAs without discussing the other possible Remedial Alternatives (RA). DOE should include information on the RA screening process, specifying the entire range of RAs and the reasons for choosing the LRA.

Response: Please see the response to General Comment 27.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric

Section #: Pg. #: Line #: Code:

29 Original Comment # 29

Comment: The LRA for Operable Unit (OU) 2 assumes RCRA capping without significant treatment of wastes. Recent findings indicate that there may be hot spots within the solid waste landfill and elsewhere in Operable Unit 2 requiring in-place treatment or excavation, treatment, and disposal in the on-site aboveground disposal facility. The LRA for Operable Unit 2 should include provision for treating and disposing of wastes; closure with in-place capping may not be adequately protective of human health and the environment.

Response: The Operable Unit 2 FS Comprehensive Response Action Risk Evaluation will use the preferred alternative for Operable Unit 2, rather than the LRA. The preferred alternative will be selected based on the results of the screening process in the FS, which will be subject to EPA review. It is therefore more appropriate to defer this discussion to the Operable Unit 2 FS.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric

Section #: Pg. #: Line #: Code:

30 Original Comment # 30

Comment: The FS portion of the SWC does not meet the standard content criteria for an FS defined by U.S. EPA guidance. However, because the SWC is not meant to fulfill the scope of a site-wide FS, it would be appropriate to rename the FS and qualify the presentation accordingly.

Response: The "FS portion" of the SWCR is called "Feasibility Study Support," and has no intent to meet standard content criteria for an FS. The title seems appropriate given that the section presents preliminary remediation goals and leading remedial alternatives, both of which support the operable unit FS reports.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric

Section #: Pg. #: Line #: Code:

31 Original Comment # 31

Comment: The SWC should have consistent nomenclature. For example, Part I, Page 2-6, Line 4, and Figure 2-3, Page 2-4, use the term "Preparation Plant," but Figure 2-4, Page 2-7, and Page 2-1 refer to the same facility as the "Sampling Plant."

Response: Agreed. Text has been revised to reference the Preparation Plant rather than the "Sampling Plant".

Action: On page 2-1, line 24, replace "preparation plant" with "recovery plant" and "sampling plant" with "preparation plant". Also, on Figure 2-4, change "Sampling Plant" to "Preparation Plant".

Commenting Organization: U.S. EPA Commentor: James A. Saric

Section #: Pg. #: Line #: Code:

32 Original Comment # 32

Comment: The SWC contains a great deal of sample analytical data for radionuclides. This is particularly evident in the summary of findings from investigations predating 1988. However, it appears that there may be data gaps with respect to the amount of data available for nonradionuclides such as metals or VOCs. As an example, the soil characterization study conducted by Roy F. Weston (Weston) focused on uranium distribution. DOE should address this issue when identifying potential data gaps.

Response: As stated in the response to General Comment 1, it is impractical to use the SWCR to identify data gaps because the document does not contain all the data which will be presented in the RI reports, due to the data cutoff date of December 1, 1991. Several sampling efforts which included nonradionuclides were either incomplete or not yet entered on the RI/FS database by that date. Potential data gaps can only adequately be discussed in the operable unit RI reports.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:

33 Original Comment # 33

Comment: Throughout Section 4.0, field screening data for radionuclides is presented along with laboratory-derived data. Based on a cursory review of the data, U.S. EPA believes that there is poor correlation between the field instrumentation and laboratory analytical data. For example, results for surface water and sediment samples from the Clearwell and waste pit area often shown nondetects or background readings for field radioactivity, but total uranium and isotopic data shows elevated values. The report should discuss this issue and its possible impacts on the quality of the data, especially considering the use of field instruments for screening samples to determine whether they should be analyzed in the laboratory.

Response: The reviewer has correctly identified an apparent poor correlation between field-derived estimates of radioactivity and corresponding laboratory-derived analytical results for certain sampling efforts. In the SWCR discussion of surface water and sediment data, the reporting of analytical data is generally limited to the laboratory-derived radionuclide measurements rather than the field-derived radioactivity measurements presented in the 1988 "FMPC Sampling and Analysis Report." The field data are presented for the purposes of providing a summary of the historical non-RI/FS environmental data collected at the site and should not be directly compared to data collected under the protocol established in the RI/FS work plan. The discussion of the data was focused on the radionuclide-specific laboratory data rather than the field-derived radioactivity measurements.

Action: The following text changes are suggested:
Page 4-48, line 6. Replace the sentence that begins on this line with the following sentences: "The field measurements of radioactivity were consistently observed at background levels and it was not possible to distinguish differences in activity levels among the samples. The laboratory-derived radionuclide data for stream sediment samples indicate that the differences in sample radionuclide levels were apparently not of sufficient magnitude to be identified during the field screening measurements."

Page 4-73, line 4. Insert the following sentences immediately after the table citation on this line: "The laboratory-derived radionuclide data and the field-derived radioactivity measurements are not directly correlated. In fact, there appears to be a poor correlation between the radioactivity measured in the field and the corresponding laboratory radionuclide data."

Page 4-91, line 1. Insert the following sentences immediately after the table citation on this line: "The laboratory-derived radionuclide data and the field-derived radioactivity measurements are not directly correlated. In fact, there appears to be a poor correlation between the radioactivity measured in the field and the corresponding laboratory radionuclide data. This is particularly evident for the Pit 5 samples."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Pg. #: Line #: Code:
34 Original Comment # 34
Comment: It is evident that extensive radionuclide contamination has been identified in the perched water. The relevant data should be shown in figures. If discrete plumes can be identified they should be included on figures and discussed.

Response: The reviewer is correct that a poor correlation exists between field-derived estimates of radioactivity when compared to laboratory-derived analytical results. In the SWCR discussion of surface water and sediment data, the reporting of field data is generally limited to the laboratory-derived radionuclide measurements rather than the field derived radioactivity measurements presented in the 1988 "FMPC Sampling and Analysis Report." The field data are presented for the purposes of providing a summary of the historical non-RI/FS environmental data collected at the site and should not be directly comparable to data collected under the protocol established in RI/FS work plan. The discussion of the data was focused on the radionuclide-specific laboratory data rather than the field-derived radioactivity measurements.

Action: A sentence will be added to qualify the data from the 1988 "FMPC Sampling and Analysis Report," and identify that there would appear to be a poor correlation between the field data and the correlated laboratory data.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-6 Line #:13 Code:
35 Original Comment # 1
Comment: DOE states that the FEMP has only a slight effect on the uranium content of the Great Miami River because concentrations downstream of the FEMP discharge are only slightly greater than those upstream. U.S. EPA disagrees, noting that there is actually a twofold or threefold higher concentration in some downstream samples and that upstream concentrations are probably influenced by FEMP discharges. DOE should further support its statement or modify it appropriately.

Response: The phrase "slight effect" will be replaced with the phrase "has a measurable effect" in the cited sentence. In response to the second part of the comment, there is no

definitive evidence that airborne contamination from the FEMP has had a measurable effect on the radionuclide concentrations in the Great Miami River.

Action: The following text changes are suggested for page ES-6, lines 13-15: "Both the WEMCO and RI/FS data indicate that the FEMP has had a measurable effect on total uranium concentrations in the Great Miami River. Upstream concentrations are typically about 1 µg/ℓ, while downstream concentrations are typically in the range of 2.0 to 3.0 µg/ℓ."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-6 Line #:20 Code:
36 Original Comment # 2
Comment: This sentence states that inorganic chemical concentrations in the Great Miami River are similar upstream and downstream of the FEMP and that they only occasionally exceed water quality criteria at the United States Geological Service (USGS) station in New Baltimore. The term occasionally should be defined, and the downstream distance of the New Baltimore station should be specified.

Response: The executive summmary is presented as a broad review of the report. For additional detail, the reader is directed to the actual report text. The term "occasionally" refers to an infrequent occurrence and is used here for the purposes of summarizing the data presented in Table 4-21. An examination of that data indicates that the OEPA criterion for aquatic life was exceeded for cadmium and mercury during at least one sampling event. These constituents were only detected six and four times, respectively, out of a total of 22 analyses.

Action: A downstream distance for the New Baltimore station will be specified. The following changes are suggested for page ES-6, line 19: The phrase "only occasionally exceed" will be replaced by the phrase "cadmium and mercury infrequently exceeding".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-6 Line #:30 and 31 Code:
37 Original Comment # 3
Comment: DOE uses the terms "several milligrams/l and several times this value." These terms should be specifically defined.

Response: Comment noted.

Action: The following text change is suggested for page ES-6, lines 31-32: Replace the phrase "several times this value" with the phrase "as high as 214 pCi/g".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-7, Paragraph 3. Line #: Code:
38 Original Comment # 4
Comment: This paragraph discusses radiological constituents detected in background samples and in on-site perched ground water and the regional aquifer. The radiological constituents detected in background regional aquifer samples are not presented. This information should be included.

Response: The SWCR presents data from a wide variety of sources which do not always clearly state the rationale for analyzing various contaminants or the particular objectives of the study. Further, it is not the purpose of the SWCR to determine whether the non-RI/FS studies cited met their objectives or had appropriate rationales. The intent of the SWCR is to summarize the data available from historical as well as RI/FS investigations. Due to the cutoff date for the data, December 1, 1991, it is infeasible for the SWCR to identify data gaps. However, Section 3 of the SWCR will include a discussion of the rationale and the sampling and analytical program for the RI/FS tasks.

Action: The Objectives and Context in Section 3.1.3.8 will be replaced by the following paragraph: "The general objective and scope of the RI/FS is described in Section 3.1.1.3. The surface water and sediment sampling programs have been combined into a single Surface Water and Sediment Sampling Plan due to their similarity in objectives (RI/FS Sampling Plan, Revision 3, 1988). The objective of the surface water and sediment sampling was to characterize the extent and spatial distribution of the radiological and hazardous substances. The specific sampling objectives include:

- Identify the trend and spatial distributions of the radiological and hazardous substances in surface water along drainage pathways and discharge points that lead to Paddys Run and along Paddys Run
- Identify the extent of radiological constituents in the sediments of the Great Miami River, Paddys Run, and sources to Paddys Run
- Determine if the FEMP is a source of organics and selected inorganics to the Great Miami River and Paddys Run downstream from the FEMP.

Based on these objectives, the sampling of surface water and sediments has been conducted along the Great Miami River, Paddys Run, the storm sewer outfall ditch, the former production area, the waste storage area, and several other locations."

The first sentence of the Methods in Section 3.1.3.8 will be deleted.

The Objectives and Context in Section 3.1.4.6 will be replaced by the following paragraph:

"The general objective and scope of the RI/FS is described in Section 3.1.1.3. The field program has been designed to determine the effect that the operations and the waste disposal practices at the FEMP have had on groundwater quality. The objectives of the groundwater sampling program include identifying sources of groundwater contamination, pathways for contaminant transport, and receptors or potential receptors of the contaminants (RI/FS Sampling Plan, Revision 3, 1988)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #:ES-9, Paragraph 2. Line #: Code:
39 Original Comment # 5
Comment: This paragraph discusses on-site and off-site total uranium concentrations in surface soil; however, this data is not compared to background total uranium concentrations.

This information should be provided, and the discussion of on-site and off-site surface soil contamination should be expanded accordingly.

Response: Because there is a wide variability in the amount of uranium present in rocks and soils, it is not possible to establish a single value for background uranium. No DOE or U.S. EPA guidelines or standards have been established for uranium. U.S. EPA and DOE have agreed that cleanup activities for soils would begin at 35 pCi/g.

Action: Text will be expanded to discuss the problem of establishing a background value for uranium. The following sentence will be added at line 5: "Since no DOE or U.S. EPA guidelines have been established regarding background for uranium, U.S. EPA and DOE have agreed that clean-up activities for soil would begin at 35 pCi/g."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-9, Paragraph 3. Line #: Code:
40 Original Comment # 6
Comment: The upper range of concentrations noted for Technetium-99, 1.540 picoCuries per gram (pCi/g), should be 1,540 pCi/g.

Response: Tc-99 upper range should be 1,540 pCi/g in the text.

Action: The text will be revised at Paragraph 3, Line 16, to say: "Technetium-99 also occurred in half the waste pit samples, at 2.6 to 1,540 pCi/g.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Executive Summary Pg. #: ES-23 Line #:17 Code:
41 Original Comment # 7
Comment: This line defines earthworms as insects. "Insects" are Class Insecta. "Earthworms" belong to Class Oligochaeta. This error should be addressed.

Response: There is no intention of calling earthworms insects. Earthworms were used as surrogates for insects in the ecological assessment because bioaccumulation factors were either available for earthworms or could be assumed to be 1.0. Similar data are not generally available for insects. The text will be clarified.

Action: Page ES-23, Line 17, replace "(earthworms)" with "(using earthworms as surrogates)".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 1.2.1, Part I Pg. #: 1-5 Line #: Code:
42 Original Comment # 8
Comment: Figure 1-2. The boundaries of the burn pit are not defined. According to the figure, it appears that all areas not occupied by other pits may be part of the burn pit, which seems unreasonable. The figure and the text should be modified to clearly describe the burn pit.

Response: Agreed. The figure will be modified to define the burn pit boundaries.

Action: Add the boundaries of the burn pit to Figure 1-2.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 1.2.2, Part I Pg. #: 1-9 Line #: Code:
43 Original Comment # 9
Comment: Bullet 1. The locations of the K-65 Decant Sump Tank and the holding tanks should be shown in a figure accompanying the text.

Response: Disagree. This level of detail seems inappropriate for the SWCR. Detail on the locations of the K-65 Decant Sump Tank and holding tanks will be provided in the Operable Unit 4 RI.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 1.2.2, Part I Pg. #: 1-10 Line #: Code:
44 Original Comment # 10
Comment: Last Bullet. The locations of Plant 2/3 and the refinery referred to in the text should be clearly shown in a figure accompanying the text.

Response: Disagree. This level of detail seems inappropriate for the SWCR. Detail on the location of the Plant 2/3 refinery will be provided in the Operable Unit 3 RI.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.2, Part I Pg. #: Line #: Code:
45 Original Comment # 11
Comment: Waste Generation Section. The discussion of waste generation is incomplete and does not conform to the schematic diagram in Figure 2-4. The text discusses many waste types that are not included in Figure 2-4, and some obvious waste types are not included in the text--for instance, the K-65 silo waste. This section should discuss all significant current and past wastes. Figure 2-4 should be revised and supplemented with additional figures, if necessary.

Response: Figure 2-4 is designed to identify and represent major processing activities and not to represent all wastes generated on site. This information is developed within each operable unit remedial investigation report. For Operable Unit 3, this information is in the Operable Unit 3 Work Plan Addendum. Figure 2-4 will be revised to illustrate the K-65 waste stream.

Action: Add the K-65 waste stream to Figure 2-4.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.2, Part I Pg. #: 2-9 Line #:10 and 11 Code:
46 Original Comment # 12
Comment: An empty drum washing station is discussed. This unit does not appear on any subsequent site figure. Additional information on this unit should be provided.

Response: This facility is no longer in existence. This fact will be added to the text.

Action: On page 2-9, replace the sentence on line 10 with: "Empty drums were washed in a drum washing facility that was located near Silos 1 and 2 (NLO 1977). This facility is no longer in existence."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-10 Line #:21 Code:
47 Original Comment # 13
Comment: Table 2-1. The amounts of uranium and thorium contained in Waste Pit 3 and discussed on Line 21 do not correspond to the amounts described in Table 2-1. These discrepancies should be corrected.

Response: Agreed. According to historical information (CIS Report), the information contained in the text is correct. The entry in Table 2-1 for the amount of thorium in Waste Pit 3 does correspond to the amount stated in the text - 880 pounds. The table will be revised to reflect the text for the uranium.

Action: Change the following entries in Table 2-1: Waste Pit 3 - 248,000 pounds of uranium.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-10 and 2-11 Line #:2 Code:
48 Original Comment # 14
Comment: Table 2-1. The amounts of uranium and thorium contained in Waste Pit 4 and discussed on Page 2-11, Line 2, do not correspond to the amounts described in Table 2-1. These discrepancies should be reconciled.

Response: Agreed. According to historical information (CIS Report), the information contained in the text is correct. The table will be revised to reflect the text.

Action: Change the following entries in Table 2-1: Waste Pit 4 - 6,600,000 pounds of uranium and 136,000 pounds of thorium.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-11 Line #:1 - 7 Code:
49 Original Comment # 15
Comment: The description of Waste Pit 4 should include the thickness of the clay liner.

Response: A minimum of one foot compacted clay liner was used on the sides and bottom of Waste Pit 4.

Action: Add the following sentence on line 3 of page 2-11: "A minimum of one foot compacted clay liner was used on the sides and bottom of Waste Pit 4."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-11 Line #:8 - 17 Code:
50 Original Comment # 16
Comment: The text indicates that water flows from Waste Pit 5 to the Clearwell under gravity. Considering the fact that Waste Pit 5 and the Clearwell are 1,000 feet apart, the text should also describe the means of conveyance--for instance, whether the water flows through closed pipes or in open trenches.

Response: Water flows from Waste Pit 5 to the Clearwell through a closed pipe.

Action: Add the following to the text on line 12 of page 2-11: "...from the pit through a closed pipe to the Clearwell,..."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-11 Line #:23 - 29 Code:
51 Original Comment # 17
Comment: The text describes the burn pit. The text should state whether the burn pit is lined and covered to control runon or runoff.

Response: The burn pit is not lined, but it is covered.

Action: Add the following sentence on line 29 of page 2-11, at the end of the bullet describing the burn pit: "The burn pit is not lined, but it is covered."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.1, Part I Pg. #: 2-11 Line #:38 Code:
52 Original Comment # 18
Comment: This sentence states that sediments were removed from the Clearwell on at least one occasion, but it is not clear where the sediments were taken and how they were disposed of. This information should be provided. Also, the text should state whether the Clearwell is lined.

Response: On the one occasion noted in the text when waste was removed from the Clearwell, the wastes were transported to unspecified waste pits. The exact location is not available. The Clearwell is a settling basin and is, therefore, not lined.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.2, Part I Pg. #: 2-12 Line #:6 - 11 Code:
53 Original Comment # 19
Comment: This section discusses waste contained in the solid waste landfill, in five cells, and in an area east of the cells. the total waste volume is given as both 25,000 cubic yards and 25,000 cubic feet. This paragraph is unclear as to what units are being described and what the total volume of waste is. This discussion should be clarified. Also, the text should indicate the dimensions of the landfill and state whether it is lined.

Response: Agreed. This section and Table 2-2 have been revised.

Action: Replace the sentence beginning on line 8 of page 2-12 with the following: "The total volume of waste in the five cells is estimated to be 19,600 cubic yards with approximate dimensions of 280 feet by 175 feet and a depth of 13 feet. The Solid Waste Landfill is not lined." Table 2-2 should be revised to contain the following: "Solid Waste Landfill -40,700 feet^2 and 19,600 yards^3."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.2, Part I Pg. #: 2-12 Line #:18 - 26 Code:

54 Original Comment # 20
Comment: The text should indicate the active life of the Lime Sludge Ponds.

Response: Assuming that the commentor is asking about the active life remaining in the lime sludge ponds, please note that the South Lime Sludge Pond is inactive and the North Lime Sludge Pond is scheduled for remediation as a part of Operable Unit 2.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.2, Part I Pg. #: 2-12 Line #:20 - 29 Code:

55 Original Comment # 21
Comment: The text describes the lengths of the lime sludge ponds as the same. However, the surface areas of the two ponds are different in Table 2-2. This discrepancy should be corrected.

Response: Agreed. This section and Table 2-2 have been revised.

Action: Change the text on line 20 of page 2-12 to read: "...approximate dimensions of 125 feet by 225 feet by 5.3 feet deep, with a total volume of approximately 5500 cubic yards." Also change the text on line 28 of the same page to read: "...are 125 feet by 225 feet by 11.3 feet deep, with a total volume of approximately 11,700 cubic yards." Revise Table 2-2 to read: "South Lime Sludge Pond - 28,100 feet^2 and 11,700 yards^3; and North Lime Sludge Pond - 28,100 feet^2 and 5,500 yards^3."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.4, Part I Pg. #: 2 - 14 Line #:25 - 32 Code:

56 Original Comment # 22
Comment: The text should describe other characteristics of the silos and should provide information on the floor, liner, and leachate collection system, if any.

Response: The floor of the silos consists of a four inch layer of concrete overlying an eight inch layer of gravel containing a leachate collection system of two inch diameter slotted pipe. A more detailed description of the silos is included in Section 1 of the Operable Unit 4 Remedial Investigation Report.

Action: On line 31 of page 2-14, add the following sentence: "The floor of the silos consists of a four inch layer of concrete overlying an eight inch layer of gravel containing a leachate collection system of two inch diameter slotted pipe."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.4, Part I Pg. #: 2 -15 Line #: Code:

57 Original Comment # 23
Comment: Table 2-3. This table uses tetrachloroethylene and perchloroethylene interchangeably. the table should consistently use one compound identification.

Response: Agreed. All references to "perchloroethylene" have been changed to "tetrachloroethylene."

Action: Change the word "perchloroethylene" in Section 2 to "tetrachloroethylene" each time it appears.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3.4, Part I Pg. #: 2-19 Line #:4 and 5 Code:
58 Original Comment # 24
Comment: Settling and decanting operations are introduced here; however, the discussion is incomplete. DOE should fully discuss the decanting operation, including the Sump Decant Tank.

Response: A more detailed description of the silos is included in Section 1 of the Operable Unit 4 Remedial Investigation Report.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.4, Part I Pg. #: 2-20 Line #:33 and 34 Code:
59 Original Comment # 25
Comment: This section states that the FEMP generated RCRA D, F, P, and U wastes; however, Page 2-23, Paragraph 1, states the K wastes were also generated. This discrepancy should be addressed.

Response: K054 is no longer a RCRA-listed waste and, therefore, was not included in the October 31, 1991 facility permit application. The text has been revised.

Action: On page 2-23, line 9, insert the following: "...K-listed wastes (K054), no longer a RCRA waste, and..."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.4, Part I Pg. #: 2-23 Line #:7 - 10 Code:
60 Original Comment # 26
Comment: This section states that the liquid incinerator was used for the annual disposal of 900 pounds of K054 until its deactivation in 1986. K054 waste is no longer a listed RCRA waste. Also, it is not clear why the liquid incinerator was deactivated. This section should indicate what wastes were disposed of in the incinerator and should provide a brief summary of the historical operations of the incinerator.

Response: Disagree. This information is presented as a part of the Operable Unit 3 Work Plan Addendum and will not be included in the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.5, Part I Pg. #: 2-24 Line #: Code:
61 Original Comment # 27
Comment: This section discusses the National Pollutant Discharge Elimination System (NPDES), but it does not provide any information on discharge limitations. This information should be provided.

Response: Additional information on discharge limitations for the NPDES will be provided.

Action: Revise text to discuss discharge limitations for NPDES at the FEMP.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.5, Part I Pg. #: 2-24 Line #:22 and 23 Code:
62 Original Comment # 28
Comment: This section states that 786 kilograms (kg) of uranium were discharged into the Great Miami River in 1990. The relationship of this discharge to FEMP's allowable uranium discharge limits should be addressed.

Response: The relationship of a 1990 FEMP discharge of 786 kg of uranium into the Great Miami River to the allowable uranium discharge limits will be included.

Action: Revise text to include a comparison of the 1990 uranium discharge to the allowable discharge limits.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.5, Part I Pg. #: 2-24 Line #:24 and 25 Code:
63 Original Comment # 29
Comment: This section states that thorium and strontium were detected in the effluent at concentrations of less than three percent of the DOE guideline. It is not clear (1) whether these concentrations represent an annual average or a one-time measurement and (2) which DOE guideline is being referenced. This information should be provided.

Response: The concentrations are annual averages. The DOE guideline is DOE Order 5400.5.

Action: Replace the sentence beginning on line 24 on page 2-24 with the following: "Annual averages of thorium and strontium were detected in the effluent at concentrations less than three percent of the guidelines provided in DOE Order 5400.5 (DOE 1992)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.5, Part I Pg. #: 2-24 Line #:28 and 29 Code:
64 Original Comment # 30
Comment: This sentence states that storm water retention basin overflow is discharged to Paddy's Run during extreme storm events. The frequency of this type of discharge and a definition of "extreme" should be provided.

Response: Agreed. The text has been expanded.

Action: Replace the sentence beginning on line 28 of page 2-24 with: "The storm water retention basins are designed to contain the runoff from a 10-year/24-hour rainfall event. Rainfalls greater than this amount are considered to be extreme events. If the retention basins overflow, storm water is discharged through the storm sewer outfall ditch to Paddys Run. Overflows have occurred seven times since the basins were constructed in 1986."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.2.3, Part I Pg. #: 2-32 Line #:31 and 33 Code:
65 Original Comment # 31
Comment: This sentence states that the three Southwestern Ohio Water Company wells have a significant influence on the infiltration rate from the Great Miami River. No other information is provided. This discussion should be expanded.

Response: The Southwestern Ohio Water Company collector wells pump at an average rate of 18 million gallons per day. Spieker (1986) and Dove (1961) concluded that 60 to 76 percent of the total flow from the collector wells comes from induced recharge from the Great Miami River.

Action: Add the following to line 33 on page 2-32: "The SOWC collector wells pump at an average rate of 18 million gallons per day. Spieker (1986) and Dove (1961) concluded that 60 to 76 percent of the total flow from the collector wells comes from induced recharge from the Great Miami River."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.3.3, Part I Pg. #: 2-41 Line #:22 and 24 Code:
66 Original Comment # 32
Comment: This sentence states that ground water from the southern and southwestern portions of the FEMP flows to the south-southwest; however, Figure 2-13 indicates that the ground water in this area flows to the southeast. This discrepancy should be reconciled.

Response: Agreed. The groundwater flow is to the southeast.

Action: Revise line 23 on page 2-41 to read: "...flows to the southeast..."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.5.2, Part I Pg. #: 2-62 Line #:7 - 12 Code:
67 Original Comment # 33
Comment: These lines describe a "distinct habitat." DOE should clarify which of the habitats listed in the preceding sentence is being described.

Response: The habitat being described is in the inactive flyash pile/South Field. The text will be clarified.

Action: Part I, Page 2-62, Line 7, replace "These areas" with "The inactive flyash pile and South Field".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.5.2, Part I Pg. #: 2-65 Line #:26 and 27 Code:
68 Original Comment # 34
Comment: This sentence states that terrestrial arthropods collected at the FEMP included a few gastropods. Gastropods are grouped in the phylum Mollusca, not Arthropoda. This error should be corrected.

Response: The text will be clarified.

Action: Part I, Page 2-65, Line 27, omit "and a few gastropods". At Line 30, add to paragraph "A few gastropods were also collected during the sampling for terrestrial arthropods."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.5.3, Part I Pg. #: 2-66 Line #:29 - 31 Code:
69 Original Comment # 35
Comment: This section states that a 1980 Ohio Environmental Protection Agency (OEPA) study found that the Great Miami River was capable of supporting a healthy fish community, "thereby attaining of CWA goals." It is not clear what is meant by "attaining of CWA goals." This text should be clarified.

Response: The statement in question was made by OEPA in the referenced study and is unclear. The phrase will be eliminated from the text.

Action: Part I, Page 2-66, Lines 30-31, omit ", thereby attaining of CWA goals."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.6.5, Part I Pg. #: 2-99 Line #: 27 and 28 Code:
70 Original Comment # 36
Comment: The text indicates that the site uses ground water for industrial purposes. The specific use and classification of the site's drinking water supply should be identified. DOE should also clearly identify the site's drinking water source. The water supply wells should b identified in Figure 2-29.

Response: The wells that supply drinking water at the FEMP are located in the lower sand and gravel aquifer. The water is treated to remove minerals and "soften" the water only. Uranium concentrations are at background levels.

Action: Add the following to line 28 on page 2-99: "The wells that supply drinking water at the FEMP are located in the lower sand and gravel aquifer. The water is treated to remove minerals and "soften" the water only. Uranium concentrations are at background levels."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.1.1, Part I Pg. #: Line #: Code:
71 Original Comment # 37
Comment: Figure 3-1. The figure shows percent recovery values for samples collected from the silo. However, no scale is evident, and in some cases this is misleading. For instance, the bar graph for samples NW-1 and NE-1 seems to indicate that 100 percent recovery was accomplished; however, only 35 and 28 percent recovery, respectively, was achieved. This figure should be modified to show a scale for percent recovery.

Response: Agreed.

Action: The figure will be edited to depict a more reasonable scale for percent recovery. While the cores will not be to scale, the cores showing 35 and 28 percent recovery will show adequate areas of nonrecovery so the reader is not led to believe 100 percent recovery was accomplished.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.1.2, Part I Pg. #: 3-8 Line #:3 - 10 Code:
72 Original Comment # 38
Comment: This paragraph states that the contents of some tanks were agitated before sampling but that the contents of others were not. The rationale for these different sampling procedures should be provided.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. It is not the purpose of the SWCR to evaluate the usefulness or rationales of previous sampling efforts at the FEMP.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.1.2, Part I Pg. #: 3-10 Line #:4 -11 Code:
73 Original Comment # 39
Comment: This paragraph mentions the types of analyses performed on tank samples from various locations. The rationale for performing the various analyses is not provided. This information should be included in the discussion.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. It is not the purpose of the SWCR to evaluate the usefulness or rationales of previous sampling efforts at the FEMP.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.1.3, Part I Pg. #: 3-13 Line #:3 -5 Code:
74 Original Comment # 40
Comment: This section states that Pb-210 was considered an indicator for radioactive contamination in soil and ground water because it is s stable breakdown product of Ra-226, which is itself a breakdown product of U-238. The usefulness of Pb-210 as an indicator of radioactive contamination in soil and ground water is questionable because of (1) the negligible volume or percentage of Pb-210 expected to be in soil or ground water as a result of the radioactive decay of U-238 and (2) the differences in chemical mobility between Pb-210, U-238, and Ra-226. The discussion of the rationale for using Pb-210 as an indicator for radioactive contamination should be expanded further in the report.

Response: Throughout the course of silo sampling, one important assumption was made: Ra-226 and Pb-210 were considered to be the indicators for radioactive contamination present in soil and groundwater that had originated from the K-65 silos. Ra-226 is a decay product of U-238. The half-life of U-238 is 4.468 x 10^9 years; therefore, the production rate of Ra-226 from the refined uranium product would be relatively low. The uranium refining process at the FEMP removed most impurities from the uranium ore, including Ra-226. These impurities were contained in the hot raffinate solutions sent to the K-65 waste storage silos. The presence of Ra-226, which has a half-life of approximately 1600 years, and Pb-210 is expected to be limited to the K-65 silos. The

highest concentrations of Ra-226 would be expected to appear in the silo contents or in material originating from the silos.

Action: The text will be expanded to clarify the rationale for using Pb-210 and Ra-226 as indicators of radioactive contamination in the soils surrounding the K-65 silos. Lines 3-5 will be replaced with: "The uranium refining process at the FEMP removed most impurities from the uranium ore, including Ra-226. Since these impurities were contained in the hot raffinate solutions sent to the K-65 Silos, the presence of Ra-226 and Pb-210, a stable breakdown product of Ra-226, is expected to be limited to the silos. Consequently, Pb-210 was considered an indicator for radioactive contamination present in soil and groundwater which originates from Silos 1 and 2."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.2, Part I Pg. #: 3-14 Line #:18 and 19 Code:
75 Original Comment # 41
Comment: This sentence states that the air pathway is considered to have the greatest potential for off-site exposure of the public. A comparison to the exposure potential from ground water should be provided to support this statement.

Response: This sentence will be eliminated.

Action: Part I, Page 3-14, Lines 18-19, omit "For these reasons...public."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.2.1, Part I Pg. #: 3-15 Line #:2 - 4 Code:
76 Original Comment # 42
Comment: This section states that substances such as nitric acid have been released to the atmosphere in relatively small amounts but that these substances are not monitored. Because of the large quantities of nitric acid used in various production processes and the lack of monitoring data, it is unclear how this statement can be made. This matter should be further explained.

Response: The statement that "relatively small amounts" of the mentioned substances were released to the atmosphere is based on the amounts FEMP reported to EPA (Forms R), which is required under the Superfund Amendments and Reauthorization Act of 1986.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.3.2, Part I Pg. #: 3-22 Line #:30 and 31 Code:
77 Original Comment # 43
Comment: This sentence mentions an unnamed ditch that drains the south area of the K-65 silos; however, this ditch is not shown in Figure 3-6 or 3-7. This omission should be addressed.

Response: Agreed. The ditch will be added to Figure 3-7.

Action: Add the ditch that drains the south area of the K-65 Silos to Figure 3-7.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 3-24 and 3-25 Line #: Code:
78 Original Comment # 44
Comment: Table 3-6. Footnote d indicates that $Na_2S_2O_3$ was used as a preservative for organic samples only if residual chlorine was present; however, Table 3-6 does not indicate that residual chlorine was tested for. This discrepancy should be clarified.

Response: Comment noted. In the RI/FS QAPjP, footnote "d" is presented as "(d) will only be used in the presence of residual chlorine. Sodium thiosulfate is only proposed as a sample preservative for HSL organics when residual free chlorine is known to be present. Sodium thiosulfate will be omitted in all other cases." This footnote would appear to indicate that the use of sodium thiosulfate as a preservative would occur only in those instances when residual free chlorine was already known to exist in the sampling medium.

Action: The following text addition is suggested to supplement the existing footnote "d," Table 3-6, page 3-25: "Sodium thiosulfate is only proposed as a sample preservative for HSL organics when residual free chlorine is known to be present. Sodium thiosulfate will be omitted in all other cases."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
79 Original Comment # 45
Comment: Table 3-8. The detection limits listed for metals in water are often above MCLs (100 grams/liter for barium in water), and in many cases, the detection limits for metals in soil are extremely high. The usefulness of such data is questionable. This data should be evaluated and, if necessary, appropriately qualified. Also, the method "Exhibit D" for several parameters cannot be identified, and its associated reference (13) is not listed in the footnotes. DOE should clarify and complete the table.

Response: Comment noted. During the final printing of Table 3-8, the mu symbol (μ) for micrograms per liter was inadvertently truncated, resulting in a unit of g/ℓ. The detection limits should be stated in μg/ℓ and Table 3-8 will be revised to indicate the appropriate units.

Action: Table 3-8 will be revised to indicate μg/ℓ instead of g/ℓ for the various detection limits, as appropriate.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
80 Original Comment # 46
Comment: Figures 3-8 and 3-10. These figures show surface water and sediment sampling locations on the Great Miami River and Paddy's Run. It is unclear why downstream sampling locations were placed so far from the FEMP (about 4 miles downstream from the FEMP outfall on the Great Miami River with no sampling locations between the off-site, upstream location and the downstream perimeter of Paddy's Run). The rationale for the selection of these sampling locations and a discussion of the usefulness of the analytical data should be provided.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected for the FEMP as of December 1, 1991. It is not the intent of the SWCR to evaluate the usefulness or the rationale of the previous sampling efforts at the FEMP. The pre-RI/FS sampling points for the Great Miami River coincided with three bridges that crossed the river: at a point upstream of the FEMP near Ross, Ohio (W1), at a point downstream of the effluent line, but upstream of the confluence with Paddys Run, near New Baltimore, Ohio (W3), and at a point downstream of the Paddys Run confluence with the Great Miami River (W4). The effluent was monitored at point W2, which coincided with Manhole-175. The RI/FS program added four new sampling locations (GMR1, GMR2, GMR3, and GMR4) to the Great Miami River to supplement the previously established sampling locations (W1, W3, and W4).

The RI/FS program was designed to supplement the existing monitoring network so that potential radionuclide or chemical inputs to the Great Miami River (i.e., the FEMP effluent line, Paddys Run, and the storm sewer outfall ditch) were adequately monitored to evaluate water quality impacts of the FEMP.

Action: Revise the text as follows:
Page 3-38, line 9. Add these sentences after the table and figure call out: "The FEMP environmental monitoring program sampling points for the Great Miami River coincided with three bridges that crossed the river. Sampling point W1 was upstream of the FEMP, at a bridge near Ross, Ohio. Sampling point W3 was located at a bridge near New Baltimore, Ohio that was downstream of the FEMP effluent line and upstream of the confluence with Paddys Run. Sampling point W4 was located at a bridge near Miamitown, Ohio and at a point approximately five miles downstream of the Paddys Run confluence with the Great Miami River."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
81 Original Comment # 47
Comment: Table 3-10. Footnote a in this table states that sampling locations are shown in Figure 3-7, but sampling locations are actually shown in Figure 3-10. This discrepancy should be addressed.

Response: Comment noted.

Action: Footnote "a" of Table 3-10 (page 3-39) will be modified to correctly identify Figure 3-10 as the appropriate figure where the locations of the sampling points are presented.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.3.4, Part I Pg. #: 3-46 Line #:23 and 31 Code:
82 Original Comment # 48
Comment: Line 23 states that water and sediment samples were collected from the wet pits (Waste Pits 5 and 6 and the lime sludge ponds); however, Line 31 states that surface water samples were collected from waste pits 4, 5, and 6 and the clearwell. This discrepancy should be addressed.

Response: Comment noted. The statement in line 23 (page 3-46) is a stated objective of the sampling program. The statement on lines 29 through 32 is a description of the collected data, as presented in Table 3-11.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 3-47 Line #: Code:
83 Original Comment # 49
Comment: Table 3-11. The title of this table should provide the sample collection date. Also, the second entry in this table states that samples were collected in water 1 to 15 feet deep using a Wheaton sampler at a depth of 6 inches. This statement is confusing and should be clarified.

Response: Sampling dates will be added to tables whenever possible. Regarding the second entry in the table ("Samples were collected in water 1 to 15 feet deep, using a Wheaton sampler to obtain the sample at a depth of 6 inches); this text is presented exactly as it was stated in the source document. It would appear that the description of the water depth (stated as 1 to 15 feet) refers to Pit 5 in its entirety. The actual depth of sample collection was stated as six inches.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.3.5, Part I Pg. #: 3-49 Line #:24 - 34 Code:
84 Original Comment # 50
Comment: The rationale used to select specific analyses for drainage ditch and manhole water samples is unclear. Further discussion of this matter should be provided.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected for the FEMP. It is not the intent of the SWCR to evaluate the usefulness or the rationale of the previous sampling efforts at the FEMP. When possible, the planning documents and related quality assurance documents prepared for these various investigative programs are referenced for this information.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
85 Original Comment # 51
Comment: Figure 3-16. The lines in the legend denoting the production area boundary and the FEMP boundary are incorrect. These errors should be addressed.

Response: Agree. The line patterns in the figure used to denote the Production Area boundary and the storm sewers within it are very similar and cause confusion. Also, "FEMP Boundary" and a line pattern to denote the boundary appear in the legend, but the figure is of such a large scale that the FEMP boundary does not show up at all.

Action: Delete "FEMP Boundary" from the legend and the corresponding line pattern. Replace the existing line patterns used to denote the Production Area boundary and the storm sewers with more distinct line patterns. Add "Storm Sewer Locations" to the legend along with the corresponding line pattern.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.3.8, Part I Pg. #: 3-54 Line #: Code:
86 Original Comment # 52
Comment: This section describes the analyses performed on surface water samples. The analyses did not include tests for VOCs, semi-volatile organic compound (SVOCs), pesticides, or polychlorinated biphenyls (PCB). The rationale for not performing organic analyses on all samples should be discussed.

Response: Section 4.2.1.5 of the approved work plan for the FEMP RI/FS (Revision 3, March 1988; approved by the U.S. EPA in May 1988) presents the objectives, scope, and rationale for surface water and sediment sample collection and analyses. This section of the work plan identifies the number and location of surface water and sediment samples to be collected for the RI/FS program. Table 4-3 of the work plan explains which groups of constituents would be analyzed for each general sampling location of the RI/FS effort. The organic analyses were to be performed only for those samples that were evaluated for extended hazardous substance list constituents. The RI/FS surface water and sediment sampling program was designed to make use of ongoing WEMCO monitoring programs; the majority of the collected samples were typically analyzed for total uranium, gross alpha, gross beta, and a full radiological analysis only. The extended hazardous substance list analyses (which included inorganics, volatiles, semivolatiles, pesticides, and PCBs) were only performed for a small subset of the surface water and sediment samples collected for the RI/FS.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.3.8, Part I Pg. #: 3-56 Line #:2 Code:
87 Original Comment # 53
Comment: The reference to Figure 3-9 is incorrect; the reference should be to Figure 3-10.

Response: Comment noted.

Action: The citation for Figure 3-9, on page 3-56, line 2 will be modified to correctly identify Figure 3-10 as the appropriate figure where the locations of the sampling points are presented.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.1, Part I Pg. #: 3-61 Line #:30 Code:
88 Original Comment # 54
Comment: The number of wells identified here, 36, does not correspond to the number shown in Figure 3-20. This discrepancy should be corrected.

Response: Agreed. Seven off-site wells were inadvertently omitted from Figure 3-20. These seven wells are Wells DG, H-123, 12-3, KY, HK-S, WK, and 2CW.

Action: These 7 wells will be added to Figure 3-20 in the revised SWCR.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.2, Part I Pg. #: 3-68 Line #:27 Code:
89 Original Comment # 55
Comment: The number of wells identified here, 21, does not correspond to the number shown in Figure 3-22. This discrepancy should be corrected.

Response: Comment noted. Figure 3-22 illustrates all of the off-property wells sampled for the environmental monitoring program from 1983 to 1991, while the text states that 21 existing off-property wells were sampled during 1983. The text will be revised to clarify the statement.

Action: The following sentence will be added to the end of the first paragraph in Section 3.1.4.2: "Many private wells have been involved over the years in the sampling program; off-property wells sampled for the environmental monitoring program have changed throughout the years depending on the owners' willingness to be included in the program."

The second sentence of the last paragraph on Page 3-68 will be revised to:

"In 1983, samples were collected monthly from 21 off-property monitoring wells (i.e., Wells 1 to 21) in the vicinity of the FEMP (Figure 3-22)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 3-74 Line #: Code:
90 Original Comment # 56
Comment: Table 3-16. This table indicates that monitoring wells 2, 6, and 20 were not sampled in 1988 or 1989. This table also indicates that the analyses of these samples did not include organic analyses. Further discussion of sampling locations and the analytical rationale is needed.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected for the FEMP. It is not the intent of the SWCR to evaluate the usefulness or rationale of previous non-RI/FS sampling efforts at the FEMP.

Action: See action to U.S. EPA Specific Comment 55.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.2, Part I Pg. #: 3-75 Line #:3 and 4 Code:
91 Original Comment # 57
Comment: This sentence states that ground-water samples were analyzed for "toxic organic compounds." This term should be defined. Also, the 227 site wells and 36 private wells noted here are not shown in a figure.

Response: Comment noted. The sentence referred to by the commentor was directly from the 1990 Annual Environmental Report (WEMCO, 1991). The sentence will be revised to clarify the issue. However, only a reference to the original document will be provided in the revised SWCR for the well locations.

Action: Page 3-75, Lines 2-4 will be revised to: "In 1990, 227 FEMP wells and 36 privately owned wells were sampled for the Comprehensive Groundwater Monitoring Program. Locations of these wells can be found in the 1990 Environment Monitoring Report (WMCO, 1991). These samples were analyzed for radionuclides and nonradioactive constituents on the EPA Hazardous Substance List (HSL). A complete list of all of the chemicals sampled for can be found in the 1990 Draft Groundwater Monitoring Annual Report (FEMP, November 1991)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.3, Part I Pg. #: 3-75 Line #:30 and 31 Code:
92 Original Comment # 58
Comment: This sentence states that monitoring well SW-2 had been previously sampled during Phase 1 or 2; however, the list of wells sampled during those phases (Lines 26 through 28) does not include SW-2. This discrepancy should be addressed.

Response: Comment noted. Well SW-2 was sampled both in Phase 2 and Phase 3 of the Round 1 RCRA Groundwater Detection Program as a background well. The "SW-1" on Page 3-75, Line 28 was a typographical error. The text will be revised to clarify this issue.

Action: Page 3-75, Line 28 will be revised to: "...aquifers (SW-2, MW-1d, MW-10, MW-10, MW-14d, MW-14s, MW-18s, and MW-19s) were sampled".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.3, Part I Pg. #: 3-77 Line #:17 Code:
93 Original Comment # 59
Comment: This sentence states that submersible pumps were used to purge and sample monitoring wells. It should be noted that submersible pumps are not recommended by U.S. EPA Region 5 for ground-water sampling, particularly when the samples will be analyzed for VOCs. Therefore, this data should be qualified.

Response: The comment has been noted. It should be noted that these data were collected from 1985 to 1987 and were in accordance with the procedures specified in the RCRA work plans. DOE agrees the quality of the data may not be as reliable as the data collected during recent sampling events when bladder pumps were utilized. A clarification of the issue will be addressed in the revised Section 4.1.4.3 where these data are discussed.

Action: The following sentence will be inserted after the first sentence of Section 4.1.4.3: "It is noted that groundwater sampling during Round 1 through Round 6 RCRA Groundwater Detection Program utilized either bailers or submersible pumps. Therefore, analytical results of some volatile organic compounds may not be accurate due to the sampling procedures used."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.4, Part I Pg. #: 3-80 Line #:27 Code:
94 Original Comment # 60
Comment: This sentence states that ground-water samples were collected with a pump when bailing was not possible. The type of pump used should be identified.

Response: Comment noted. As specified in the sampling procedure, groundwater samples were collected with a submersible pump when bailing was not possible. Please also see the response to U.S. EPA Specific Comment 59. The text will be revised to clarify this issue.

Action: Page 3-80, Line 27 will be revised to: "...collected using a teflon bailer, when possible, and collected with a submersible pump when bailing was not possible."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.6, Part I Pg. #: 3-87 Line #:33 Code:
95 Original Comment # 61
Comment: This section states that selected off-property private wells were sampled. DOE should indicate whether the ground-water samples from private well samples were analyzed using methods capable of achieving low instrument detection limits, as required to determine compliance with drinking water standards.

Response: Groundwater samples collected from the FEMP under the RI/FS were all analyzed using consistent procedures, regardless of whether the samples were collected from project-installed monitoring wells or from off-property wells. These samples were submitted to the laboratory and analyzed in accordance with the QAPP regardless of the source of the samples. DOE does not believe that it is necessary to distinctively address the analytical method of the groundwater samples collected from off-property private wells.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.6, Part I Pg. #: 3-97 Line #:32 Code:
96 Original Comment # 62
Comment: The text notes that certain samples "were analyzed for extended HSL parameters." DOE should define these parameters or reference the appropriate documents which describe the compounds included in this list.

Response: Comment noted. Table 3-20 (Page 3-100) of the SWCR specifies the parameters analyzed as extended HSL parameters. The term "extended HSL parameters" was utilized in the FEMP RI/FS work plan to include the parameters listed under extended HSL Analysis in Table 3-20 of the SWCR. The RI/FS work plan will be referenced in the revised SWCR for the list of the extended HSL parameters.

Action: Page 3-97, Line 32 of the SWCR will be revised to: "...groundwater samples were analyzed for extended HSL parameters as specified in Table 3-20 (also see RI/FS Work Plan, Revision 3, 1988)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.7, Part I Pg. #: 3-102 Line #:5 Code:
97 Original Comment # 63
Comment: This brief section states that "significant changes of indicator parameters" were noted during the RCRA detection program. However, no details are provided. DOE should

provide enough information or references so that the Assessment Program can be understood and placed in context.

Response: Agreed. Additional information describing the relationship between RCRA Groundwater Detection Program and the RCRA Groundwater Assessment Program will be presented in the revised SWCR to clarify this issue.

Action: Page 3-102, the Objective and Context under Section 3.1.4.7 will be revised as: "After the completion of the RCRA Groundwater Detection Program, the U.S. EPA and the OEPA were notified by DOE, in a submittal dated November 13, 1987, that Waste Pit 4 at the FEMP could be affecting groundwater quality. This notification was based on statistical comparisons conducted on the results of groundwater samples monitored by the Groundwater Detection Program and was in accordance with 40 CFR265.93 and OAC 3745-65-93 (RCRA 1989 Annual Report). The purpose of the RCRA Groundwater Assessment Program is to determine the concentration and the rate and extent of migration of any hazardous waste or hazardous waste constituents in the groundwater that could be attributed to leakage from Waste Pit 4. The sampling for the RCRA Groundwater Assessment Program started in May 1988. The analytical results collected from this program are stored and available in the Fernald database.

The RCRA Groundwater Assessment Program and the CERCLA monitoring programs were consolidated due to the similarity of their objectives. Consequently, data for the RCRA Groundwater Assessment Program were collected during the first four rounds of sampling for the RI/FS program."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #:
98 Original Comment # 64
Comment: This sentence states that "this program started in May 1988." It is not clear which program is being referred to, the Assessment Program or the Detection Program. This matter should be clarified.

Response: Agreed.

Action: See proposed action to USEPA Specific Comment 63.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.4.7, Part I Pg. #: 3-102 Line #:13 Code:
99 Original Comment # 65
Comment: This sentence states that the results of the RCRA Assessment and Detection Programs are stored in the Fernald database. These results should be incorporated in the report.

Response: It should be clarified that, of the RCRA data collected at the FEMP, only the data collected from the RCRA Groundwater Assessment Program have been stored in the Fernald Database. These data have been combined with the RI/FS data and presented in Section 4.1.4.4 as ongoing RI/FS and RCRA groundwater monitoring programs. Also, the data collected for the RCRA Groundwater Detection Program are presented in Section 4.1.4.3.

Action: See proposed action to U.S. EPA Specific Comment 63.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 3-108 Line #: Code:
100 Original Comment # 66
Comment: Table 3-22. The organization of this table is confusing. Specifically, it is not clear which locations were sampled on the various dates listed. This table should be clarified.

Response: Agreed. This particular sampling program underwent changes on almost an annual basis. The biggest changes that took place in sampling locations were between the years 1987 and 1988. In providing information about this program, an attempt was made to provide the reader with a base figure and table that showed the changes and overlaps in sampling location from year to year.

Action: The figure and table will be reorganized into two tables and two figures to reduce confusion over dates and locations of soil sampling. Furthermore, lines 12-18, page 3-109 will be replaced with: "During 1988, the routine soil sampling and parallel soil and vegetation sampling programs were reviewed. Routine soil sampling meant that only soil is sampled at a location, while parallel soil and vegetation sampling meant that samples of both soil and vegetation were taken at the same location at the same time. It was found that many of the sampling locations of both programs were situated very close to one another. The programs were combined to increase sampling efficiency and effectiveness, reducing the number of sampling locations to 29 from 38 (Fig. 3-36B, Table 3-22B, and Table 3-23). In addition, care was taken to avoid fertilized areas where sample results could have been biased from high concentrations of uranium found in some fertilizers. Soil samples were collected at a depth of 0-5 cm and 5-10 cm at the 29 selected locations.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.5.2, Part I Pg. #: 3-109 Line #:16 Code:
101 Original Comment # 67
Comment: This sentence states that care was taken to avoid fertilized areas during surface soil sampling. Further discussion should be provided regarding how it was determined whether soil sampling locations were located in fertilized areas.

Response: The document for the monitoring program in question did not provide the level of information requested by the commentor.

Action: Line 16 will be replaced with: "In addition, care was taken to avoid fertilized areas where sample results could have been biased from high concentrations of uranium found in some fertilizers. Soil samples were collected at a depth of 0-5 cm and 5-10 cm at the 29 selected locations."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 3-113 Line #: Code:
102 Original Comment # 68
Comment: Table 3-23. This table indicates that parallel soils and vegetation samples were collected at location 12 in 1987; however, this table also indicates that no routine soil

sample was collected at location 12. Also, the table's format suggests that parallel samples were not collected at locations 4, 5, and 17, but the sample numbers shown suggest otherwise. These discrepancies should be addressed.

Response: The routine soil sampling and parallel soil and vegetation sampling were two separate sampling programs. During routine soil sampling only soil was sampled at a location and all vegetation was excluded. During parallel soil and vegetation sampling, samples of soil and vegetation were taken at the same location at the same time. In 1988, a review of these programs found that many of the sampling locations for both programs were situated very close together. To increase sampling efficiency and effectiveness, the programs were combined and the number of sampling locations were reduced. Table 3-23 shows previous sampling numbers for both programs and the new number designated for locations where the programs were combined.

Action: See U.S. EPA Original Comment #66.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.5.4, Part I Pg. #: 3-114 Line #:28 Code:
103 Original Comment # 69
Comment: This sentence states that surface soil samples were collected from the K-65 trench; however, Figure 3-40 describes this area as the K-65 slurry line. This discrepancy should be addressed.

Response: Agreed.

Action: In Line 28, "K-65 trench" will be replaced with "K-65 slurry line".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.5.4, Part I Pg. #: 3-114 Line #:30 and 31 Code:
104 Original Comment # 70
Comment: The locations described in this paragraph ("pilot plant tile, " "old incinerator area," "prior location of the Cone house") either are not shown in the following figures (3-42, 3-43, and 3-44) or have different names in the figures. The text should be reconciled with the figures.

Response: Agreed.

Action: Lines 30-31 will be clarified to say: " ...at the FEMP: the K-65 slurry line, the pilot plant tile field (Fig. 3-42), the prior location of the Cone House (Fig. 3-44, 0126 and 0127).

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
105 Original Comment # 71
Comment: Figures 3-41 and 3-43. These figures show surface soil sampling locations in the fly ash piles and south field area. The boundaries of the fly ash piles should be shown in the figures.

Response: Agreed.

Action: Figure 3-41 and 3-43 will be modified to show the boundaries of the Active and Inactive Flyash Piles.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.5.5, Part I Pg. #: 3-121 Line #:18 Code:
106 Original Comment # 72
Comment: This sentence states that the FEMP RI/FS studies are described in Section 3.1.1.3; however, Section 3.1.1.3 only discusses K-65 silo sampling. This discrepancy should be addressed.

Response: Agreed. The reference to Section 3.1.1.3 was intended to direct the reader to text describing the context and objectives of the FEMP RI/FS and from that discussion to a more detailed description in Section 1.2.1 of the text.

Action: Line 18 will be modified to read: "This study is described in detail in Section 1.2.1."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.6.1, Part I Pg. #: 3-127 Line #:14 and 15 Code:
107 Original Comment # 73
Comment: This section states that subsurface soil samples were collected using a 3-inch outside diameter, hollow-stem auger and a 24-inch drive, split spoon sampler. It is unlikely that a 3-inch outside diameter, hollow-stem auger was used for this type of sampling. This apparent discrepancy should be addressed.

Response: The description of the sampling procedure was taken directly from the original document.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.6.1, Part I Pg. #: 3-130 Line #:13 - 28 Code:
108 Original Comment # 74
Comment: The rationale used for selecting the various chemical analyses is not clear. Specifically, it is unclear why cyanide and many common VOCs were not analyzed for. The rationale for selecting the analyses performed should be provided.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected for the FEMP. It is not the intent of the SWCR to evaluate the usefulness or rationale of previous non-RI/FS sampling efforts at the FEMP.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
109 Original Comment # 75
Comment: Figure 3-55. The title of this figure is "Location of Permanent Transects at the FEMP." The title should provide more information regarding the types of transects depicted.

Response: The figure title will be expanded.

Action: Part I, Page 3-141, Figure 3-55, change the title to "Location of Permanent Ecological Survey Transects at the FEMP."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.7.1, Part I Pg. #: 3-145 Line #:29 Code:
110 Original Comment # 76
Comment: This section states that the off-site or laboratory (rather than the field) method was used to define wetlands in the FEMP. It is not clear how this method could be used to identify jurisdictional wetlands where the seasonal high water table must lie within 6 inches of the surface for at least 1 week during the growing season. This matter should be explained.

Response: When using the offsite method, hydric soils are identified from Soil Conservation Service soil survey maps. Soil surveys for the FEMP show a large map unit of hydric (Ragsdale) soil in the northern wooded area of the FEMP. This area was checked during the limited field reconnaissance and confirmed to contain hydric soil.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.7.1, Part I Pg. #: 3-146 and 3-147 Line #: Code:
111 Original Comment # 77
Comment: This section states that aerial photographs dating back to 1950, with special attention being paid to the most recent photograph taken in April 1988, were used to verify approximate wetland boundaries and to identify areas to be field-checked. The term "special attention" should be defined, and the text should clearly state whether aerial photographs taken before April 1988 were used to determine wetland boundaries and field-check locations. This is important because 1988 was a drought year; using only photographs taken at the time might not have allowed thorough identification of all wetlands.

Response: Special attention was paid to the 1988 photograph because it was the most recent and would therefore be the most reliable for showing any human alterations of the site. As the text states, the other photographs were also reviewed and a field check was made to confirm wetlands indicators.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.7.2, Part I Pg. #: 3-165 Line #:29 and 30 Code:
112 Original Comment # 78
Comment: This sentence states that "fish were collected from four sites each on Paddy's Run and the Great Miami River, and from a small drainage pond north of the production area (Figure 3-61)." This is the first mention of the drainage pond in the report, but its location is not shown in Figure 3-61. Complete descriptions, including the depth, surface area, and flow characteristics, of all on-site surface water bodies (ditches,

streams, ponds, and wetlands) should be included in the report, and all surface water body locations should be shown in figures.

Response: The small pond will be indicated on Figure 3-61. It is seasonal, and the detailed information requested is not available. The SWCR contains figures showing the other surface water features on the property in Figures 3-61 and 2-17.

Action: Part I, Page 3-164, Figure 3-61, add the location of the drainage pond north of the production area to the figure.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.7.2, Part I Pg. #: 3-167 Line #:22 - 36 Code:
113 Original Comment # 79
Comment: This paragraph and the following analytical parameter list are very confusing. Specifically, it is not clear what was analyzed for in the various samples collected. The specific analyses conducted and the rationale used to select these analyses should be provided.

Response: The paragraph will be clarified. The rationales are provided in the approved RI/FS Work Plan.

Action: Part I, Pages 3-167, Lines 24-29, beginning "Samples collected...," replace with the following: "In 1988, 15 samples were collected and analyzed for these same radionuclides, technetium-99, and the following nonradioactive constituents:"

Part I, Page 3-168, Line 5, replace with the following:

"These constituents were analyzed due to their potential presence at the FEMP."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.7.3, Part I Pg. #: 3-168 Line #:10 and 11
Code:
114 Original Comment # 80
Comment: This sentence states that the FEMP main effluent line is a permitted discharge regulated by a NPDES permit and DOE orders. The text should clearly state which DOE orders regulate specific contaminants and which contaminants are regulated under the NPDES permit.

Response: This level of detail does not seem necessary to a description of toxicity testing.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.2.1.4, Part I Pg. #: 3-186 Line #:9 - 13 Code:
115 Original Comment # 81
Comment: This paragraph states that "leachate" contaminant concentrations within the glacial overburden (as opposed to contaminant concentrations within each waste area) were used as initial contaminant concentrations in the fate and transport model. It seems likely that this approach would greatly reduce the estimated contaminant dose received

at the human receptor sites. The rationale for using this approach should be explained further.

Response: DOE does not understand the question. The source areas consist of solid wastes. It is necessary to estimate the concentrations of constituents in water percolating through this waste. This liquid (called leachate) is used as the source for the linked fate and transport models. This is explained in Appendix O, as stated on line 29 of page 3-186 (the same page to which the comment refers). In the absence of measured concentrations of contaminants in leachate, geochemical modeling is performed for the waste areas and for the soil beneath the waste areas to determine the concentrations and quantities of contaminants that will migrate to the regional acquifer.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.2.1.4, Part I Pg. #: 3-186 Line #:32 - 34 Code:
116 Original Comment # 82
Comment: This paragraph states that concentrations of organic compounds in leachate were determined using surface water or perched ground water when Toxicity Characteristic Leaching Procedure (TCLP) results were not available. This approach would likely underestimate the leachate concentrations. It is not clear why leachate was not sampled directly. Also, given the number of analyses performed for the FEMP, it is unclear why the necessary TCLP analyses were not performed. DOE should address this issue as a potential data gap.

Response: The SWCR uses data available as of December 1, 1991, as stated on page S-2, line 36. More recent sampling and analysis plans for the various operable units requested that both TCLP and in-situ leachate samples be collected from significant waste areas. The results of these analyses were not available as of December 1, 1991, but will be available in time to be incorporated into the operable unit-specific RI reports and baseline risk assessments.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.2.1.4, Part I Pg. #: 3-187 Line #:7 - 9 Code:
117 Original Comment # 83
Comment: The meaning of this sentence is unclear. It should be rewritten for clarification.

Response: Agreed.

Action: Delete sentence. Restructure remaining text in paragraph to read: "If source depletion is estimated to occur in less than 70 years, 0.143 (1/70) of the waste inventory was assumed to leach into the groundwater in each year (EPA 1988, Superfund Exposure Assessment Manual). Seventy years was also the default depletion time for constituents for which no data were available. This method is likely to be the most conservative approach (i.e., result in the greatest contaminant concentration) for most constituents. The possible exceptions are those soluble elements which are present in small quantities (e.g., cesium in the waste pits). The impact of these exceptions on the

magnitude of potential exposures and risks to potential receptors is insignificant when compared to the remaining constituents.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.2.4.2, Part I Pg. #: 3-192 Line #:23 Code:
118 Original Comment # 84
Comment: This sentence states that the prevailing winds used in the conceptual model are from the northwest. Figure 2-5 indicates that the prevailing winds are from the southwest. This discrepancy should be reconciled.

Response: Agreed. The prevailing winds are actually from the southwest as indicated in Figure 2-5.

Action: Line 23 on page 3-192 of Part I will be changed to read: "the prevailing winds are from the southwest."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1, Part I Pg. #: 4-1 Line #:20 and 21
Code:
119 Original Comment # 85
Comment: The text should state what types of VOCs were detected and at what levels.

Response: Section 4.1.1 is intended as an introduction. The results of the DOE report mentioned in 4.1.1 are discussed in detail in Section 4.1.1.3. For the types and levels of VOCs detected, the reviewer is referred to Table 4-3C (Page 4-11).

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1, Part I Pg. #: 4-1 Line #:22 and 23 Code:
120 Original Comment # 86
Comment: The text should include a statement specifying the percentage of areas sampled that showed above background levels of contamination. Also, the text should include a summary of what is considered background and how background was established.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. Section 4.1.1 is intended as an introduction. The results of the DOE report mentioned in 4.1.1 are discussed in greater detail in Section 4.1.1.4 and Tables 4-4, 4-5, and 4-6. The DOE report did not provide percentage of areas above background or new background areas established.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
121 Original Comment # 87
Comment: Tables 4-1 and 4.2. These tables list the frequency of detection (the number of times a specific analyte was detected divided by the number of analyses performed) for elements detected at least once; however, the number of analyses performed is not

presented for elements not detected. This information should be provided. Also, the entries for thorium-228 and thorium-232 in Silos 1 and 2 have mean concentrations less than the lower limits of the ranges. DOE should address this discrepancy.

Response: The elements analyzed for during this sampling effort are stated in Section 3.1. Elements analyzed for but not detected are not included in Section 4.0 in order to reduce its length and increase focus on those substances which were found. The complete data set for the silos will be provided in the RI report for Operable Unit 4.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
122 Original Comment # 88
Comment: Table 4-2. This table presents analytical data for Silos 1 and 2 cumulatively and for Silo 2 alone. Almost without exception, inorganic data for Silo 2 shows much higher concentrations than does the cumulative inorganic data for Silos 1 and 2. Conversely, the cumulative organic data for Silos 1 and 2 shows much higher concentrations than does the organic data for Silo 2 alone. All data for Silos 1 and 2 should be presented independently.

Response: The complete data set for the silos will be provided in the RI report for Operable Unit 4.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-7 Line #: Code:
123 Original Comment # 89
Comment: Table 4-2. This table indicates that Silos 1, 2, and 3 contain substantial levels of VOCs and SVOCs; however, total organic carbon (TOC) values are shown as nondetects for Silos 1 and 2. These discrepancies should be reconciled.

Response: Agreed. Samples from Silos 1 and 2 were not analyzed for TOC. However, Silo 3 samples were analyzed for TOC.

Action: The table will be corrected to distinguish constituents that were not detected from constituents that were not included in the analysis.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-7 Line #: Code:
124 Original Comment # 90
Comment: Table 4-2. This table indicates that trichloroethane was analyzed for. This is apparently a typographical error. The report should indicate whether 1,1,1-trichloroethane or trichloroethene was analyzed for. Also, this table indicates that the compound was analyzed for only once while other VOCs were analyzed for as many as 13 times. The report should provide more detailed regarding the analytical rationale, particularly with regard to frequency of analysis and suites of compounds analyzed for.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. It is not intended to evaluate the usefulness or rationales of previous sampling efforts at the FEMP. The table will be checked to determine which analyte is intended.

Action: Check Table 4-2 to determine which analyte is intended.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.2, Part I Pg. #: 4-8 Line #:8 Code:
125 Original Comment # 91
Comment: The text states that inorganic constituents were detected at levels above background. However, background levels area not defined here or in a table. DOE should define the background levels.

Response: Agreed.

Action: Line 8 will say: "A number of inorganic constituents were detected above background concentrations established by U.S. Geological Survey data (Shacklette & Boerngen 1984)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.2, Part I Pg. #: 4-8 Line #:11 Code:
126 Original Comment # 92
Comment: This sentence states that VOCs including Aroclor-1254 were detected. Aroclor-1254 is a PCB. This discrepancy should be addressed.

Response: Agreed.

Action: Page 4-8, Line 11 will be revised to say: "Volatile organic compounds detected included 4-methyl-2-pentanone, while Aroclor-1254 was detected in concentrations up to 5,000 µg/kg."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.2, Part I Pg. #: 4-8 Line #:15 and 16 Code:
127 Original Comment # 93
Comment: The text should explain why both grab and composite samples were collected.

Response: The report in question does not clearly state the rationales for the various types of sampling.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.3, Part I Pg. #: 4-8 Line #:16 - 18 Code:
128 Original Comment # 94
Comment: This sentence states that radionuclide data is shown in Tables 4-3A and 4-3B. Table 4-3B contains only metals data. This discrepancy should be addressed. Also, the term "detectable level" should be defined, specific radionuclides detected and the levels at which they were detected should be identified.

Response: Agreed.

Action: The text will be revised. Line 18 reference to Table 4-3B will be omitted.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
129 Original Comment # 95
Comment: Tables 4-3B and 4-3C. These tables contain many "blank areas." The significance of these "blank areas" should be discussed.

Response: Agreed.

Action: The table will be modified to eliminate blank areas.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.4, Part I Pg. #: 4-18 Line #: Code:
130 Original Comment # 96
Comment: DOE should provide a graphic representation of the data in Tables 4-4 and 4-5 that identifies areas of low, medium, and high concentrations.

Response: As stated in the response to General Comment 1, it is not the intent of the SWCR to provide the detail necessary to discuss the nature and extent of contamination at the FEMP. Any required graphics identifying areas of varying contaminant levels will be provided in the Operable Unit 4 RI report.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1.4, Part I Pg. #: 4-18 Line #:11 - 14
Code:
131 Original Comment # 97
Comment: This paragraph discusses background data for radon and thoron and then states only that the highest thoron concentrations were detected in 1992. Radon is not discussed further. A more detailed discussion of radon and thoron data should be presented.

Response: Agreed.

Action: Line 14 text will be revised to say: "The highest average Rn-222 values were consistently found in the (old) Plant 5 Warehouse at levels from 59.45 to 94.5 pCi/ℓ."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-22 Line #: Code:
132 Original Comment # 98
Comment: Table 4-6. This table indicates that the average Rn-222 value in the old Plant 5 Warehouse is 94.5 pCi/ℓ; however, the average Rn-222 plus Rn-220 value is reported as 76.25 pCi/L. This discrepancy should be addressed.

Response: Agreed. Although the reason for this anomalous value is unknown, there are several possible explanations. The Terradex Cups used to measure average Rn-222 and average Rn-222 plus Rn-220 were not located in precisely the same location in each building. Consequently, work conducted in the area around a receptor could have caused the anomalous reading. As an example, if the lid of a drum containing material

high in Rn-222 were removed in close proximity to the average Rn-222 receptor, the measured value for Rn-222 would be skewed.

Action: Line 14 text will be expanded to: "The value of 94.5 pCi/ℓ for Rn-222 found in the third quarter of 1990 is anomalous compared to the average Rn-222 and Rn+220 value. This high value may have been the result of work conducted in the vicinity of the Terradex cups used to measure average Rn-222. This could have resulted in the skewed value for average Rn-222 detected."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.2, Part I Pg. #: 4-23 Line #:9 and 10 Code:
133 Original Comment # 99
Comment: DOE should include a statement of what the percentage of radon emission reduction was after bentonite was placed in the silos.

Response: Following the placement of bentonite in the K-65 Silos, radon emissions were reduced by 95 percent. This information can be found in the SWCR in Section 4.2, page 4-331 (Completed Removal Actions).

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.2, Part I Pg. #: 4-23 Line #:16-19 Code:
134 Original Comment # 100
Comment: This sentence states that in 1990, the concentrations of airborne radionuclides emanating from the FEMP were well below the DOE Derived Concentration of 100 millirems per year. The 1990 data should also be compared to background levels or promulgated standards.

Response: Agreed.

Action: Table 4-10, page 4-27 will be edited to include concentration levels for environmental compliance with NESHAPS.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-24 Line #: Code:
135 Original Comment # 101
Comment: Table 4-7. This table lists estimated radionuclide airborne emissions for 1988 through 1990. This table does not include radon or thoron. The data for radon and thoron should be added to the table.

Response: Emissions data for thoron, a daughter product of radon with a 55-second half-life, are negligible at the FEMP. Radon is described in detail in Table 4-100, page 4-332 of the SWCR, so no reason was apparent in repeating the data in Table 4-7, page 4-24.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-25 Line #: Code:
136 Original Comment # 102

Comment: Table 4-8. This table gives uranium concentrations in air for 1988 through 1990. The table should indicate which station locations represent upwind or background locations.

Response: The locations of the air monitoring stations are shown in Figures 3-4 and 3-5, and wind data (i.e., wind speed, wind direction, percentage of frequency, upwind, downwind, etc.) are specified in the wind rose for the FEMP in Figure Q.2-1 of Appendix Q. The upwind/downwind locations can be determined by comparing the two figures. Therefore, incorporating wind data into Table 4-25 was viewed as a repetition of data already discussed in the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-28 Line #: Code:
137 Original Comment # 103
Comment: Table 4-10. This table contains two subscripts (e and f) that are not defined in the footnotes below the table. This omission should be addressed.

Response: Agreed.

Action: Table 4-10, page 4-28, will be revised to include the following:

Footnote "e": Derived concentration guides from DOE Order 5400.5, February 1990. Continuous inhalation of this concentration will result in a committed effective dose equivalent of 100 mrem (1 mSv).

Footnote "f": Composite sample activity adjusted to midpoint of sampling.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-30 Line #:9 Code:
138 Original Comment # 104
Comment: The text uses Station W1 for background values for the Great Miami River. However, the wind rose diagram (Figure 2-5) shows frequent winds in that direction. The surface soil data (Section 4.1.5, especially Figure 4-6) shows that air emissions (Table 4-7) have produced measurable contamination in the vicinity of Station W1. DOE should select a true background site for the Great Miami River and should consider Section W1 as possibly contaminated by air emissions and associated surface runoff.

Response: Please see the response to U.S. EPA General Comment #9.

Action: The background surface water and sediment data will be validated and thoroughly evaluated in the Operable Unit 5 RI report. These data will also be compared with other water quality data collected upstream, for example, from the USGS gaging station at Hamilton, Ohio.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-30 Line #:20 Code:
139 Original Comment # 105
Comment: The text notes that the concentrations of Technetium-99 was lower at the downstream location than at the upstream location. In fact, Technetium-99 was found at the

background location at 60 times the downstream concentration. This data suggests that the FEMP has impacted the upstream location and that it should not be used as a background location. DOE should either provide evidence of a viable upstream source or re-evaluate the use of this sampling point as a background location.

Response: Monitoring Station W1 on the Great Miami River was sampled 6 times by WEMCO between 1985 and 1990. Tc-99 was not detected in 8 out of the 12 samples collected; the highest activity of Tc-99 detected was 5 pCi/ℓ. Also, Tc-99 was always nondetectable (detection limit was 30 pCi/ℓ) in 6 samples collected and analyzed for from Station W1 during RI/FS characterization efforts. One sample collected at Station W1 in 1984 by NLO supposedly had a Tc-99 activity of 1,351 pCi/ℓ. It is strongly presumed that this older data point is incorrect and probably due to some sampling, labeling, analytical, or transcription error. Activity of Tc-99 was consistently lower at Station W1 than downstream monitoring stations.

Action: The background surface water and sediment data will be validated and thoroughly evaluated in the Operable Unit 5 RI report. These data will also be compared with other water quality data collected upstream, for example, from the USGS gaging station at Hamilton, Ohio.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-30 - 4-39 Line #: Code:
140 Original Comment # 106
Comment: The usefulness of the surface water and sediment data presented here is not clear. The nearest downstream sampling locations are 4 miles downstream from the FEMP. The rationale for designing this type of sampling scheme and the usefulness of this data should be further discussed in the text.

Response: The establishment of the locations for the initial surface water and sediment sampling points on the Great Miami River is explained in the Response and Action items for comment #80 (EPA46). It should be restated that the pre-RI/FS monitoring program for Great Miami River sediments routinely included samples collected from locations closer than 4 miles downstream of the FEMP (please review Figures 3-11, 3-12, 3-13, 3-14, and Tables 4-13 and 4-14).

Subsequent to the development of the FEMP environmental monitoring program, other independent surveys usually included a sampling location that would be able to adequately assess the impacts of Paddys Run discharge on the water quality of the Great Miami River. The maps that identify the sampling locations of these other monitoring efforts are depicted in Figures 3-6, 3-8, and 3-10. The RI/FS program was designed to supplement the existing monitoring network, so that potential radionuclide or chemical inputs to the Great Miami River could be identified and characterized.

Action: Revise the text as follows:
Page 3-53, line 32, add the following sentence: "The RI/FS program for surface water and sediment sampling was designed to supplement the existing monitoring network so that potential radionuclide or chemical point source contributors to the Great Miami River (i.e., the FEMP effluent line, Paddys Run, and the storm sewer outfall ditch) were adequately monitored to evaluate water quality impacts of the FEMP."

SITE-WIDE CHARACTERIZATION REPORT
TECHNICAL COMMENTS

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-30 Line #:7 and 8 Code:
141 Original Comment # 107
Comment: This sentence states that the surface water and sediment sampling programs record the effect of routine discharges of treated effluent into the Great Miami River. The river also periodically receives untreated surface water runoff during large storm events. This fact should be noted in the text.

Response: The commentor has identified a statement that requires some additional explanation. The text will be revised to improve the stated purpose of the surface water and sediment sampling program, as it was initially presented on page 3-38, lines 3-6.

Action: The first sentence of the paragraph page 4-30, lines 7 and 8 will be restated as follows: "The surface water and sediment sampling programs were initially developed to measure the effects of the routine discharges of treated effluent into the Great Miami River and the periodic discharge of untreated storm water runoff during large storm events."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-30 Line #:10 Code:
142 Original Comment # 108
Comment: Figure 3-10 states that the sample data presented was collected from 1976 to 1990, but the title of Section 4.1.3.1 says 1977 to 1991. This discrepancy should be addressed.

Response: Although the years of the data collection and the corresponding report publication years appear to conflict, there is a period of approximately one year from the time of sample collection to the release of a published report containing the data. The samples and associated data collected during calendar year 1976 are presented in a report that is released the following year (i.e., 1977). For example, the cited references for Figure 3-10 identify the years of the published reports (1977-1991), while title of Figure 3-10 correctly identifies the actual years of the sampling effort (1976 - 1990).

The title of Section 4.1.3.1 identifies the publication dates of the specific reports in the same way that the publication year is identified for the other reports. This type of report identification assists the reader in the identification of the specific reports in the reference section of the document.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-30 Line #:10 Code:
143 Original Comment # 109
Comment: This sentence states that background conditions for surface water and sediment were established at Station W-1. The usefulness of background data from this location is highly questionable because it is directly downwind of the FEMP. Background data may be biased high from (1) deposition of airborne particulates directly onto surface water and sediment at this location and (2) discharge of overland surface water runoff containing airborne particulate-derived contaminants deposited in this portion of the drainage basin. Table 4-11 provides many examples of the background concentrations of radionuclides at location W1 exceeding the concentrations detected at downstream

locations. The appropriacy of using locations in this area as background locations should be completely addressed in the report.

Response: Please see response to U.S. EPA General Comment #9.

In Table 4-11 of the SWCR, Tc-99 was listed as much higher upstream than downstream. This conclusion is incorrect because it was based on one bad data point of 1,351 pCi/ℓ (please see response to U.S. EPA Specific Comment #105). Isotopes of uranium (U-234, U-235, U-236, and U-238) were all listed as slightly higher upstream than downstream. However, this may be due simply to a small data set. Based on total uranium data in Table 4-11, it is clear that total uranium is slightly higher at the downstream stations. There are more than 750 total uranium data for each sampling station. Thus, one must assume that the conclusions based on the total uranium data are more reliable, i.e., uranium concentrations are increasing in a downstream direction. Aside from the Tc-99 and the uranium isotopic data, there are no other radionuclides higher at Station W1 (upstream station). It is not the purpose of the SWCR to address the appropriateness of using particular sampling locations as background. However, the text will be expanded to include the discussion above.

Action: Expand the text to discuss the higher values for some constituents at W1 relative to downstream locations.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: Line #: Code:
144 Original Comment # 110
Comment: Not all sampling locations referenced in this section and in Tables 4-11 through 4-14 are shown in Figure 3-10 as the text indicates. This discrepancy should be addressed.

Response: Comment noted.

Action: The figure citation on page 4-30, lines 15-16 will be expanded to include Figures 3-11, 3-12, 3-13, and 3-14. These figure numbers will also be cited on Tables 4-11 through 4-14.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
145 Original Comment # 111
Comment: Table 4-14. This table does not provide specific details regarding sampling locations. The appropriate station locations and figures showing these locations should be cited in the table. Also, the row showing Radium-223 data indicates that no samples were collected; however, a concentration range is cited. This discrepancy should be reconciled.

Response: The level of detailed information that can be presented in the SWCR is limited by the types and detail of data presented in the identified source documents. If the source documents presented the analytical data as averages for specific stream reaches rather than by individual sampling points, then the data were displayed in a similar format because additional detail was not readily available. For example, it is stated in the footnotes for Table 4-14 (Footnote "a" on page 4-39) that the annual monitoring data

for 1986 and 1987 were presented as averaged values for the total monitored portion of the Great Miami River.

The presentation of the sediment data for the Great Miami River is also complicated by the fact that the sediment sampling locations were revised and/or renumbered several times since 1983. To assist the reader in locating the individual sampling points that were sampled for the river sector values, Table 4-14 will be modified to include a citation to Figures 3-13 and 3-14.

The stated years of sample collection for the first three columns for radium-223 (Table 4-14) are incorrect. Table 4-14 should not identify any years of sampling for radium-223 in the first three columns of the table. Radium-223 was not included in the list of analyzed constituents for the river segments listed in the first three columns. The number of samples analyzed for radium-223 was correctly stated as zero. The radium-223 isotope was analyzed only during 1986, and the analytical results from that sampling were presented as an average value for the entire monitored portion of the river (see Table 4-14, footnote "a"), and could not be placed in the first three columns that present the traditionally monitored river segments.

Action: The following text changes are suggested: Following the explanation footnote "d" in the footnotes section of Table 4-14, page 4-39, add, "Note: the sampling locations are presented in Figures 3-13 and 3-14."

Table 4-14 will be corrected to remove the years 1985-1990 in the first three columns for radium-223 (page 4-37).

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-40 Line #:12 Code:
146 Original Comment # 112
Comment: The concentration of uranium at Ross Bridge is identified as 10 micrograms per liter (μg/L). U.S. EPA notes that this concentration is higher than the values for Paddy's Run. DOE should discuss the possible reasons for uranium contamination in the upstream sample, including the possibility that FEMP emissions may have affected this area.

Response: The Ross Bridge (or Venice Bridge) sampling station is the same as Station W1 on the Great Miami River (Figure 3-10), which has been used repeatedly during many FEMP studies and programs as the upstream sampling station. Based on several studies and many hundreds of samples analyses, the total uranium concentration at Station W1 is in the range of 1 to 2 pCi/ℓ (Table 4-11 and 4-23).

Action: The statement on p. 4-40, line 12 is incorrect and will be corrected. Also, the paragraph containing this statement will be expanded and clarified.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-40 Line #:16 Code:
147 Original Comment # 113
Comment: The phrase "declined to background at sample location R-3" should be clarified. Sampling location R-3 is upstream of the confluence with Paddy's Run.

Response: Comment noted.

Action: The following text revision is suggested as a replacement for the sentence on page 4-40, line 16: "The concentrations of thorium and uranium at sampling location R-3 were comparable to those observed upstream at the Ross Bridge (sampling point W1)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-40 Line #:28 - 34 Code:
148 Original Comment # 114
Comment: None of the data presented in this paragraph appears in tables, nor is it referenced in an appendix. This omission should be addressed.

Response: Comment noted. The sentences beginning on line 31, page 4-40 and ending on line 2, page 4-48 are to be deleted in response to U.S. EPA Specific Comment # 116. The remaining text on page 4-40, lines 28 to 31 is similar to that presented for surface water (lines 17-20 of the same page). The amount of information represented by these discussions is minimal and does not warrant presentation in table format.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-45 Line #: Code:
149 Original Comment # 115
Comment: Table 4-17. This table indicate that samples R1 through R4 were collected in March 1986; however, the discussion on Page 4-40, Line 11, states that these samples were collected in 1985. Also, this table is referenced in Section 4.1.3.1, which is titled "Great Miami River"; however, data for Paddy's Run is also presented in this table. These discrepancies should be addressed.

Response: The sample collection dates for samples R1 through R4 in Table 4-17 are correct as stated (March 1986). The 50 upstream samples used for the determination of upstream uranium concentration in the Great Miami River were collected in 1985 as part of a separate sampling effort. The text will be modified to convey this fact to the reader.

In an effort to reduce the number of tables that are present in the text, the sampling data for the Great Miami River and Paddys Run are combined on Tables 4-17 and 4-18. The limited number of surface water and sediment sampling points for each water body allows for the consolidation of these data into two, rather than four separate tables. The corresponding water body is identified for each of the samples. These tables are also referenced in the discussion of Paddys Run monitoring efforts on page 4-65.

Action: Replace two sentences (lines 11 and 12) on page 4-40, with the following text: "An average upstream uranium concentration of 10 μg/ℓ (6.8 pCi/ℓ was derived from 50 upstream water samples collected from the Great Miami River at the Ross Bridge during 1985. Although these upstream samples were collected as part of a separate sampling effort, the 10 μg/ℓ concentration was considered to be indicative of upstream conditions (beyond the influence of surface drainages and discharges from the FEMP) for this particular sampling effort."

No additional text modification is required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-48 Line #:1 Code:
150 Original Comment # 116
Comment: This sentence states the PCBs detected in sediments of the Great Miami River are probably associated with a PCB spill that occurred in Dayton, Ohio, in 1987; however, the studies cited in this section were conducted in 1985 and 1986. Therefore, this conclusion is unfounded and should be deleted or further supported.

Response: Comment noted.

Action: The sentence beginning on page 4-40, lines 33-34 and the sentence beginning on page 4-48, lines 1-2 will be deleted.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-48 Line #:9 Code:
151 Original Comment # 117
Comment: This sentence makes reference to the upstream sampling location. It is not clear whether this is a reference to a background location. This sentence should be clarified.

Response: Comment noted. The upstream concentration of barium was considered to be indicative of background conditions for the Great Miami River.

Action: The following sentence will be added to the text on page 4-48, line 9, immediately after the sentence that ends on that line: "The upstream concentration of barium was considered to be indicative of background conditions for the Great Miami River."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-48 Line #:12 and 13 Code:
152 Original Comment # 118
Comment: The percentages by which the uranium concentration increased should be stated. The concentration of Thorium 227 should also be stated.

Response: The reporting of constituent concentrations by percentage increase or decrease from the upstream or background level would tend to overemphasize minor fluctuations in constituent levels due to the low concentrations involved (i.e., most analytical results were near or below the detection limit). To improve the communication of the actual differences between the upstream concentration and the downstream concentrations, the observed concentrations will be inserted into the cited text.

Action: The following text revision is suggested as a replacement to the sentence on page 4-48, lines 12-14: "The average upstream total uranium concentration of 2.1 μg/ℓ was exceeded at two sampling points downstream of the FEMP effluent line, but upstream of Paddys Run (both 2.4 μg/ℓ) and also at the sampling point immediately downstream of the Paddys Run confluence (12.0 μg/ℓ). The average upstream thorium-227 concentration (0.08 pCi/ℓ) was also surpassed at one sampling location downstream of the FEMP effluent line, but upstream of Paddys Run (0.98 pCi/ℓ). However, thorium-227 was not detected at levels above the MDL at either of the two sampling locations farther downstream."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-48 Line #:18 Code:
153 Original Comment # 119
Comment: DOE references previously identified background levels. The background levels should be clearly defined and included in the corresponding tables.

Response: The source report presented the results of the field measurements for radioactivity in relation to a "background" level. The "background" level for surface water and sediment samples is not clearly identified in the source document.

Action: No additional text clarification is possible.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-49 Line #: Code:
154 Original Comment # 120
Comment: Table 4-19. The meaning of the first row of data, titled "Radioactivity (μR/hr)" is not clear. All the data entries in this row read "BKG." This part of the table should be clarified.

Response: Please see the response to U.S. EPA Comment #153. The unit of radioactivity presented in the report was micro-Rems per hour (μR/hr). However, the actual value of background was never specified in the original report. Therefore, actual data values cannot be presented in the columns of the table.

Action: No additional text clarification is possible.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-51 and 4-52 Line #: Code:
155 Original Comment # 121
Comment: Table 4-20. Total uranium, metals, and organics were not sampled for at the background locations, making the comparisons with downstream locations unrealistic. The implications of these omissions should be expanded. Also, the background radioactivity levels referenced here seem to be for ambient air. This matter should be clarified.

Response: Two samples were collected and analyzed from the upstream location. Footnote "a" of Table 4-20 identifies that numbers in parentheses indicate an additional sample was collected at the same sampling point. Most of the results from one of these samples failed to produce concentrations above the minimum detection limits and were reported as blank spaces in the source document. When transferring these data from the source document to a table for the SWCR, several of the blank spaces (less than minimum detection level readings) in the original table were inadvertently deleted from the SWCR table. Readings for radium-228 were below minimum detection level, but this constituent was inadvertently omitted from Table 4-20. Upon further review of the data, there were samples collected at the upstream (background) location and at least one of the samples was evaluated for each listed constituent.

Please refer to the comment response for U.S. EPA Comment #153 concerning the background radioactivity measurement issue.

Action: Table 4-20 will be modified to improve the explanation that there were two samples collected at the upstream location by displaying one of the measurements in parentheses, even if the measurement was below the minimum detection level.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-54 Line #:25 - 28 Code:
156 Original Comment # 122
Comment: This paragraph should provide a more thorough description of the sampling locations and dates and the analyses performed for the study discussed.

Response: Comment noted.

Action: The following sentences will replace the text on page 4-54, Lines 26-28: "The RI/FS sampling and analysis program for the Great Miami River followed the procedures presented in the RI/FS Work Plan approved in 1988. The surface water sampling plan was designed to augment the ongoing environmental monitoring program through the collection of samples from the three previously established locations and four new locations on a quarterly basis for one year (1988 and early 1989). The quarterly sampling plan was designed to characterize variation in seasonal flow and water quality parameters. Refer to Section 3.1.3.8 for a description of the RI/FS sampling program and a list of the analyses to be performed.

The Great Miami River RI/FS sampling locations are presented in Figure 3-10. Surface water samples were analyzed for the full set of radiological parameters, total organic halogens, total organic carbon, and general water quality parameters. These water samples were not analyzed for volatile or semivolatile organic compounds. The sediment samples were also collected on a quarterly basis from the same locations as the surface water samples. Several samples were collected along a transect at each location, with one sediment sample from the most prominent depositional area at each location evaluated for a full radiological analysis.

Many of the analyzed constituents in water and sediment samples were non-detectable. The following sections focus on the RI/FS data collected for surface water and sediment samples from the Great Miami River."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-54 Line #:32 and 33 Code:
157 Original Comment # 123
Comment: This sentence states that the range of downstream uranium concentrations was about two times higher than that of upstream concentrations. Table 4-23 indicates that the mean total uranium concentration was three times higher than the upstream concentrations and that the range was as much as five times higher. This discrepancy should be addressed.

Response: Comment noted. A comparison of the data will be restricted to simply comparing the means of total uranium values.

Action: The sentence on page 4-57, lines 32-33 will be modified to the following: "The means of total uranium concentrations downstream of the FEMP main effluent line and downstream of Paddys Run were about 3 times higher than the upstream mean."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-55 Line #: Code:
158 Original Comment # 124
Comment: Table 4-22. This table does not include a description of the superscripts used in the table. Also, concentration units are not provided for many of the compounds listed. These omissions should be addressed. Also, this table lists the chronic aquatic life criterion of zinc as greater than the acute criterion. DOE should check its sources and correct the table.

Response: "The explanation of superscripts, which appears on a second page, was inadvertently left out of the table. This will be added. The chronic and acute criteria for zinc were reversed in the table. This will be corrected.

Action: On Page 4-55, Table 4-22, change the zinc Chronic ORSANCO Aquatic Life Criterion value to 110, and change the Acute value to 120. Add the following set of footnotes to Table 4-22:

[a] Elizabethtown, Ohio (Great Miami River - mile 5.5) sampling point January 1989 - March 1991.

[b] Cleves, Ohio (Great Miami River - mile 7.9) sampling point April 1991 - September 1991.

[c] Where criterion is stated as an exponential expression, aquatic toxicity is dependent on water hardness (H).

[d] Suspended solids and total hardness, mg/ℓ; remaining variables, µg/ℓ.

[e] NA = Not applicable.

[f] Stated levels for trivalent arsenic.

[g] Detection limits ranged from <1 to <5 µg/ℓ. Aquatic life criterion was exceeded in October 1989, at 7 µg/ℓ.

[h] Hardness dependent (100 mg/L level given).

[i] Detection limits reported as <10 µg/ℓ from July 1989 to June 1990; not stated before July 1989.

[j] Detection limits reported as <10 µg/ℓ, January 1989 - May 1989; <50 µg/ℓ, June 1989 - July 1990. Aquatic life criterion was exceeded in April 1990 at 20 µg/ℓ.

[k] Detection limits ranged from <0.1 - <0.2 µg/ℓ. Aquatic life criterion exceeded in January, February, March, June, October 1989 and May 1990; any detectable mercury will exceed aquatic life criterion.

[l] Insufficient data to develop criteria. Value presented is the lowest observed effect level (LOEL)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1, Part I Pg. #: 4-57 Line #:1 Code:
159 Original Comment # 125
Comment: This sentence states that, apart from uranium and its isotopes, only three radionuclides were detected. Table 4-23 indicates that five other radionuclides were detected. This discrepancy should be reconciled.

Response: The intended meaning of this sentence was that only isotopes of radium, thorium, and technetium were infrequently detected during the surface water monitoring of the Great Miami River.

Action: The sentence beginning on line 1, page 4-57 will be modified to state: The only other radionuclides detected during the surface water monitoring of the Great Miami River were isotopes of radium, thorium, and technetium, which were detected in less than 10 percent of the collected samples."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.1 , Part I Pg. #: 4-57 Line #:12 and 13 Code:
160 Original Comment # 126
Comment: This sentence states that no heavy metal concentrations are elevated in river water at downstream stations relative to observed concentrations at background stations. Given the problems mentioned above regarding selection of background sampling locations and the great distance between the site and downstream locations, this conclusion is probably premature and should be reconsidered.

Response: The statement made in the cited sentence is correct. For many metals (e.g., mercury, cadmium, calcium, chromium, molybdenum, and nickel), it even appears that concentrations upstream are higher than downstream. However, the data populations for each constituent at each station are often two or less, so conclusions cannot be stated emphatically.

Air emissions from FEMP may have contributed minor amounts of metals to the streams (Paddys Run and Great Miami River). However, many other potential sources of metals may be present in the watersheds upstream of the FEMP. There is absolutely no way to identify what portion of the metals originated from FEMP airborne emissions and what portion was derived from other upstream sources.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.2 , Part I Pg. #: 4-57 Line #:26 Code:
161 Original Comment # 127
Comment: DOE includes Station W9 as an upstream sampling location. The fact that Station W9 is on FEMP property and could be affected by site contamination should be noted.

Response: In the approved RI/FS Sampling Plan (Revision 3, March 1988), it is stated that Station W5 represents an upstream control and Stations W9 and W10 represent upstream and downstream locations with respect to the waste storage area (Section 5, page 8 of the Sampling Plan). On the same page it is stated that Station W5 will also

be included in the sediment sampling program to provide a background comparison. Station W5 is considered the background sampling location for Paddys Run and Station W9, while upstream of the waste storage area will be identified only as an upstream (not background) location.

Action: The sentence beginning on line 26, page 4-57 will be replaced with the following: "Station W5, upstream of the FEMP is considered to be a background station for Paddys Run. Station W9 is located on FEMP property, upstream of the waste storage area."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.2 , Part I Pg. #: 4-73 Line #:13 and 20 Code:
162 Original Comment # 128
Comment: The presentation of data here and in Table 4-31 is misleading. Table 4-31 combines data for sampling points W-5 (background), W10, and W11 to indicate area concentrations between the FEMP's northern boundary and its confluence with the Storm Sewer Outfall Ditch (SSOD). Background sample results should be clearly defined and shown separately. In this case, and in many others, the data would be better represented in a figure.

Response: The information presented in Tables 4-31 and 4-32 was not presented to be misleading but rather to maintain consistency with the format of the data presented for the WEMCO environmental monitoring reports for Paddys Run (Table 4-28).

The use of figures for presenting these analytical data has been considered. However, because there are several analyzed constituents, and there is more than one result for each constituent due to multiple sampling rounds at each sampling location, the suggested figure would be cluttered with data and would provide little improvement in understanding of the data over the currently presented in table format.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.2 , Part I Pg. #: 4-79 Line #:2 Code:
163 Original Comment # 129
Comment: DOE uses the term "upstream" instead of "background" to define results for location W-5. The report should clearly indicate the relevance of comparative sampling points described as "upstream" or "background."

Response: Comment noted. Please see the response to U.S. EPA General Comment #161 (EPA127).

Action: Line 1, page 4-79. The phrase "upstream station" will be changed to "background station W5" to more clearly identify the station used as a point of comparison.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.2 , Part I Pg. #: 4-80 Line #: Code:
164 Original Comment # 130
Comment: Table 4-33. The gross alpha results for the single downstream sample are listed as a range of 16.0 pCi/g and a mean of 6 pCi/g. DOE should correct this discrepancy.

Response: The number "1" was inadvertently omitted from the cited mean concentration for gross alpha.

Action: Table 4-33, page 4-80: Revise the mean concentration for gross alpha for the Paddys Run sediments downstream of the storm sewer outfall ditch from "6" to "16.0."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.3, Part I Pg. #: 4-84 Line #:15 Code:
165 Original Comment # 131
Comment: The text states that "No above background levels of inorganic chemicals were noted." Background levels should be clearly defined and included for direct comparison.

Response: Because the storm sewer outfall ditch is an intermittent discharge that is derived from storm water runoff from the FEMP, there is no background sampling location on this watercourse that would be upstream of the influences of the FEMP. The use of the term background in this sentence refers to a comparison to other designated background locations in the RI/FS surface water and sediment sampling program, namely W1 (on the Great Miami River) and W5 (on Paddys Run).

Action: Revise the sentence on page 4-84, line 15 to state: "The results for the inorganic analyses for these locations in the storm sewer outfall ditch were similar to concentrations observed at the background locations for Paddys Run (W5) and the Great Miami River (W1)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.4 , Part I Pg. #: 4-84 Line #:29 Code:
166 Original Comment # 132
Comment: DOE uses a comparative standard of 550 pCi/ℓ for data comparison here. The rationale for comparison should be provided. This standard is at least 50 times the background level and seemingly irrelevant. In addition, the results for sampling location DD07 and DDACT3 in Table 4-36 actually exceed this standard, which is not stated. The data should be compared to background levels.

Response: The standard used for comparison was the applicable guideline in effect at that time, DOE Order 5480.xx, which limited the discharge of radionuclides including Th-228 (400 pCi/ℓ), Th-230 (300 pCi/ℓ), Th-232 (50 pCi/ℓ), U-234 (500 pCi/ℓ), U-235 (600 pCi/ℓ), and U-238 (600 pCi/ℓ). However, these drainage ditch samples occur in areas with intermittent flow conditions and should not be compared to "background levels" observed for other water courses as the reviewer as suggested.

Action: The standard was incorrectly stated in the text as 550 pCi/ℓ and will be corrected and explained in more detail. Those specific locations that exceeded the DOE guidelines will be properly identified in Section 4.1.3.4.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-85 Line #: Code:
167 Original Comment # 133
Comment: Table 4-36. This table indicates that the heavy metals cadmium and mercury as well as many radionuclides and organics were not analyzed for. The rationale for this omission should be presented.

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Response: As was stated in the response Specific Comment #80 (EPA46), it is not the intent of the SWCR to evaluate the usefulness or the rationale of the previous non-RI/FS sampling efforts at the FEMP. The data presented in Table 4-36 correspond to those presented in the source document.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.4 , Part I Pg. #: 4-91 Line #:1 - 11 Code:
168 Original Comment # 134
Comment: This discussion provides a very limited summary of the surface water data collected during the study. The discussion, particularly with regard to sampling locations and contaminant concentrations, should be expanded.

Response: It should be emphasized that the cited text section is describing water samples that were collected from the actual waste management units and not surface water bodies. Sampling locations are presented in Figure 3-9 and correspond to the samples identified in Table 4-37. The level of the discussion in the text is appropriate for the level of information available in the original source document.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-92 Line #: Code:
169 Original Comment # 135
Comment: Table 4-37. See General Comments No. 6 and 12 with regard to uranium isotopes, metals, and organics.

Response: The data presented in Table 4-37 are not related to the RI/FS program, and analyses in compliance with the RI/FS QAPjP were therefore not required or performed. The data presented in Table 4-37 are the same as presented in the source document. Regarding the reference to General Comment #12, the source document for Table 4-37 (The Feed Material Production Center Sampling and Analysis Data Document - DOE, 1988) did evaluate the stream reach of the Great Miami River immediately downstream of the FEMP (see Figure 3-8 and Table 4-20).

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-94 Line #: Code:
170 Original Comment # 136
Comment: Table 4-38. The units given in this table for organics are wrong; "gR/kg" should be corrected. The report should clearly indicate what these units are and why, if they represent grams per kilogram, they are so high.

Response: Comment noted. The correct unit for the organic compounds in Table 4-38 is µg/kg.

Action: Revise the unit for organic compounds in Table 4-38 to read "µg/kg."

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TECHNICAL COMMENTS

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.4, Part I Pg. #: 4-100 Line #:1 - 22 Code:
171 Original Comment # 137
Comment: None of the data summarized in these paragraphs is presented in tables, and no sampling locations are cross-referenced with corresponding figures. Concentrations of uranium-238 are cited, but their corresponding sampling locations are not (Line 5). These omissions should be addressed.

Response: Comment noted. The summary level tables of these data are presented in Appendix R, Table R.3-7 (surface water radionuclide data) and Table R.3-18 (surface water chemical data). It should be stated that the RI/FS environmental data presented in these tables represent RI/FS data for Sections 4.1.3.4, 4.1.3.5, and 4.1.3.6. The text discussion has attempted to present the data on an operable unit basis for comparative purposes. More detailed discussions of these data will be presented in the individual operable unit reports for the FEMP.

Action: The following text revisions are suggested: Page 4-100, Line 6 will be changed to read: "The RI/FS sampling in the waste pit area was limited to single samples collected at the following locations in the drainage ditches surrounding the waste pit area: ASIT-018, ASIT-019, ASIT-020, ASIT-022, ASIT-027, ASIT-028, ASIT-029, ASIT-030, ASIT-031, and ASIT-038; locations of these sampling points are shown in Figure 3-17."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.5, Part I Pg. #: 4-41 Line #:3 - 8 Code:
172 Original Comment # 138
Comment: None of the manhole sampling data presented in this section is presented in a table, and no appendix is referenced. This omission should be addressed.

Response: Comment noted. It is assumed that the comment applies to lines 3 through 8 on page 4-101.

Action: A table presenting the analytical data for the manhole sampling effort will be inserted into the text to assist the reader in evaluating the collected environmental data.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.5, Part I Pg. #: 4-101 Line #:6 Code:
173 Original Comment # 139
Comment: The DOE standard noted here, "600 pCi/ℓ," is inconsistent with that used on Page 4-89. As noted earlier, the relevance of this comparison is questionable; the result should be compared to the background level.

Response: As stated previously in the response to Specific Comment #166 (EPA 132), the standard used for comparison was the applicable guideline in effect at that time, DOE Order 5480.xx, which limited the discharge of radionuclides including Th-228 (400 pCi/ℓ), Th-230 (300 pCi/ℓ), Th-232 (50 pCi/ℓ), U-234 (500 pCi/ℓ), U-235 (600 pCi/ℓ), and U-238 (600 pCi/ℓ). The water samples collected from the facility manholes are not naturally occurring drainages, and therefore should not be compared to a local "background level" conditions observed for other water courses as the reviewer has suggested.

Action: The DOE standard is correctly stated in the text as 600 pCi/ℓ for uranium-238; however, the use of this guideline for comparison purposes will be explained in more detail. Those specific locations that exceeded the DOE guidelines will be properly identified in Section 4.1.3.5.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.5 , Part I Pg. #: 4-101 Line #:13 Code:
174 Original Comment # 140
Comment: This sentence states that "higher than average values" for specific analytes were observed. It is not clear whether the term "higher than average" refers to a statistical mean or a background level. This sentence should be clarified.

Response: The cited statement was taken from the source document. It is presumed that the average values used for comparison were those specific to this analysis and this area, and not a background level.

Action: The following text change is suggested for page 101, line 12: "For those samples assessed in this sampling program, sample MH-33 contained generally higher than the observed average concentrations of specific analytes. For example, ..."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.6, Part I Pg. #: 4-101 Line #:30 - 32 Code:
175 Original Comment # 141
Comment: This sentence states that the sampling of surface water and sediments not included in sampling efforts for the Great Miami River, Paddy's Run, and the SSOD has focused on characterizing the conditions in the immediate vicinity of waste management units. This implies that many other on-site surface water bodies and surface drainages have not been investigated. A complete inventory of these site features should be presented along with clear discussion of the characterization activities performed for them.

Response: The cited sentence on page 4-101, lines 30 through 32 was presented to introduce a series of surface water and sediment sampling locations that were not included in the previously described sampling areas (i.e., the Great Miami River, Paddys Run, the storm sewer outfall ditch, the waste pit area, and the production area). The areas that are identified in this Section are: the active and inactive flyash piles, the sanitary landfill, and the K-65 silo area. These locations are current or former waste management areas which were sampled to characterize any impacts of these areas on the surrounding surface water and sediment quality. The surface waters and sediments beyond the immediate vicinity of these waste areas flows into drainage ditches that discharge into Paddys Run, and ultimately the Great Miami River. There are no other surface water bodies at the FEMP that have not been investigated, and the text will be revised to improve the intended meaning of the sentence.

Action: The two sentences on page 4-101, lines 30 through 33 will be replaced with the following: "The FEMP contains several other waste disposal areas where surface runoff water and sediment were analyzed during the RI/FS program. These areas are the active and inactive flyash piles, the sanitary landfill, and the K-65 silo area. The focus of the monitoring in these areas was similar to that for the waste pit area (Section 4.1.3.4) and the former production area (Section 4.1.3.5) programs, in that the

effort was intended to characterize any impacts that these areas had on nearby surface water and sediment quality."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3.6, Part I Pg. #: 4-102 Line #:31 and 32 Code:
176 Original Comment # 142
Comment: This sentence states that organic compounds were "typically not present." This sentence is vague. The text should clearly state whether organics were detected, and a thorough discussion of relevant data should be provided.

Response: The cited sentence will be modified to improve clarity.

Action: The following text change is suggested for page 4-102, lines 31 and 32: "Organic constituents such as acetone and methylene chloride were present in detectable quantities, along with several metals and inorganic compounds (Appendix R, Table R.3-39)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.1.1, Part I Pg. #: 4-104 Line #:22 - 27 Code:
177 Original Comment # 143
Comment: A great deal of data is summarized here that is difficult to evaluate without corresponding figures. For this section and subsequent ground-water discussions, significant data should be plotted on figures.

Response: As stated in the response to General Comment #1, it is not the intent of the SWCR to provide the detail necessary to discuss the nature and extent of contamination at the FEMP. The requested figures should be based on a complete and validated database, which will be available for the operable unit RI reports, but was not available for the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.1.1, Part I Pg. #: 4-105 Line #:18 - 23 Code:
178 Original Comment # 144
Comment: The text suggests that another source of elevated radionuclides is evident. To allow evaluation of this hypothesis, more information needs to be provided. At a minimum, the information should be provided in figures.

Response: Please see the response to Specific Comment #178 (EPA 143).

Action: Nones required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.1.2, Part I Pg. #: 4-105 Line #:25 - 28 Code:
179 Original Comment # 145
Comment: This paragraph states that iron and manganese concentrations exceeding the secondary maximum concentration limits (MCLs) are typical for the area. A thorough discussion of iron and manganese concentrations in background locations should be presented,

and these concentrations should be compared to FEMP ground-water monitoring data to support this assertion.

Response: This comment has been noted. The text will be revised to clarify this issue.

Action: The second sentence in Section 4.1.4.1.2 will be revised as follows: "The background concentrations of iron detected during the ongoing RI/FS and RCRA sampling programs up to the cut off date of the SWCR ranged from 0.005 to 4.9 mg/ℓ in the perched groundwater and from 0.007 to 3.6 mg/ℓ in the sand and gravel aquifer. The background concentrations of manganese detected during the ongoing RI/FS and RCRA sampling programs ranged from 0.003 to 0.22 mg/ℓ in the perched groundwater and from 0.002 to 0.48 mg/ℓ in the sand and gravel aquifer. It is not uncommon to find concentrations of iron and manganese in groundwater that exceed the 0.3 and 0.05 mg/ℓ Secondary Maximum Contaminant Level (SMCL), respectively, for these two metals."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.1, Part I Pg. #: 4-108 Line #:10 and 11 Code:
180 Original Comment # 146
Comment: This sentence states that only Wells 12, 15, and 17 had annual total uranium concentration averages exceeding the background concentration of 2 pCi/ℓ; however, Table 4-42 indicates that Well 34 had an annual total uranium concentration average of 2.8 pCi/ℓ in 1990. This discrepancy should be addressed. Also, the following paragraph compares total uranium concentrations with the 22-pCi/ℓ DOE drinking water guideline, not the proposed MCL.

Response: For the first part of the comment, a mistake was made in the sentence cited. The overall average of total uranium concentrations was calculated for each well using the annual averages of total uranium concentrations as shown in Table 4-42. Among the wells listed, the overall averages of total uranium concentration for Wells 12, 15, and 17 are the only ones that exceeded the proposed MCL or the background concentration of uranium.

DOE agrees with the second part of the comment. However, only the wells containing uranium concentrations that exceeded the DOE guideline are presented in the 1990 Annual Environmental Monitoring Report. Because the original data could not be accessed to compare against background or the MCL, the SWCR can only quote the statement in the original report.

Action: The sentence on Page 4-108, Line 10-12 will be replaced by: "With the exception of Wells 12, 15, and 17, none of the overall averages of total uranium in the off-property wells exceeded ....."

The heading for the last column in Table 4-42 will be changed to "Overall Average[d]."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.1, Part I Pg. #: 4-108 Line #:23 - 35 Code:
181 Original Comment # 147
Comment: This section discusses data for over 150 wells, yet the information is presented only in tabular form. Without graphical display of the data, it is difficult to evaluate the

discussion. Significant data, particularly data indicative of a plume, should be plotted figures.

Response: It is not the intent of the SWCR to provide the detail necessary to discuss the nature and extent of contamination at the FEMP. The requested figures should be based on a complete and validated database. As addressed in the response to the U.S. EPA Specific Comment #146, due to the limited accessibility to the entire database of the Environmental Monitoring Program, it is not feasible to prepare such figures.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-110 Line #: Code:
182 Original Comment # 148
Comment: Table 4-42. Footnote b refers the reader to Figure 3-16 for well locations. This figure shows the locations of production area manholes. This discrepancy should be addressed.

Response: The comment has been noted. Footnote b in Table 4-42 will be revised.

Action: Footnote b in Table 4-42 will be revised to: "See Figure 3-22 for well locations."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.2, Part I Pg. #: 4-111 Line #:24 - 31 Code:
183 Original Comment # 149
Comment: This section discusses "major radionuclides of concern." The report should fully describe and justify how radionuclides were placed in such a category. Also, this section compares these "major radionuclides of concern" with "DOE guidelines." Throughout this report, all data should be compared to background levels and applicable standards. DOE standards should be used for comparison only when applicable U.S. EPA guidelines or regulations do not exist.

Response: For the first part of this comment, the text will be revised to clarify this issue.

For the second part of this comment, due to the limited accessibility to the complete data set used to prepare the Annual Environmental Reports, the SWCR can only quote the statements in these reports. Only the wells containing concentrations of thorium, total radium, strontium-90, and technetium-99 that exceeded the DOE guidelines are presented under the Comprehensive Sampling Program in the 1990 Annual Environmental Report. Without the original data set, it is impossible to assess the groundwater quality in the fashion suggested by the comment.

Action: Page 4-111, Line 24-27 will be replaced by the following sentences: "The other primary radioactive elements analyzed for, in addition to uranium, under the Comprehensive Groundwater Monitoring Program were radium, strontium, technetium, and thorium. Gross alpha activity, gross beta activity, cesium, plutonium, ruthenium, and neptunium in the groundwater were also monitored as indicators of radionuclide contamination (WMCO, 1991). The DOE guidelines, the numbers of samples with concentrations higher than DOE guidelines, and the total number of samples analyzed for these four primary analytes are as follows:."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.3, Part I Pg. #: 4-115 Line #:4 Code:
184 Original Comment # 150
Comment: Well 3066, which could not be located in a figure, appears to be northwest of the facility and not "northeast" as indicated in the text. The location of the well should be clarified and included in a figure.

Response: This comment has been noted. Well 3066 is shown in Figure 3-28, which will be referenced in the statement in the revised SWCR. Also, Well 3066 is located at the northwest corner of the FEMP property. The mistake was a typographical error.

Action: Page 4-115, Line 3-5 will be revised to: "Arsenic concentrations above the 0.05 mg/ℓ MCL were found only in Well 3066, which is located at the northwest corner of the FEMP property (Figure 3-28)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.3, Part I Pg. #: 4-115 Line #:11 - 17 Code:
185 Original Comment # 151
Comment: The discussion of data for on-property wells is inadequate. The data is presented in Table 4-45 as average values for each indicator parameter; the averages include all data from all wells. The data should be presented individually by well, and the change over time (1984 to 1990) should be discussed.

Response: The requested analyses and descriptions will be provided in the Operable Unit 5 RI report and are currently available in part in the Groundwater Report. Those analyses should be based on a complete and validated database, which will be available for the operable unit RI reports, but was not available for the SWCR.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.2.4, Part I Pg. #: 4-115 Line #:29 Code:
186 Original Comment # 152
Comment: This sentence makes reference to the 13 "traditional" on-property wells. This term should be defined.

Response: Agreed. A clarification on the 13 traditional on-property wells will be made in the leading paragraph of Section 4.1.4.2 for the Environmental Monitoring Program (Page 4-106).

Action: The following sentences will be inserted after the third sentence of Section 4.1.4.2 on Page 4-106: "Thirteen on-property wells, as listed in Table 3-15, have been sampled since 1983 for the Environmental Monitoring Program and are referred to as the traditional on-property wells. The list of the off-property wells has changed from year to year depending on the willingness of the private well owners to be included in the program."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-116 Line #: Code:
187 Original Comment # 153

Comment: Table 4-45. This table provides an explanation in the footnotes for superscript d; however, subscript d does not appear in the table. Also, superscript e appears in the table but is not defined in the footnotes. These discrepancies should be resolved.

Response: This comment has been noted. Footnote d appears in the third line of the heading in Table 4-45, immediately after "Range" for chloride, nitrate nitrogen, and sulfate. Footnote e was inadvertently left out of the report. A definition of Footnote e will be included in the revised Table 4-45.

Action: Footnote "e" will be added to Table 4-45 which reads "Only one sample was collected in Wells 1124 and TOAB, which occurred in 1984."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.3, Part I Pg. #: 4-118 Line #: Code:
188 Original Comment # 154
Comment: The introduction to this section should provide a thorough description of the RCRA monitoring system. The introduction should identify the wells in the system and should provide a map showing their locations. Also, significant results should be shown in figures.

Response: A thorough description of the RCRA monitoring system has been provided in Sections 3.1.4.3 and 3.1.4.4, which includes the wells sampled in the program and the analytical methods. DOE does not believe that it is necessary to repeat the description in Section 4.1.4.3. As stated in the response to the U.S. EPA Specific Comment #59, Round 1 through Round 5 data were collected before the current Quality Assurance Project Plan (QAPP) for the FEMP Site was implemented. The quality of the data, therefore, may not be as reliable as the data collected subsequently. Presenting these data in figures may be misleading.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.3.1, Part I Pg. #: 4-122 Line #:6 - 8 Code:
189 Original Comment # 155
Comment: This paragraph states that Radium-228 is an alpha decay product of Thorium-232 and that the elevated concentration of Radium-228 in Well 1022 is a result of this phenomenon. However, this argument cannot be used to explain the elevated levels of Radium-228 in Well 1021 because Thorium-232 was not detected in this well. This line of reasoning needs to be further supported or removed from the text.

Response: This comment has been noted. The paragraph referred to by the commentor was a phenomenon suggested by the referenced document. The correlation of high radium-228 and high thorium-232 was also observed in Round 1 RCRA Detection Program data for Well 2019. Since this phenomenon may not be true in all situations, DOE will remove this paragraph from the text.

Action: Page 4-122, Lines 6-8 will be removed from the revised SWCR.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.3.1, Part I Pg. #: 4-122 Line #:23 - 25 Code:

190 Original Comment # 156

Comment: This sentence lists wells with concentrations of total uranium "less than or close to background." This sentence implies that some of the wells in the list contain total uranium at levels above background concentrations. It is not clear what "close to background" means. This type of data treatment is potentially misleading and should not be used.

Response: Agreed. The text will be revised to clarify the concentrations of uranium in the wells referred to by the commentor.

Action: Page 4-122, Line 23-25 will be replaced by the following sentences: "Concentrations of total uranium detected in background groundwater samples collected from Collector Well 2 during the RCRA Detection Program ranged from 0.6 to 0.8 pCi/ℓ. Total uranium concentrations in groundwater samples collected from Wells 2011, 2020, 3017, 3020, 4001, 4008, 4015, 4102, and 4103 ranged from 0.1 to 1.1 µg/ℓ, which were very close to the background concentration."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.3.4, Part I Pg. #: 4-131 Line #:2 - 4 Code:

191 Original Comment # 157

Comment: This sentence states that a number of other organic compounds were detected but provides no further explanation. This discussion should be expanded to identify the other compounds.

Response: This comment has been noted. Rounds 1 to 5 data of the RCRA Groundwater Detection Program were collected under a different quality assurance protocol than the data collected subsequently. The quality of the earlier data may be questionable.

Action: The following sentences will be added in Page 4-131, following the last sentence in the first paragraph: "It should be noted that the quality of the data collected during Round 1 through Round 5 may be questionable because a different quality assurance protocol was used. Nine organic compounds were detected in groundwater samples collected from Well 1019, which is located immediately east of Pit 4, and may be related to the waste material disposed of in Pit 4."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.3.4, Part I Pg. #: 4-131 Line #:24 - 30 Code:

192 Original Comment # 158

Comment: VOCs were evidently detected in many wells during this investigation. If a plume is evident in the sand and gravel or perched aquifer, it should be defined and shown in a figure.

Response: Please see the response to U.S. EPA Specific Comment #154.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-133 Line #: Code:

193 Original Comment # 159

Comment: Table 4-50. The reported concentrations for phenols and trichloroethene (0.006 µg/ℓ and 0.0044 µg/ℓ, respectively) in Monitoring Well 2004 are several orders of magnitude below contract laboratory program (CLP) contract required quantitation limits (CRQLs). These concentrations should be double-checked for accuracy.

Response: This comment has been noted. The 0.006 µg/ℓ and 0.0044 ug/ℓ for phenols and trichloroethene, respectively, referred to by the commentor were typographical errors. Table 4-50 will be revised to report the correct values of phenols and trichloroethene for this sample.

Action: Page 4-133, Table 4-50, Monitoring Well 2004, concentrations of phenols and trichloroethene will be corrected to 6 and 4.4 ug/ℓ, respectively.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.1, Part I Pg. #: 4-138 Line #:26 - 28 Code:
194 Original Comment # 160

Comment: This sentence states that a water sample collected from the oil-fire pond revealed the highest total uranium concentration found in any water sample from the area. No further information is provided. The exact sampling location, sample number, and concentration should be provided.

Response: Agreed. The source of these data will be provided in the revised SWCR, and the text will be revised to clarify this issue.

Action: The first and the second sentences of the last paragraph on Page 4-138 will be replaced by the following sentences: "Samples collected from all of the eight piezometers located in the fire training area showed elevated total uranium concentrations with averages ranging from 0.014 to 0.117 mg/ℓ. A water sample collected in May 1990 from Well 1509, which is located southwest and downgradient of the fire-training pond, showed the highest total uranium concentration in this area, 0.183 mg/ℓ (OU5 RI/FS Work Plan Addenda, January 1992)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.1, Part I Pg. #: 4-142 Line #:4 Code:
195 Original Comment # 161

Comment: According to the discussion, radionuclides were repeatedly detected in 31 wells. The frequency of detection is fairly high. The discussion should be modified to discuss the frequency of detection and the repeated detection of radionuclides.

Response: Agreed. The text will be revised to reflect the high frequency of detection in groundwater samples collected from these 31 wells.

Action: The following text will be inserted after the sentence referred to by the commentor (Page 4-142, Line 4): "The frequency of detection for the radionuclides listed in Table 4-52 for these 31 wells and the total number of wells found with repeated detections of these radionuclides are:

- Radium-226 detected in 19 of 23 samples (a total of 7 wells)
- Radium-228 detected in 4 of 5 samples (a total of 2 wells)
- Technetium-99 detected in 31 of 40 samples (a total of 12 wells)

- Thorium-228 detected in 30 of 59 samples (a total of 14 wells)
- Thorium-230 detected in 35 of 69 samples (a total of 17 wells)
- Thorium-232 detected in 22 of 30 samples (a total of 9 wells)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
196 Original Comment # 162
Comment: Table 4-51. Total uranium is misspelled throughout this and subsequent tables. This error should be corrected.

Response: The spelling of uranium will be checked and corrected in Table 4-51 and subsequent tables.

Action: Check Table 4-51 and subsequent tables for any spelling errors.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-145 Line #: Code:
197 Original Comment # 163
Comment: Table 4-53. The upper tolerance limits (UTL) for barium, lead, and nickel are above existing MCLs. The use of such high UTLs is misleading and may lead to incorrect risk assumptions and inaccurate data reporting. This issue should be discussed.

Response: This comment has been noted. As listed in Table 4-53, the upper tolerance limits of barium, lead, and nickel calculated from background sample analytical results are 0.132, 0.054, and 0.103 mg/ℓ, respectively. The MCLs of these metals are 2, 0.015, and 0.10 mg/ℓ as of April 1992. The UTLs of lead and nickel indeed exceed the MCLs of these two metals. Further evaluation of the UTLs will be performed after the completion of the data validation process. This will involve validating the background well selection and data screening for outliers and inconsistent detection limits.

Action: The background wells used to represent background groundwater quality will be reevaluated, and UTLs will be recalculated for purposes of the Operable Unit 5 RI Report.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.1, Part I Pg. #: 41-152 Line #:25 - 35 Code:
198 Original Comment # 164
Comment: These paragraphs provide a very limited discussion of the organic contamination. This discussion should be expanded.

Response: Organic compounds detected in perched groundwater have been summarized in Table 4-56 based on the compound variety, the well locations, the potential source areas, and the degree of contamination (i.e., concentration range). Further interpretation of these data beyond this well be presented in the Operable Unit 5 RI Report after the completion of the data validation process.

Action: Detailed discussion and evaluation of these organic analytical results will be presented in the Operable Unit 5 RI Report following the completion of the data validation.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-158 Line #: Code:
199 Original Comment # 165
Comment: This page was not submitted with the draft report and thus was not reviewed.

Response: Page 4-158 (Figure 4-1) is a foldout figure. It was inadvertently omitted from the volume and was sent to U.S. EPA separately.

Action: Check future submissions to be sure foldout figures are included.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.2, Part I Pg. #: 4-159 Line #:19 - 28 Code:
200 Original Comment # 166
Comment: This paragraph suggests that nitrate and ammonia concentrations differ in the various Great Miami Aquifer tributaries because of differences in the amount of chemical reduction occurring. The possibility that these differences are related to agricultural activities should be explored.

Response: Agreed. The possibility that the differences of nitrate and ammonia concentrations in the various Great Miami Aquifer tributaries may be related to agricultural activities will be included in the revised SWCR.

Action: Page 4-159, Lines 24-28, the last sentence in the paragraph will be deleted and the following sentences will be added: "Similarly, the average iron and manganese concentrations in Shandon background samples were higher than Dry Fork and Ross background samples. Thus providing additional evidence that the Shandon Tributary is more reducing than the other two tributaries of the Great Miami Aquifer. The differences in concentrations of nitrate, ammonia, iron, and manganese may also be attributable to the variety and intensity of crop production and pasturel land use in these areas."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.2, Part I Pg. #: 4-160 Line #:24 Code:
201 Original Comment # 167
Comment: This sentence states that "statistically elevated" uranium concentrations were found in ground-water samples from various locations. A definition of the term "statistically elevated" should be provided.

Response: This comment has been noted. The term "statistically elevated" refers to concentrations of uranium that exceed the upper tolerance limit (UTL) calculated from background analytical results. This sentence will be revised to avoid the confusion.

Action: Page 4-160, Line 24 will be revised to: "Uranium concentrations that exceeded the UTL were found in groundwater samples from wells located in....."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.4.4.2, Part I Pg. #: 4-160 Line #:31 - 33 Code:
202 Original Comment # 168

Comment: This sentence presents data for a well that displayed "consistently elevated uranium concentrations." This implies that wells showing occasional elevated concentration are not discussed in the report. This issue should be clarified.

Response: This comment has been noted. The sentence is meant to identify the distinctively high concentrations of total uranium found in Well 2397 where concentrations of total uranium ranged from 212 to 258 µg/ℓ. This sentence will be revised to clarify the issue.

Action: Page 4-160, Lines 31 to 33 will be revised to: "Groundwater samples collected from Well 2397 show the highest total uranium concentrations among the samples collected from the sand and gravel aquifer at locations outside of the South Plume Area. Well 2397 is located in the vicinity of the Stormwater Retention Basin, and concentrations of total uranium in this well ranged from 0.212 to 0.258 mg/ℓ."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-176 and 4-177 Line #: Code:
203 Original Comment # 169
Comment: Table 4-60. This table presents UTLs for inorganic compounds. Many of the UTLs are above existing MCLs. This matter should be further discussed.

Response: This comment has been noted. Please see the response to U.S. EPA Specific Comment #163. It is recognized that the UTLs of arsenic, beryllium, cadmium, iron, lead, manganese, and selenium listed in Table 4-60 exceed the MCL or SMCL for these metals. As addressed in the response to U.S. EPA Specific Comment #163, the groundwater data collected from wells located in the background areas will be reevaluated after the completion of the data validation process.

Action: See the proposed action to U.S. EPA Specific Comment #163.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.5.3, Part I Pg. #: 4-195 Line #:17 and 18 Code:
204 Original Comment # 170
Comment: This sentence states that different laboratories were used to analyze the samples in 1985 and 1986 and that this may account for the differences seen in the analytical results. In the absence of any proof, this type of speculation should be removed from the report.

Response: The suggestion that the use of different analytical laboratories may have accounted for the year to year differences originated in WMCO (1987), not the SWCR. It is important to point out that switching laboratories may confound the interpretation of inter-year differences, whether or not it can be "proved."

Action: Page 4-195, Line 17, insert "WMCO (1987) suggested that" before "Different". Omit "were" and "and."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.5.3 , Part I Pg. #: 4-195 Line #:26 and 27 Code:
205 Original Comment # 171

Comment: This sentence states that all but three off-property sampling locations displayed uranium concentrations within the range considered background for Ohio. All data should be compared to background conditions established in the FEMP area.

Response: The statement originated in the report cited, not in the SWCR.

Action: Omit the sentence in Lines 26-27.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.5.3, Part I Pg. #: 4-195 Line #:31 - 33 Code:
206 Original Comment # 172
Comment: This sentence states that when sampling and analytical uncertainties were considered, the uranium concentrations in three of the remaining 10 locations were within background range. The phrase "sampling and analytical uncertainties" should be explained along with the procedures used to identify these uncertainties and remove them from the data.

Response: Agreed. Sampling and analytical uncertainties for the surface soil collected provided a margin of error up to ± 2.7 pCi/g. When this margin of error was considered, three of the samples fell within background range."

Action: Lines 31-32 will be modified to read: "Sampling and analytical uncertainties for the surface soils collected provided a margin of error up to ±2.7 pCi/g. When this margin of error was considered, three of the samples fell within background range.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
207 Original Comment # 173
Comment: Figure 4-7 and 4-8. The sampling location numbers should be provided in these figures.

Response: The requested information will be added to Figures 4-7 and 4-8.

Action: Part I, Pages 4-307 and 4-308, Figures 4-7 and 4-8, add sampling location numbers.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: Line #: Code:
208 Original Comment # 174
Comment: Figure 4-8. According to this figure, the sampling locations farthest upstream are located adjacent to the FEMP; no background stations are shown that would allow upstream versus downstream comparisons. The data presented indicates decreasing invertebrate community indices for Paddy's Run as this stream flows through the FEMP. Therefore, an indication of the upstream (background) water quality would be useful. This data should be provided.

Response: Available data on surface water quality at and adjacent to the FEMP are provided in Section 4.1.3. It should be noted that the general patterns observed are similar to those for decreasing macroinvertebrate diversity found by Facemire et al. (1990) in their 1986-1987 study.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.7.2 , Part I Pg. #: 4-309 Line #:33 - 35 Code:
209 Original Comment # 175
Comment: This sentence states that no consistent differences in uranium concentrations have been observed between produce samples collected adjacent to the FEMP and at reference locations; however, all the data for corn and tomatoes presented in Table 4-85 shows significant elevations in uranium concentrations compared to the data for the reference locations. This discrepancy should be addressed.

Response: Table 4-85 does not support the statement that "significant" elevations exist in corn and tomatoes grown in the vicinity of the FEMP, although the maxima are higher. This latter observation will be added to the text.

Action: Part I, Page 309, Line 35, add after "facility" ", although the maximum values for corn and tomatoes adjacent to the FEMP are higher than the maxima at the reference locations."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part I Pg. #: 4-310 Line #: Code:
210 Original Comment # 176
Comment: Table 4-84. This table presents average uranium and fluoride concentrations in grass and forage at varying distances from the FEMP over time; however, results are presented as single averages from samples collected between 0.10 and 40 kilometers away from the FEMP. The usefulness of data presented in this manner is questionable. A justification for this type of data treatment should be provided in the report.

Response: The data are presented as annual averages and ranges in order to be concise. The details are available in the cited reports.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.7.2 Pg. #: 4-313 Line #:4 - 8 Code:
211 Original Comment # 177
Comment: This sentence states that the high uranium concentrations in milk samples collected near FEMP in 1989 and 1990 were incorrect because other samples had concentrations below detection limits and because air monitoring equipment detected no uranium releases from the FEMP. This rationale for discounting the milk sample data is questionable. The text should state whether the air monitoring equipment can be guaranteed to detect such releases.

Response: The rationale in question, as stated in the text, is that of the cited reports. It is not the function of the SWCR to evaluate the air monitoring program conducted by WEMCO.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.7.2 , Part I Pg. #: 4-313 Line #:10 - 12 Code:
212 Original Comment # 178
Comment: This sentence states that "there were not consistent differences among the three sample locations, although fish collected from the outfall and downstream stations showed markedly higher uranium concentrations than those form the upstream location in 1988." Also, the data presented in Table 4-87 indicates similar uranium concentration increases at this location in 1985 an 1989. This sentence appears to be contradictory and should be clarified.

Response: The magnitude of the differences in 1988 was much greater than those of the differences in other years.

Action: No change is required in the text in response to the comment. In Part I, Page 3-313, Line 11, insert "had" before the word "markedly".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Summary, Part II Pg. #: S-1 Line #:19 Code:
213 Original Comment # 179
Comment: In view of the incomplete nature of the data and the partial validation of the available data, the results should be qualified in the introduction. Section 1.3 has language that can be adapted to this purpose.

Response: Agreed.

Action: Add the following text on page S-1, line 19 at the end of the paragraph (do not create a new paragraph): "It is not the intent of this document to provide the validated data necessary for deciding among alternative remedial actions or for choosing remedial action vs. no action. The validated data and risk analyses required for these decisions will be provided in the operable unit-specific RI and FS reports. The status of the data validation effort, which was ongoing when preparation of the SWCR began, is provided in Part I, Section 4.3."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Summary, Part II Pg. #: S-7 Line #:17 Code:
214 Original Comment # 180
Comment: As in the Executive Summary, earthworms are called insects. This should be corrected.

Response: There is no intention of calling earthworms insects. Earthworms were used as surrogates for insects in the ecological assessment because bioaccumulation factors were either available for earthworms or could be assumed to be 1.0. Similar data are not generally available for insects. The text will be clarified.

Action: Part II, Page S-7, Line 17, replace "(earthworms)" with "(using earthworms as surrogates)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.1.3 Pg. #: 2-17 Line #: 27 Code:
215 Original Comment # 181

Comment: This bullet discusses criteria for including nondetect results in sample averages. DOE's procedure is acceptable. However, the risk-based quantitation limits should be extended from chemicals to radionuclides using the same procedures and the same sources for risk values.

Response: This comment requests that Risk Based Quantitation Limits (RBQLs) be derived and presented for radionuclides, using the approach used to derive RBQLs for chemicals in Appendix N. RBQLs are presented for chemicals in order that reported detection limits that greatly exceed detected measurement values can be eliminated from a data set to avoid a bias in calculated statistical summary parameters. Such a bias could result in high risk estimates for chemical constituents that may not actually be present in samples. Generally, radiological sample analytical results that are reported as less than a detection limit are within the project-specific detection limits, do not exhibit great variation for a given medium and analyte, and do not greatly exceed detected measurement values reported for radionuclides. For these reasons, RBQLs for radionuclides are not necessary and are not included in the Site-Wide Characterization Report.

It is noted that unusually high detection limits are reported for nondetections for waste samples from the K-65 silos and Silo 3. However, the raw data reveal that the magnitude of these detection limits is consistent with the magnitude of detected measurement values in the same data sets.

Action: RBQLs for radionuclides will not be added to the Site-Wide Characterization Report, Appendix N.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.2, Part II Pg. #: 2-20 Line #:1 - 20 Code:
216 Original Comment # 182

Comment: This text discusses a concentration-toxicity screen for eliminating chemicals from further consideration as threats to human health or the environment. U.S. EPA is not convinced that the data for the FEMP includes so many chemicals that some should be dropped before actual risk-based calculations are done. Furthermore, the last sentence misstates the criterion for elimination of chemicals as given in the cited guidance. The sum of all eliminated chemicals, not each individual eliminated chemical as stated by DOE, must be no more than 1 percent of the total risk. U.S. EPA recommends calculation of all risks from all contaminants present at or near the FEMP.

Response: The concentration-toxicity screening procedure is a "risk-based" calculation since it involves calculation of "chemical-specific risk factors" as they are described in RAGS, Part A. Furthermore, page 5-24 of RAGS, Part A describes the ratio calculated using the concentration-toxicity screening procedure as the ratio of the risk factor for each chemical to the total risk factor for the medium (as it is also described in the Site-Wide Characterization Report), rather than as the sum of all eliminated chemicals as described in the comment.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.3, Part II Pg. #: 2-20 Line #: Code:

78

217 Original Comment # 183

Comment: The tables in this section contain just the chemicals and radionuclides retained as constituents of concern. U.S. EPA recommends that these or supplementary tables list all constituents reported in at least one sample but rejected as not being of potential concern and the reason for this rejection.

Response: As stated in Section 2.3 of Part II, Appendix R provides complete statistical summary tables listing all constituents detected in at least one sample for each sub-area of interest within each medium. The reason for rejection as not being of potential concern is also given in Appendix R for the constituents that are not listed in Section 2.0 of Part II.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.3, Part II Pg. #: 2-25 Line #: Code:

218 Original Comment # 184

Comment: Table 2-6. It is doubtful that the "background" data for the Great Miami River (Sampling Point W1) represents true background condition. Additional information should be provided to support DOE's contention.

Response: The background perched groundwater data will be reevaluated during the preparation of the Operable Unit 5 RI Report.

Action: The 1000 series background wells used to represent background perched groundwater quality will be reevaluated and UTLs will be recalculated during preparation of the Operable Unit 5 RI Report.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.3, Part II Pg. #: 2-38 and 2-40 Line #: Code:

219 Original Comment # 185

Comment: Table 2-13. On these pages, nitrate is listed under "Organics." DOE should list it under "Inorganics" as is done on Page 2-37.

Response: Agreed. The data listed for nitrate will be allocated to a proper place in the table.

Action: Part II, Table 2-13, the "nitrate" data in each of the three data sets will be respectively moved to the end of each of the respective data sets.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1.2.2 , Part II Pg. #: 3-5 Line #:8 Code:

220 Original Comment # 186

Comment: This section discusses critical subpopulations within 5 miles of the FEMP. Because there are multiple sources within the FEMP, DOE uses the center of the entire facility as the basis for measuring distances. This is contrary to the method used in the Hazard Ranking System (40 CFR 300, Appendix A), which measures distances from the boundaries of the source areas. At the FEMP, the source areas are the operable units including the South Plume, which extends well beyond the fence line. DOE should redraw its radii and, if necessary, include additional sensitive receptors in this discussion.

Response: The population within a 5-mile radius of the FEMP is determined from an origin located in the center of the former production area. Population estimates for the RI/FS use the standard approach of estimating populations from the source of all releases. Because of the difficulty in preparing a separate population estimate from the boundary of each release from the site, the center of the FEMP was chosen as the source and center point for estimating potentially exposed populations.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.3.1.1, Part II Pg. #: 3-17 Line #:24 Code:
221 Original Comment # 187
Comment: The text states that evaluation of risks from hazardous chemicals is unnecessary because the estimated exposures are much lower than the current ambient air quality standards. The reasoning is questionable because lead is the only on-site hazardous chemical with an ambient air quality standard. However, the conclusion is correct because risk calculations for persons exposed for a lifetime to such maximum point concentrations are well below the levels of concern. DOE should revise its reasoning and should include an example of the risk calculations for these data.

Response: The text states that modeled air concentrations of hazardous chemicals are much lower than ambient air quality standards. It is concluded in the text that no evaluation of risks for airborne hazardous chemicals is necessary because estimated air concentrations are orders of magnitude below ambient air quality standards. The air quality standards of concern are Maximum Acceptable Ground Level Concentrations (MAGLCs) derived according to a method specified by the Ohio EPA Division of Air Pollution Control, although these standards are not identified in the text. MAGLCs may be derived for a variety of contaminants, in addition to lead, and are based on the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH). The air quality standards will be identified in the text.

Action: In Part II, Section 3.3.1.1, on page 3-17, the third sentence will be changed to read: "Modeled concentrations of hazardous chemicals in air are orders of magnitude below Maximum Acceptable Ground Level Concentrations (MAGLCs) derived according to the methodology recommended by the Ohio EPA Division of Air Pollution Control."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.3.2.1, Part II Pg. #: 3-20 Line #: 27 Code:
222 Original Comment # 188
Comment: The text states that well locations are shown in Figures 5-4 and 5-5. However, those figures show only 10 of the 21 wells cited in text. DOE should modify the figures to show all the well locations or reference suitable figures in Part I.

Response: Agreed.

Action: In Part II, Section 3.3.2.1, on page 3-20, the sentence ending on line 27 will be changed to read: "The locations of the 21 wells can be found in Figures 4-2 and 4-3 in Part I."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.3.2.1, Part II Pg. #: 3-23 - 3-28 Line #: Code:
223 Original Comment # 189
Comment: Tables 3-5 and 3-6. In these tables, a number of analytes (such as thorium and carbon disulfide) are listed without exposure point concentrations. If an analyte was not detected above the background level in any relevant wells, then the line should be deleted. If any analytes were detected, the data should be included here and in succeeding calculations. DOE should revise these tables accordingly. This comment also applies to Table 3-9 and other tables on later pages.

Response: Agreed.

Action: In Part II, Section 3.3.2.1 Tables, delete rows for analytes as listed below:

Table 3-5, delete Sr-90, Tc-99, Th-232, Thorium.
Table 3-6, delete Carbon Disulfide, Copper.
Table 3-8, delete Cobalt.
Table 3-9, delete 2-Nitrophenol, Benzene, Di-n-butyl phthalate, Cyanide, Manganese, Nitrate, Nitrate/Nitrite.
Table 3-10, delete U-233, Benzene.
Table 3-11, delete Pa-231, U-233, 1,1,2-Trichloro-1,2,2-trifluoroethene, Ammonia, Chlordane, Nitrate, Thallium.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.3.2.2, Part II Pg. #: 3-30 Line #:5 and 6 Code:
224 Original Comment # 190
Comment: In the modelling of future ground-water concentrations, DOE omits modelling for concentration equivalent to a 10^{-7} cancer risk, a 20 percent hazard quotient, or less. These cutoff criteria are acceptable for single chemicals, but not for mixtures of many chemicals as are found at the FEMP. The most appropriate criteria are a 10^{-8} cancer risk and a 1 percent hazard quotient, which would be consistent with DOE's exclusion of pathways contributing less than 1 percent of the risk. DOE should revise its criteria and recalculate results as necessary.

Response: The groundwater concentration screening limits were applied to groundwater immediately prior to its mixing in the aquifer. This additional mixing generally results in a further dilution of modeled constituent concentrations. This dilution decreases the constituent concentration by a factor of 10 to 40, depending on the source type and its physical location. Thus the 10^{-7} risk screening level for water entering the aquifer results in estimated concentrations in the aquifer of 10^{-8} or lower. The hazard quotient screening level of 20 percent would be decreased by the same factor, to 2 percent or lower.

Action: DOE will add text clarifying that the screening level concentrations chosen for constituents in water in the vadose zone insure that concentrations corresponding to a risk level of 10^{-8} and a hazard quotient of 2 percent in the aquifer are not exceeded.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.4, Part II Pg. #: 3-66 - 3-69 Line #: Code:
225 Original Comment # 191

Comment: Tables 3-15 and 3-16. These tables contain many undefined acronyms (IR, ET, EF, ED, BW, AT7, FI, SA, PC, AF, ABS, DR, and possibly others). DOE should define these acronyms in the footnotes. If an acronym is used on other contexts, it should be included in the list in the prefatory material.

Response: Agreed.

Action: Definitions of acronyms used in Tables 3-15 and 3-16 will be added to the tables.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.4, Part II Pg. #: 3-66 - 3-69 Line #: Code:
226 Original Comment # 192
Comment: Tables 3-15 and 3-16. An inhalation rate of 0.83 cubic meters per hour (m^3/hr), which is equivalent to 20 m^3/day, is used here for all adult exposures. This is reasonable for day-long exposures including rest and sleep. However, it seems likely that shorter exposures such as those for a delivery man and a scavenger would involve significant manual labor and a consequent increase in respiratory volume. Therefore, U.S. EPA recommends using a greater inhalation rate, perhaps 2 m^3/hr, for these exposures. DOE should revise the parameters and recalculate results as necessary.

Response: The alteration of individual parameters by themselves is quite feasible and corresponds with DOE's commitment to follow EPA's guidance in the CERCLA process at the FEMP. However, the cumulative effect of changing all of the parameters listed in the various EPA comments should be considered. To change all of the parameters, recalculate all of the intakes, ILCRs,and HIs and present them in an understandable manner will require considerable time and effort. Therefore,DOE proposes to change only those parameters which result in significant changes to the risks presented for important exposure scenarios at the FEMP.

In this case, changing the breathing rate for the hypothetical visitor from 2.0 m^3/hr to 0.83 m^3/hr would increase the risks calculated for this receptor by a factor of 2.0 m^3/hr divided by 0.83 m^3/hr or 2.4. As shown on Table 5-2 of Volume II of the Site-Wide Characterization Report, risks from radon inhalation dominate the airborne risks to this receptor. The ILCR for a visitor breathing at a rate of 0.83 m^3/hr is about 5×10^{-5}. The ILCR for a visitor breathing at a rate of 2.0 m^3/hr would increase to about 1.2×10^{-4}. Given the uncertainties in the exposure scenario and the radon inhalation slope factor, DOE feels these are essentially the same number (ie: 10^{-4}). For this reason, DOE does not propose to change this parameter in the preliminary baseline risk assessment.

Action: None required. In response to EPA's guidance in this matter, the breathing rate for the visitor pathway will be changed to 2.0 m^3/hr in subsequent drafts of the operable unit risk assessments.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.4, Part II Pg. #: 3-68 Line #: Code:
227 Original Comment # 193
Comment: Table 3-16. The adult ingestion rate for soil or sediment is incorrectly listed as 0.01 grams per day. The correct rate is 0.1 gram per day [U.S. EPA, 1991, Human Health

Evaluation Manual, Standard Default Exposure Factors. OSWER Directive 9285.6-03 (March 25)]. All calculations using 0.01 grams/day should be redone.

Response: The receptor in question is the "typical on-property resident," not the RME. The time weighted soil ingestion value for the adult RME is 0.109 g/d, as presented in the next column of the table in question (Table 3-16).

In a memorandum from F. Henry Habicht II dated February 26, 1992, EPA Headquarters recently directed that all risk assessments should consider the central tendency of the risk range, as well as risks to the reasonable maximum exposed (RME) individual. No specific parameters or parameter values for the central tendency determination were provided by EPA in the memorandum or in subsequent communications. In the spirit of the EPA directive, the FEMP RI/FS risk assessment team has included an additional risk assessment scenario in the Preliminary Site-wide Baseline Risk Assessment that reflects risks which are closer to the central tendency than the RME scenario. This additional scenario is identified in the Preliminary Site-Wide Baseline Risk Assessment as the "typical resident" scenario.

In the absence of specific methods and parameters which may be used to calculate the central tendency of risks at a CERCLA site, existing EPA guidance for exposure assessments provides information that can be used to estimate the central tendency of the soil ingestion rate. The ingestion rate of 0.01 is the intermediate ingestion rate presented in Table 2-23 of EPA's Exposure Factors Handbook (USEPA 1989). Text will be inserted to clarify that this soil ingestion rate was developed by DOE in response to the Habicht memo. The text introducing the "typical on-property resident" scenario will also clearly state that it is an attempt to estimate risks which are closer to the central tendency than risks to the RME receptor. It will also be noted that EPA has not endorsed a set of parameters to represent the "true" central tendency for adult exposures.

Action: Insert the following paragraph at line 22 on page 3-9 of Part II, "The typical on-property resident scenario is an attempt to investigate risks which are closer to the central tendency than risks to the RME receptor. This scenario should not be construed as representing the "true" central tendency for adult exposures, since EPA has not endorsed a set of central tendency parameters."

Reference this new text from Part II, Section 3.4 by inserting the following sentence at the end of line 29 on page 3-63. "These parameters are based on the receptor descriptions presented in Sections 3.1.4.1 through 3.1.4.4."

Change footnote "i" on Table 3-16, page 3-68 to "i - Intermediate value presented in Table 2-23 on page 2-57 of USEPA 1989_, "where the reference U.S. EPA 1989_ will refer to EPA's Exposure Factors Handbook, EPA 600/8-89/043.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.4, Part II Pg. #: 3-68 and 3-69 Line #: Code:
228 Original Comment # 194
Comment: Table 3-16. The adult residential exposure is incorrectly listed as 9 years. The correct adult residential exposure is 24 years (U.S. EPA, 1991). All calculations using 9 years should be redone.

Response: An exposure duration of nine (9) years for this receptor is correct. The receptor in question is the "typical on-property resident", not the RME individual. The parameters selected for this receptor are intended to investigate risks closer to the central tendency for on-property individuals. For this reason, the national median residency time of nine (9) years for a typical homeowner (listed on page 5-34 of The Exposure Factors Handbook, EPA 600/8-89/043) was used.

Action: Insert the following paragraph at line 22 on page 3-9, "The typical on-property resident scenario is an attempt to investigate risks which are closer to the central tendency than risks to the RME receptor. This scenario should not be construed as representing the "true" central tendency for adult exposures, since EPA has not endorsed a set of central tendency parameters."

Reference this new text from Section 3.4 by inserting the following sentence at the end of line 29 on page 3-63. "These parameters are based on the receptor descriptions presented in Sections 3.1.4.1 through 3.1.4.4."

Change footnote "i" on Table 3-16, page 3-68 to "i - Intermediate value presented in Table 2-23 on page 2-57 of USEPA 1989_," where the reference USEPA 1989_ will refer to EPA's Exposure Factors Handbook, EPA 600/8-89/043.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1, Part II Pg. #: 4-1 Line #:25 Code:
229 Original Comment # 195
Comment: This text cites the Health Effects Assessment Summary Table (HEAST) (SWC reference: EPA, 1992) as the primary source of reference doses (RfD). Line 32 repeats the citation for slope factors of chemical carcinogens, and Line 5 on page 4-16 repeats the citation for radionuclides. However, U.S. EPA guidance (SWC reference: EPA, 1989b) gives HEAST as the secondary source for these toxicity values and gives the Integrated Risk Information System (IRIS) as the primary source. Although the 1991 and earlier editions of HEAST included the toxicity values in IRIS, the cited current edition of HEAST merely refers the reader to IRIS. DOE should change the text to reflect guidance priorities for the toxicity values and should confirm that the tabulated values reflect these priorities.

Response: Radionuclide slope factors are available in HEAST. The 1992 HEAST was used to obtain slope factors for radionuclides for the Site-Wide Characterization Report. The toxicity values for chemicals were consistent with the 1991 IRIS or HEAST available as of December 1991, although some chemicals were updated with 1992 values (i.e., chemicals of concern in Operable Unit 2).

Action: The text will be clarified to reflect guidance priorities for sources of toxicity values. The toxicity values used will be confirmed. Any necessary changes will be made to Tables 4-1 and 4-2 (See attachments for the revised Tables 4-1 and 4-2).

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1, Part II Pg. #: 4-2 Line #: Code:
230 Original Comment # 196
Comment: Table 4-1. The headings do not indicate whether the chronic or subchronic RfDs are listed. Also, a spot check of the table against HEAST (SWC reference: EPA, 1992)

revealed discrepancies, including the sources of the values for boron and cadmium and the valency of chromium. DOE should ensure that chronic RfDs are given and clearly labeled. Also, all values here and in Tables 4-2 and 4-3 should be checked against the references.

Response: All RfDs listed are chronic RfDs. The correct reference for boron and cadmium RfDs is the 1991 HEAST. The chromium valency is conservatively assumed to be CrVI.

Action: The following changes will be made to Table 4-1: add "Chronic" to column headings for oral and inhalation reference doses, correct footnote (a) to reference the 1991 HEAST, and indicate that the valency for chromium is assumed to be CrVI.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.1, Part II Pg. #: 4-2 - 4-4 Line #: Code:
231 Original Comment #197
Comment: Table 4-1. Incorrect RfDs are listed for chromium, lead, and 1,1,2,2-tetrachloroethane. In addition, and RfD an RfC were calculated for cobalt. Although references are provided for the data used in these calculations, the calculation including the uncertainty factors and rationale for the selection of the critical studies and critical effects as the basis for the RfD and RfC should also be provided.

Response: This comment will be addressed in several parts: (1) No RfDs for lead will be presented in the risk assessment (See response/action to EPA Comment #24). (2) The toxicity values used for cobalt will be revised. A discussion of the derivation of an RfD and RfC for cobalt will be included in the toxicity profiles to be added to Section 4.2. (3) The inhalation RfD for chromium is based on an RfC of 2×10^{-6} mg/m^3 for CrVI from the 1991 HEAST, assuming a 70-kg adult with an inhalation rate of 20 m^3/day. (4) No RfDs were available for 1,1,2,2-tetrachloroethane in 1991.

Action: (1) The RfDs for lead will be deleted from Table 4-1. (2) Toxicity profiles (see Attachment I) for several chemicals of potential concern, including cobalt, will be inserted into Section 4.2 and toxicity values used for cobalt will be updated and listed in revised Table 4-1 (attached). (3) A column of RfCs will be added to Table 4-1 with the RfC for Chromium (VI) included. (4) No further action required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 4.1.3, Part II Pg. #: 4-16 Line #:8 Code:
232 Original Comment # 198
Comment: The text cites Table C in HEAST as the source for radionuclide slope factors. In the 1992 edition of HEAST cited by DOE, these slope factors are given in Table 4. DOE should correct the error.

Response: Agreed.

Action: In Part II, Section 4.1.3, page 4-16, line 8, replace "(Table C)" with "(Table 4)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 5.2.1.1, Part II Pg. #: 5-13 - 5-15 Line #: Code:
233 Original Comment # 199

Comment: Figures 5-1 - 5-3. The numerals in these contour plots are not clear. The line between the "2" and "10" contours could be "5", "6", or "9." DOE should redraw the figures using a larger type size and, if possible, a different font. This recommendation also applies to Figures 5-6 through 5-8 but not to Figure 5-9.

Response: Agreed.

Action: Isopleth labels on contour plots in Figures 5-1 through 5-3 will be changed to enhance their readability.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 5.2.1.3, Part II Pg. #: 5-26 Line #: 17 Code:
234 Original Comment # 200
Comment: The text says that the Great Miami River data for the location upstream of FEMP's effluent outfall is assumed to represent background levels. This assumption is not sound and should be reconsidered.

Response: Please see response to U.S. EPA General Comment #9.

Action: Please see action to U.S. EPA General Comment #9.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part II Pg. #: 5-75 Line #: Code:
235 Original Comment # 201
Comment: Figure 5-10. This figure, and its accompanying text (Page 5-73, Paragraph 1) are intended to describe the change in cancer risk over time resulting from radiologic contamination of the ground water. However, this figure is confusing in its present form. Cancer risk increases as the values change from 2E-2 to OE+O. Cancer risk decreases as the values change from 2E-2 to 2E-6. It would seem that the correct Y-axis for this graph should show a maximum risk value of 2E-2 as shown, but that the risk should decrease to either 2E-4 or 2E-6. This apparent discrepancy should be addressed.

Response: The y-axis has a linear scale, not a logarithmic scale. The cancer risk in Figure 5-10 does not increase as the risk values range from 2.0E-02 to 0.0E+00 (zero is numerically less than 2.0E-02, or in other words 0 < 0.02).

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 5.4, Part II Pg. #: 5-103 - 5-109 Line #: Code:
236 Original Comment # 202
Comment: Only uncertainties relating to overestimation of risk are discussed. Uncertainties that contribute to underestimation of risk should also be discussed. These include (1) lack of risk values for all contaminants in all media and (2) use of the additivity assumption, which ignores synergistic activity of chemical and radiological toxicity. These type of uncertainties should be added.

Response: DOE agrees that lack of toxicity values for some chemicals and hence, their associated risks, were not calculated and can lead to the underestimation of the total risk.

However, since the synergistic or the antagonistic effect for many chemicals are unknown at this time, use of the additive assumption can either under or over estimate the risk, respectively.

Action: The following items will be added to Table 5-41 (page 5-105) of Part II:

	Effect on Risk Estimation		
Assumption	Potential Magnitude for Over-Estimation of Risk	Potential Magnitude for Under-Estimation of Risk	Potential Magnitude for Over- or Under-Estimation of Risk
Toxicity Assessment			
Use of additive assumption for chemical toxicity			Low to moderate
Lack of toxicity value for some chemicals		Low to moderate	

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 6.3.2.1, Part II Pg. #: 6-4 Line #: 26 Code:
237 Original Comment # 203
Comment: The estimate of contamination intake given here is incomplete for ground-dwelling rodents, lagomorphs, and other mammals. These species contact near-surface soil in their burrows, especially when digging, and ingest some when grooming. DOE should include this intake in its estimate, including propagation up the food chain.

Response: DOE is prepared to include soil ingestion as a pathway for the white-footed mouse and sediment ingestion for the muskrat and raccoon for the Operable Unit 5 Sitewide Ecological Assessment, and would appreciate guidance from U.S. EPA and OEPA on what values would be acceptable to use for soil intake by these species. It is suggested that this addition be made in the Operable Unit 5 assessment because this document will be able to rely on a complete and fully validated data set, which was not available for the SWCR.

Action: None required. Request the assistance of U.S. EPA and OEPA in identifying appropriate values for soil and sediment ingestion rates for the white-footed mouse, muskrat, and raccoon.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 6.3.2.1, Part II Pg. #: 6-16 Line #: Code:
238 Original Comment # 204
Comment: The uncertainty factors used to modify toxicity values for the ecological risk assessment include 0.2, which is used to convert lowest observed effect levels (LOEL) to no observed effect levels (NOEL). However, in the development of RfCs and RfDs for the human health risk5, a conversion factor of 0.1 is used for this extrapolation. The use of the different extrapolation factor should be justified. In addition, for the purposes of justification, a reference should be provided for the use of 0.2 to extrapolate oral 50 percent lethal dose (LD_{50}) values to acute NOEL values.

Response: The LOEL to NOEL factor was taken from Newell et al. (1987), as stated in the text. Newell et al. (1987) also used a factor of 0.1 to extrapolate short-term or subacute studies to chronic NOELs. Given that an acute NOEL should be higher than a chronic NOEL, a value of 0.2 is reasonable. If U.S. EPA wishes to provide guidance on this issue, it is suggested that this be done in the course of preparing the Operable Unit 5 Sitewide Ecological Assessment, as in the response to Specific Comment #237 (U.S. EPA 203).

Action: None required. Request the assistance of U.S. EPA and OEPA in identifying satisfactory wildlife toxicity criteria for use in the Operable Unit 5 Sitewide Ecological Assessment.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 6.3.2.2, Part II Pg. #: 6-17 Line #: 19 Code:
239 Original Comment # 205
Comment: This equation for converting activity to dose contains an unidentified numerical factor. DOE should define this factor or provide a reference for deriving it.

Response: The derivation of the constant 0.01867 in the equation on Page 6-17 is given in the Risk Assessment Work Plan Addendum, Section 7, Page 35. A note to this effect will be added to the SWCR.

Action: In Part II, Page 6-19, Line 24, add: "The derivation of this equation is provided in the Risk Assessment Work Plan Addendum (DOE 1992a)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part II Pg. #: 6-18 Line #: Code:
240 Original Comment # 206
Comment: Table 6-7A. Typographical errors appear in this table that should be corrected. For example, 0.1 is the species factor for cobalt, not the human uncertainty factor, and 0.00026 is the wildlife NOEL rather than the acute-to-chronic factor for cobalt.

Response: The errors noted will be corrected and the table will be checked for accuracy. None of the errors noted affect the calculated wildlife NOEL.

Action: In Part II, Page 6-18, Table 6-7A, make the following changes:

1) For cobalt, human uncertainty factor, replace "0.1" with "--".
2) For cobalt, species/class factor, replace "--" with "0.1".
3) For cobalt, acute-to-chronic factor, replace "0.00026" with "--".
4) For cobalt, wildlife NOEL, replace "--" with "0.00026".
5) For barium, human reference dose, replace "0.21" with "0.07".
6) For barium, human uncertainty factor, replace "--" with "3".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Part II Pg. #: 6-19 Line #: Code:
241 Original Comment # 207
Comment: Table 6-7B. Incorrect RfDs and uncertainty factors are listed for barium, beryllium, and nickel. Typographical errors appear in the entry for cobalt similar to those indicated above. These errors should be corrected.

Response: The errors noted will be corrected and the table will be checked for accuracy. The values for beryllium and nickel are correct and are based on IRIS printouts. The value of 0.21 mg/kg/day for the barium RfD is a composite of a 0.07 RfD and an uncertainty factor of 3. Tables 7A and 7B will be revised to indicate this. None of the errors noted affect the calculated avian NOEL.

Action: In Part II, Page 6-19, Table 6-7B, make the following changes:

1) For cobalt, human uncertainty factor, replace "0.05" with "--".
2) For cobalt, species/class factor, replace "--" with "0.05".
3) For cobalt, acute-to-chronic factor, replace "0.00013" with "--".
4) For cobalt, wildlife NOEL, replace "--" with "0.00013".
5) For barium, human reference dose, replace "0.21" with "0.07".
6) For barium, human uncertainty factor, replace "--" with "3".

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 6.4.2.2, Part II Pg. #: 6-65 Line #: Code:
242 Original Comment # 208
Comment: Table 6-23. The entries on this page of the table seem to be misaligned. DOE should correct the alignment.

Response: The entries on Page 6-65 are misaligned. This error will be corrected.

Action: On Part II, Pages 6-64 through 6-67, review each entry to ensure proper alignment of rows and columns and identical order for chemical names on each page.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 1.1, Part II Pg. #: 1-1 Line #: 28 Code:
243 Original Comment # 209
Comment: This discussion of the objectives of the LRAs omits one significant factor. A standard doctrine of health physics is called ALARA for "as low as reasonably achievable." This doctrine is explicitly required of medical facilities in 10 CFR 35.20 and is implicit elsewhere in the regulations. Although the LRAs given here appear to be in accordance with ALARA, DOE should include a brief discussion of this doctrine and its applications to the LRAs for the various operational units (OU).

Response: Agreed.

Action: The following text will be added to Part III, Section 1.1: "Identification of LRAs is made in accordance with the philosophy that exposures of the public and workers will be managed and controlled to levels that are "As Low As Reasonably Achievable." This is the ALARA philosophy, with the objective that exposures are kept to the lowest practicable levels after taking into account social, technical, economic, practical, and public policy considerations."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 2.2.1, Part II Pg. #: 2-15 - 2-20 Line #: Code:
244 Original Comment # 210
Comment: Table 2-2. This table lists various federal water quality standards, including MCLs. However, it omits the latest list of MCLs announced in the Federal Register in July

1992. DOE should include these new values and should change "proposed" to "final" in the table.

Response: The July 1992 MCLs were unavailable when the SWCR was prepared. DOE will add the latest MCLs to the table if EPA will provide them.

Action: Request July 1992 MCLs from EPA and incorporate them into Table 2-2.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.1, Part III Pg. #: 3-1 Line #:35 - 37 Code:
245 Original Comment # 211
Comment: The statement, "Stable waste materials such as concrete construction rubble and debris will be crushed and sent directly for disposal," indicates that the stable waste would be disposed of without being tested for residual contamination. The SWC should indicate that waste materials will be sent directly for disposal only if they are not contaminated above the levels of concern. In addition, the report should clarify whether the stable materials would be disposed of in an on-or off-site disposal facility.

Response: Stable waste materials would be sent directly for disposal in an on-property engineered aboveground disposal facility. This will be noted in the text.

Action: In Part III, Page 3-1, Line 37, after "directly for disposal," add "in an on-property engineered aboveground disposal facility."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.2, Part III Pg. #: 3-3 Line #:28 and 29 Code:
246 Original Comment # 212
Comment: This statement should indicate whether waste oils were contaminated with radionuclides if this information is available.

Response: As the text states, this information is not available.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: 3.4, Part III Pg. #: 3-7 Line #:37 and 38 Code:
247 Original Comment # 213
Comment: This statement should indicate whether the stabilized waste will be disposed of in an on- or off-site facility.

Response: Page 3-7, Lines 30-31 state that the bulk of the stabilized waste will be disposed of in an on-site facility and Lines 37-38 state that the separated waste, containing long-lived alpha constituents, will be disposed of in an off-site facility.

Action: No change is required in the text.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: Appendix A Pg. #: A-9 Line #: Code:
248 Original Comment # 214

Comment: Table A-1. The text of footnotes c and d is scrambled. DOE should correct the text of both footnotes.

Response: The footnote text will be corrected.

Action: In Appendix A, Page A-9, footnote c, move the block of material on the right, defining "R," "O," "C," "A," and "Terminology..." to footnote d.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: C.1.3, Appendix C Pg. #: C-1 Line #: Code:
249 Original Comment # 215
Comment: The text discusses the population within a 5-mile radius of the FEMP but does not give the origin of the radii. As detailed above, the origin should be the boundary of the FEMP or the boundary of the South Plume where it extends beyond the fence line.

Response: The population within a 5-mile radius of the FEMP is determined from an origin located in the center of the former production area. Population estimates for the RI/FS use the standard approach of estimating populations from the source of all releases. Because of the difficulty in preparing a separate population estimate from the boundary of each release from the site, the center of the FEMP was chosen as the source and center point for estimating potentially exposed populations.

Action: None required.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: General, Appendix N Pg. #: Line #: Code:
250 Original Comment # 216
Comment: The methodology for calculating and using risk-based quantitation limits for chemicals should be extended to radionuclides. This appendix uses the obsolete 1991 edition of HEAST, but that is acceptable because it was apparently prepared before the 1992 edition became available. However, DOE should do future risk assessments for the FEMP using the most recent edition of HEAST.

Response: This comment requests that Risk Based Quantitation Limits (RBQLs) be derived and presented for radionuclides, using the approach used to derive RBQLs for chemicals in Appendix N. RBQLs are presented for chemicals in order that reported detection limits that greatly exceed detected measurement values can be eliminated from a data set to avoid a bias in calculated statistical summary parameters. Such a bias could result in high risk estimates for chemical constituents that may not actually be present in samples. Generally, radiological sample analytical results that are reported as less than a detection limit are within the project-specific detection limits, do not exhibit great variation for a given medium and analyte, and do not greatly exceed detected measurement values reported for radionuclides. For these reasons, RBQLs for radionuclides are not necessary and are not included in the Site-Wide Characterization Report.

It is noted that unusually high detection limits are reported for nondetections for waste samples from the K-65 silos and Silo 3. However, the raw data reveal that the magnitude of these detection limits is consistent with the magnitude of detected measurement values in the same data sets.

Action: RBQLs for radionuclides will not be added to the Site-Wide Characterization Report, Appendix N.

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: General, Appendix R Pg. #: Line #: Code:
251 Original Comment # 217
Comment: There are some obvious gaps in this appendix, beginning with the third entry (thorium-228) in Table R.1-1. Two samples contained this radionuclide at concentrations of 411 pCi/g and 638 pCi/g; the other 11 samples contained none. However, the mean concentration is given as 285.77 pCi/g with no indication of how this value was calculated. Similarly, there is no explanation of how the 95 percent upper confidence intervals were calculated, a matter complicated by the presence of both normal and lognormal distributions in this appendix. DOE should include a detailed discussion of the methodology used to generate these numbers in the introductory part of the appendix. This recommendation also applies to Appendix T.

Response: Data reported as non-detects are assigned a value of 1/2 SQL (Sample Quantification Limit) for calculating the mean and the UCL (95% upper confidence limit). As indicated in Section 2.3 of Part II and the introduction of Appendix R, the detailed discussion of the methodology to determine the distribution and to construct the UCLs has been given in Section 7.0 of the Addendum (DOE 1992). Procedures for calculating UTLs used in Appendix T have also been presented in Section 4.0 of the Addendum, as stated in Section 2.2.1, of Part II of SWCR. These detailed presentation of methodologies will not be repeated in the document.

Action: The following sentence will be added to line 6 of the introduction section of Appendix T: "Procedures for calculating the UTL have been given in details in Section 4.0 of the Addendum (DOE 1992)."

Commenting Organization: U.S. EPA Commentor: James A. Saric
Section #: General Appendōix S Pg. #: Line #: Code:
252 Original Comment # 218
Comment: This appendix gives a single example of calculations but no details for the other types of data. As with Appendixes R and T, DOE should include the formulas for all calculations, and should identify all pathways, all scenarios, and all types of risk (noncarcinogenic, chemical carcinogenic, and radionuclide carcinogenic).

Response: DOE agrees that the methodology used to calculate the Unit Risk Factors is not evident from the current presentation provided in the SWCR.

Action: Additional explanations and examples will be provided in the next revision as part of an expanded Appendix S.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Summary Report, S-3, Part II Pg. #: Line #: Code:
253 Original Comment # 1)
Comment: This is a stand alone report. All acroynms (i.e., RME, ILCR, etc.) should be written out before use in the text.

Response: Agreed.

Action: Definitions of all acronyms used in the Part II summary and the text will be checked to ensure that they are appropriately specified when they first appear.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 2.1.3, Part II Pg. #: 2-17 Line #:31 - 34 Code:
254 Original Comment # 2)
Comment: What is the Risk-Based Quantitation Limit (RBQL) referred to here? How is this limit derived? How is it to be used? What are the values of the RBQL for each chemical/radionuclide in each media?

Response: RBQLs are presented for chemicals in order that reported detection limits that greatly exceed detected measurement values can be eliminated from a data set to avoid a bias in calculated statistical summary parameters. Such a bias could result in high risk estimates for chemical constituents that may not actually be present in samples. As indicated in section 2.1.3 of Part II, Appendix N contains detailed information on RBQLs, including the values of RBQL for chemicals in each medium. RBQLs for radionuclides are not necessary and are not derived for the SWCR (see comment response/action for EPA Specific Comment #216).

Action: None required.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 2.2.1, Appendix T Pg. #: 2-18 Line #: Code:
255 Original Comment # 3)
Comment: We have discussed the use of the Upper Tolerance Limit (UTL) test, as described here to choose Chemicals of Concern, extensively. Comments and direction from Headquarters statistician, Paul White, has indicated that this approach is inconsistent with Agency guidance (RAGS, ref. EPA 1986b) and is unacceptable to EPA. The method described in Appendix T results in the use of background concentration levels which are often two or three times greater than the highest measured background values, or worse yet, national survey values. This is clearly not acceptable.

The values of the UTL derived in Appendix T (Table T-7) are not the same values used for some chemicals in Section 2 (see nickel, Tables 2-23, 2-25, 2-27, etc). The latter values are higher; no explanation is offered.

In Table T-4, background Upper Limit Concentration values are given as < 3 or <1. Why wasn't a real value calculated? It is not appropriate to compare these values to measured values having three significany digits (i.e., data in Tables 2-12, 2-14).

Response: The Risk Assessment Work Plan Addendum proposed the comparison of site-related concentration data to the Upper Tolerance Limit (UTL) of background concentration data as one criterion for determining Chemicals of Concern (COC) at the site. This criterion was discussed with U.S. EPA and Ohio EPA with the resolution that, for the purpose of determining COCs, this is an acceptable method. There has never been any intention of using the UTL for background concentrations as the value from which background risks are calculated. Risks from background concentration are calculated from the upper 95 percent confidence limit on the mean (UCL) of the background data. Neither UTLs nor UCLs are subtracted from site-related concentrations to obtain "above-background" concentrations.

DOE agrees that the values of UTLs presented in different sections of the Site-Wide Characterization Report should be internally consistent.

For certain chemicals in certain media, background concentrations were below the analytical detection limits for these chemicals and media. Approximate values for UTLs were listed as "less than" values in these instances. There are very few of these instances since many chemicals are assumed to have background concentrations of zero (i.e., UTL = 0).

Action: As a consequence of the meeting with EPA in Chicago, use of the UTL method for determining COCs is being reviewed. The Site-Wide Characterization Report will be reviewed for consistency of presentation of UTLs and inconsistencies will be corrected.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 2.2.2, Part II Pg. #: 2-20 Line #: 16 - 20 Code:
256 Original Comment # 4)
Comment: The elimination of chemicals with a ratio of Rij to Rj less than 0.01 is an <u>example</u> in RAGS, <u>not</u> guidance. Any such criteria used for elimination of chemicals for consideration in the risk assessment must be approved by the Project Manager and the Risk Assessor. RAGS further states that a <u>lower value</u> is needed if site risks are expected to be high. Because of the risk level at the FEMP site, the ratio used may not be appropriate.

Response: The concentration/toxicity screening procedure described on page 2-20 was excerpted from the approved Risk Assessment Work Plan Addendum. The concentration/toxicity screening procedure was not used in the SWCR, but it may be used in operable unit-specific risk assessments.

Action: Lines 1-20 will be deleted from page 2-20.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 2, Part II Pg. #: Line #: Code:
257 Original Comment # 5)
Comment: <u>Tables 2-4, 2-13, ...</u> Several chemicals - i.e., ammonia, fluoride, nitrate - are listed as organics. These chemicals are inorganics. Please check all tables.

Response: Agreed.

Action: Tables in Section 2.0 of Part II will be reviewed to ensure that each chemical is placed in the correct category of organics or inorganics.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 2, Part II Pg. #: Line #: Code:
258 Original Comment # 6)
Comment: <u>Table 2-6.</u> The Background values are given in pCi/g for surface water; the measurements are in pCi/L. Be consistent. Table 2-12 (continuations) Ditto. Table 2-13 (continuation) The Background values are given in pCi/g; the measurements are in mg/L. Obvious error.

Response: Agreed.

Action: Tables in Section 2.0 of Part II will be reviewed to ensure that the background values are in the correct units.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: 3-11 - 3-12 Line #: Code:
259 Original Comment # 7)
Comment: Table 3-1. Exposure pathway 16, inhalation of gases emitted to air, is eliminated on page 3-14, because exposure is too short term to be considered. Acute exposure to highly toxic volatile chemicals (i.e., benzene, vinyl chloride) can have significant adverse health effects. Rationale is not very sound.

Response: The text on page 3-14 lines 19-22 states "Inhalation of airborne gases ... *is included* [emphasis added] as a pathway for current and future land use, both on-property and off-property, provided that the exposure duration is long enough to produce a measurable intake." The pathway was not eliminated from consideration at this point; no screening based on exposure duration was actually performed. Screening of the inhalation pathway was based on modeled air concentrations and Ohio MAGLCs (Maximum Acceptable Ground Level Concentrations). It is agreed that acute (short-term) exposures to some vapor-phase chemicals may have adverse health effects. Therefore, any discussion of exposure duration will be eliminated from this paragraph.

Action: The text starting with "provided that the exposure duration..." on lines 21-23 will be deleted and the following sentence will be inserted: "Screening of the inhalation pathway is based on modeled air concentrations and Ohio MAGLCs."

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 3.3.1.2, Part II Pg. #: 3-17 Line #: Code:
260 Original Comment # 8)
Comment: If containment of waste sources degrades "in the future", resulting in the release of higher contaminant levels, how are exposures to existing receptors under the Current Land Use addressed? This has been a area of misunderstanding for some time. The risk assessment addresses Current Land Use and Future Land Use, not current conditions and future conditions. Loss of containment can occur anytime, given the No Action alternative, which is the basis for all risk assessments. The data in Table 3-3 would therefore be the most appropriate for evaluating the potential risks to an off-site farmer under the Current Land Use.

Response: DOE agrees that this seems to be an area of reoccurring miscommunication which needs permanent resolution at the earliest possible time. The Site-Wide Characterization Report considers two groups of land use scenarios. The first group, known as current land use scenarios, are those which encompass current activities and land uses. The second group, called future land use scenarios, encompasses all potential activities and land uses, including those listed under the current land use scenarios.

Perhaps this is where the misunderstanding lies. All land uses are included in the group of future scenarios. Risks associated with future containment failures are evaluated for all future land uses (including the subset of scenarios shared with the current scenarios) during the preliminary Baseline Risk Assessment.

The SWCR calculates current risks for existing receptors under current land use practices using the concentrations of constituents currently reaching those receptors. The SWCR also calculates risks for these same existing receptors under future conditions using current land use practices and the concentrations of constituents which could reach those receptors in the future due to a loss of containment on the site. For example, the off-property farmer current land use scenario is also included as a subset of future land use scenarios. Risks to this receptor from potential releases are presented several times in the document. Figure 5-7 in the preliminary baseline risk assessment depicts risks to both on- and off-property farmers from estimated concentrations of radon in air. Another example is in Figure 5-9, which depicts the risks from all constituents and all sources to both on- and off-property farmers using the Great Miami Aquifer as a source of groundwater. Since the focus of the SWCR has been the determination of risks to the site-wide RME receptor, the lesser risks to current receptors from potential exposures are not generally reported.

Action: In response to comments by USEPA, the exposure assessment and risk characterization will be reorganized to present future risks to receptors under both current and future land use.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
261 Original Comment # 9)
Comment: Table 3-3. What happened to benzo(a)pyrene in this table? BAP is a semi-volatile. Where are the other carcinogenic PAHs?

Response: The text in Section 3.3.1.2 states that under the future land use scenario, it is assumed that containment of all waste sources has degraded to the extent that they no longer provide any protection against release mechanisms. Since benzo(a)pyrene is a semi-volatile chemical, it is reasonable to assume that under the future land use scenario the BAP would have been lost to volatilization and would not be available to expose a future receptor, especially considering that the exposure duration for the resident farmer receptor would be 70 years.

Action: In Part II, Section 3.3.1.2, page 3-17, add the following text immediately after the first sentence of the paragraph: "Therefore, it is reasonable to assume that under the future land use scenario the semi-volatile chemicals have been lost to volatilization and are not available to expose a future receptor."

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 3.3.2.1, Part II Pg. #: 3-22, paragraph 2 Line #: Code:
262 Original Comment # 10)
Comment: Approach is not very sound. As I understand it, an UTC, sometimes greater than the highest detected background value at the site and characterized as < 1 or < 3, was subtracted from the Upper Confidence Limit on the mean contaminant value, reported in 3-significant digits. So much for statictical approaches.

Response: Paragraph 2 of Page 3-22 was inadvertently retained during preparation of the document. Although subtraction of background concentrations from site-related concentrations was previously considered, DOE agreed with EPA's request that background concentrations not be subtracted. Background concentrations have not

been subtracted. Concentrations (UCLs) presented in this report include background concentrations and, therefore, risks calculated from these concentrations include risks from background concentrations.

Action: Lines 6-11 of Page 3-22 will be deleted.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
263 Original Comment # 11a)
Comment: Tables 3-15 and 3-16. Lots of problems with parameter values given in these Tables, even after our extensive discussions. I was surprised to see that values we agreed to early on were not used in this report. Without the incorporation of acceptable EPA methodology and parameter values, the risk assessment has no meaning.

Response: Parameter values are discussed in the following comment responses/actions.

Action: See responses/actions to the subsequent comments.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
264 Original Comment # 11b)
Comment: Tables 3-15 and 3-16, SA: Earlier discussions requested that values for body surface area for all age groups be made consistent with current guidance and refered the contractors to the OHEA document (OHEA-E-367), section 2.4 , for default values. To reiterate, the values incorporated in the table are not very conservative. Using values from OHEA-E-367, the Total body surface area for the child <6 years would range from 7000-8000 cm2, for the child/teen from 15,150-16,550 cm2 and for the adult from 20,000-23,000 cm2, using the 50th and 95th percentile values for the ages of concern. For the dermal contact with soil pathways, it is appropriate to include the hands, legs, arms, neck and head, for an exposure of 25% of total body surface area. The range of values for the child/teen and the adult for soil contact pathways should be 3800-4200 cm2 and 1750-2000 cm2, respectively. The EPA document "Dermal Exposure Assessment; Principles and Application", EPA/600/8-91/011B, was suggested as guidance. It recommends the use of the 95th percentile values for the RME.

Response: The values of SA used in the Risk Assessment Work Plan Addendum will be changed to be consistent with the values presented in the comment. These revised SA values will also be incorporated in the risk assessments for subsequent operable unit RIs.

Action: All Risk Assessment Work Plan Addendum users will be notified of the change on the SA values. No change on the SA values for the dermal absorption will be made in the SWCR.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
265 Original Comment # 11c)
Comment: Tables 3-15 and 3-16, FI: Use of 0.1 for the trespass scenario is not defensible.

Response: The trespasser is postulated to spend a fraction of their day on the FEMP. Therefore, it is reasonable to assume that only a fraction of the dirt eaten during that day would

come from the particular on-property source(s) investigated. An FI of 0.1 was selected as a reasonable value for this parameter, in the absence of clear EPA guidance, as of December 1, 1991.

Action: No change is required in the SWCR. In response to USEPA's comments, the FI will be changed to 0.25 for the transient exposures incurred by a trespasser in operable unit risk assessments submitted after November 30, 1992.

In response to the discussions with EPA Region V representatives in Chicago on November 5, 1992, DOE has calculated the impacts of this change on the risks presented in the SWCR. The highest calculated risks to the hypothetical trespassing child without access controls occur in the NW quadrant of the production area. The increased ingestion rate would cause the calculated risks to increase about 0.9%.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
266 Original Comment # 11d)
Comment: Tables 3-15 and 3-16, EF: The values used here often reflect the Central Tendancy (CT) not the RME - i.e., trespass scenarios. The standard trespass scenario in Region V is 52 days a year, 4 hours a day for the RME. Contractors were advised of Region V policy. The RME is the required calculation. The CT values are only used to express uncertainty in the exposure evaluation.

Response: DOE disagrees with the statement that EPA has provided prior guidance on this matter. Prior to this comment, DOE has not received guidance from EPA Region V on parameter values for the trespasser scenario. DOE has been proceeding in good faith by using what it considered, in the lack of EPA guidance, as reasonable assumptions for this scenario. DOE welcomes the information on the parameter values for use in risk assessments. DOE regrets that these values were not provided as part of the Risk Assessment Work Plan Addendum review process.

In response to the discussions with EPA Region V representatives in Chicago on November 5, 1992, the parameters provided in this latest set of EPA comments (dated September 30, 1992) will be used as EPA guidance. Note that the values used in the SWCR are actually more conservative than the values presented in USEPA Region V's comment. DOE has calculated the impacts of this change on the risks presented in the SWCR. The highest calculated risks to the hypothetical trespassing child without access controls occur in the NW quadrant of the production area. The changes in the exposure duration and frequency would cause the calculated risks to decrease by about 14%.

Action: Three separate actions are required:

1) DOE requests that a copy of the previous written communication from EPA Region V to DOE about the trespasser parameter values be forwarded to DOE as soon as possible to allow DOE to assess where communications may have been interrupted.
2) In response to the discussions with EPA Region V representatives in Chicago on November 5, 1992, the parameters provided in this latest set of EPA comments (dated September 30, 1992) will be used as EPA guidance. It is understood that

this is a referenceable source of information and is suitable for inclusion in the public record. To satisfy project quality assurance standards, DOE is requesting that a written copy of this new guidance, and the rationale used to derive the parameter values cited in the comment, be made available.

3) No change in the SWCR text is required. However, in keeping with DOE's commitment to follow EPA guidance in the CERCLA process at the FEMP, the scenario involving the trespassing child without access controls will be changed to reflect this new EPA guidance in operable unit risk assessments submitted after November 5, 1992.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
267 Original Comment # 11e)

Comment: Tables 3-15 and 3-16, ED: Use of a residency time of 9 years reflects the CT, not the RME. Cannot compare and/or combine risks if some are CTs and some are RMEs. This risk assessment should not consider the CT or the uncertainty in any detail, given the weak data base from which it was prepared. All carcinogenic risks/hazard indices should be reported for the RME.

Response: DOE has reported calculated results for the RME receptor in the SWCR. The exposure duration (ED) used to calculate results for the RME individual is 70 years, as stipulated in the Risk Assessment Work Plan Addendum. The estimated risks to a more typical on-property resident have also been reported and are considered supplemental to the RME results. This is clear from the scenario's use and presentation in Table 5-47 and its supporting text in Volume 2 of the SWCR.

The parameters selected for a more typical on-property resident are intended to investigate risks which are closer to the central tendency for on-property residents than are those calculated for the RME scenario. Consistent with this approach, the national median residency time of nine (9) years for a typical homeowner (listed on page 5-34 of The Exposure Factors Handbook, EPA 600/8-89/043) was used. Note that risks calculated for this more typical receptor are not presented as a "true" central tendency because this scenario is more conservative than the central tendency, as defined in the February 26, 1992 memo from EPA's Deputy Administrator F. H. Habricht to EPA's Assistant and Regional Administrators concerning "Guidance on Risk Characterization for Risk Managers." As the lead agency in the CERCLA process at the FEMP, DOE feels information provided by this more central calculation will be helpful to decision makers reviewing this document. DOE agrees with the commenter that a presentation of the true central tendency for hypothetical on-site residents is not required in this preliminary baseline risk assessment.

Action: Insert the following paragraph at line 22 on page 3-9, Part II, "The typical on-property resident" scenario is an attempt to investigate risks which are closer to the central tendency than risks to the RME receptor. The scenario presented in the Site-Wide Characterization Report should not be construed as representing the "true" central tendency for adult exposures, since EPA has not indorsed a set of central tendency parameters."

Reference this new text from Section 3.4 by inserting the following sentence at the end of line 29 on page 3-63. "These parameters are based on the receptor descriptions presented in Sections 3.1.4.1 through 3.1.4.4."

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
268 Original Comment # 11f)
Comment: Tables 3-15 and 3-16, IR: How was the IR of 0.01 g/d for the typical on-property resident derived? Value should be 0.1 g/d. The IR used for agricultural and construction workers is 480 mg/d, not 0.1 or 0.109. Need to consider additional exposure and incidential ingestion of dust for these receptors.

Response: Page 2-57 of the Exposure Factors Handbook cites two studies in which adult soil ingestion rates were reported. These IRs range across three orders of magnitude, from 0.001 to 0.1 g/d. The soil ingestion rate (IR) of 0.1 g/d cited by the commenter is an upper-bound estimate. Since the behavior described by this receptor scenario is intended to be more typical of on-property residents than the RME receptor, a more central value was sought. The value selected for use in this scenario represents an intermediate tendency to ingest soil, 0.01. Since risks calculated using this number are presented only as a comparison to risks calculated for the RME individual, DOE feels that the selection of 0.01 g/d for the soil ingestion rate of a more typical on-property resident is reasonable.

Action: Insert the following paragraph at line 22 on page 3-9, "The typical on-property resident" scenario is an attempt to investigate risks which are closer to the central tendency than risks to the RME receptor. The scenario presented in the Site-Wide Characterization Report should not be construed as representing the "true" central tendency for adult exposures, since EPA has not indorsed a set of central tendency parameters."

Reference this new text from Section 3.4 by inserting the following sentence at the end of line 29 on page 3-63. "These parameters are based on the receptor descriptions presented in Sections 3.1.4.1 through 3.1.4.4."

Change footnote "i" on Table 3-16, page 3-68 to "i - Intermediate value presented in Table 2-23 on page 2-57 of USEPA 1989_," where the reference USEPA 1989_ will refer to EPA's Exposure Factors Handbook, EPA 600/8-89/043.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: 3-70 Line #: Code:
269 Original Comment # 12)
Comment: Calculation of volatiles released by household water use. The reference given on line 9 is incorrect; EPA 1991e is listed as HEAST 1991. HEAST does not contain models for this exposure. EPA does not use the Murphy 1987 model; it uses the model based on Andelman, which is more conservative. This model was provided to the contractor at one of the early meetings.

Response: Agreed.

100

Action: The reference on page 3-70, Line 9 will be changed to: "B.L. Murphy, 1987. "Total Exposure from Contaminated Tap Water" Presented at the 80th Annual Meeting of APCA, New York, NY June 21-26, 1987."

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: 3-74, paragraph 1 and elsewhere Line #: Code:
270 Original Comment # 13)
Comment: HI for Lead. There are not toxicity values for lead; therefore it is not possible to calculate a HI for lead. The toxicity of lead should be evaluated using the Uptake Biokinetic Model or addressed qualitatively using EPA OSWER Directives.

The lead example as an air toxic is a poor example. Lead is only toxic by the inhalation pathway under extremely high exposure concentrations (industrial settings); the exposure route of concern for lead is incidential ingestion by children. Use another chemical as an example here.

Response: (1) It is acknowledged that the June 1992 work plan states that "lead toxicity will be evaluated with the EPA Uptake/Biokinetic Model." There are, however, several limitations with the use of this model. First, the Uptake/Biokinetic model is available only in draft form. Second, because a child is recognized to be the most sensitive receptor to lead, the model applies only to a child receptor from birth to seven years of age, not to any adult receptors. There are several scenarios in the SWCR with an adult receptor. Finally, the model provides output in the form of blood lead levels; additional information would be needed to evaluate "risk" from this output (i.e., some measure of health risk as a function of blood lead levels).

(2) Agreed.

Action: (1) The latest available version of the Uptake/Biokinetic model (version 0.5) will be used for the child receptor in the current land use scenarios with and without access controls. For model parameters where site-specific values are not available, default parameters in the model will be used. Recognizing that the model is in draft form, blood lead levels for the child receptors will be presented in the revised Site-Wide Characterization Report and HI values deleted from the results. HI values estimated for lead will be deleted from the Site-Wide Characterization Report for adult receptor/scenarios and lead will be evaluated qualitatively.

(2) Another chemical will be used as an example for air toxins.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
271 Original Comment # 14)
Comment: Tables 4-1/4-2 (Toxicity Values). Pay attention to references here. Reference "a" (HEAST 1992) is most often cited, when the data source is IRIS. Tables need a thorough examination. There are no toxicity values for lead. IRIS and HEAST give RfCs for the inhalation route of exposure; these should not be converted to Rfds for inhalation. RfDs and RfCs are calculated using different assumptions. The SF for BAP should be used for all carcinogenic PAHs, following current Agency guidance. Carcinogenic PAHs should be considered as a group for risk assessment purposes.

Response: This comment will be addressed in several parts. (1) The primary references should be IRIS and the 1991 HEAST. This will be corrected in Tables 4-1 and 4-2. (2) Any toxicity values cited for lead will be eliminated. (3) Inhalation RfDs and RfCs are frequently converted back and forth, based on the guidance in EPA, 1989 (RAGS), Section 7.2.3: "A human body weight of 70 kg and an inhalation rate of 20 m^3/day are used to convert between an inhaled intake expressed in units of mg/kg-day and a concentration in air expressed in mg/m^3." This conversion allows an estimation of risk based on *dose*. For clarity, a column of RfCs will be added to Table 4-1 with a footnote describing this conversion. (4) The slope factor for benzo[a]pyrene will be applied to all carcinogenic PAHs in the risk calculations. Their exposure will be modeled seperately, however, to account for differing physicochemical properties and environmental behavior of the various PAH compounds.

Action: (1) The references will be reviewed and corrected where necessary in Tables 4-1 and 4-2 (revised copies are attached at the end of this document). (2) The RfDs listed for lead in Table 4-1 will be replaced with "ND". (3) A column labled Reference Concentration (mg/m^3) will be added to Table 4-1; where RfCs alone are available from IRIS or HEAST, the RfC will be listed with a footnote to explain that "the conversion to RfD is based on a human body weight of 70 kg and an inhalation rate of 20 m^3/day." (4) The slope factors for benzo[a]pyrene will also be used for the following carcinogenic PAHs: benzo[a]anthracene, benzo[b]fluoranthene, chrysene, dibenzo[a,h]anthracene, and indeno[1,2,3-c,d]pyrene. This will be added to Table 4-2, and ILCRs for these PAHs will be presented in the results.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 4-2, Part II Pg. #: Line #: Code:
272 Original Comment # 15)
Comment: Tox Profiles. No toxicological profiles are included for non-radionuclides. Profiles for highly toxic chemicals or for those for which there is a demonstrated risk at the site, should be included. These include, but are not limited to, benzene, chloroform, methylene chloride, arsenic, cadmium, chromium, silver, etc.

Response: Agree that profiles for chemicals of potential concern that are major contributors to high risk levels or hazard indices should be included.

Action: Summary toxicity profiles (Attachment I) will be included in Section 4.2 for those chemicals of potential concern shown to be major contributors to high risk levels or hazard indices.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 5-1, Part II Pg. #: 5-2 Line #: 8-13 Code:
273 Original Comment # 16)
Comment: This does not make any sense. You cannot have a "Unit Toxicity Factor" for a non-carcinogen that includes a SF.

Response: Agreed.

Action: In Part II, Section 5.1, page 5-2, delete the sentence beginning on line 10: "The analogous term for non-carcinogens is the "unit toxicity factor" or UTF." In addition,

on line 13 change "UTF" to "URF". In addition, insert the following text between lines 13 and 14.

"The analogous term for non-carcinogens is the "unit toxicity factor" or UTF. The UTF is represented as:

(non-carcinogens) UTF = [(CR)(EF)(ED)/(BW)(AT)]/RfD"

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: 5.1.2.1, Part II Pg. #: 5-4 Line #: Code:
274 Original Comment # 17)
Comment: It is not clear from the discussion presented here whether migration of contaminants from the South Plume or any other source are considered as potential well water contaminants to present off-site residents living in this area under the Current Land Use scenarios. Need to explain and defend approach used in the Current Land Use scenarios. Risk should not be based on measurements taken in 1991, or earlier, but on potential for exposure, given no action and the current land use.

Response: It is noted in lines 26-27 of Page 5-4 that: ".....exposure to current groundwater contamination is limited to off-property well locations under both scenarios." Contamination that currently exists in groundwater at off-property well locations leads to potential health risks. These health risks for current potential receptors are based on scenarios that assume exposure to contamination that currently exists in off-property locations.

Future potential health risks from groundwater pathways are assessed by modeling contaminant fate and transport in the regional aquifer. If future potential land use assumes on-property receptors, then concentrations of contaminants in groundwater on property are considered. If future land use assumes access controls, then modeled concentrations of contaminants in off-property locations are used. This is explained further in Section 5.1.2.2.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
275 Original Comment # 18)
Comment: Tables 5-44/5-45/5-46. These tables provide an evaluation of the sources of risk at the site, but are inadequate for characterizing the overall risk to any receptor population from site contamination. Need a additional set of tables which combines all exposure pathways for the Maximumly Exposed Individual (MEI) for each receptor population identified in the risk assessment. For example, does the trespassing child also have additional exposures from groundwater, ingestion of meat, milk, etc. What is the total risk to an on-site farmer. The Tables report data for the CT (typical resident), without noting that this exposure is not comparable to other scenarios presented. Need to limit presentation to the RME for each receptor population and provide exposure evaluations for the MEI. Need to combine risks from Radionuclides and chemicals in one table.

Response: The overall risk to each receptor will be presented in a table(s) to be added to Section 5.5.4.1 of Part II. Contrary to the comment, Tables 5-44, 5-45, and 5-46 do not include information pertaining to the typical on-property resident; however, Table 5-47 does include the typical on-property resident receptor. The purpose of Table 5-47 is to present the risks contributed from various radionuclides in different media for each of the receptors listed. Contrary to the comment, the risk assessment results for the typical on-property resident can be compared to the results for other receptors, keeping in mind that the typical on-property resident does not represent an RME receptor.

Action: Produce table(s) that present the overall risk to each receptor from all pathways. Add these table(s) to Section 5.5.4.1 of Part II.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
276 Original Comment # 19)
Comment: Tables 5-50, 5-51. Receptor population not indicated on these tables; add label. Which HIs are additive - have the same target organ or effect?

Response: (1) Agreed

(2) EPA guidance (HHEM 1989) suggests adding together hazard quotients for all chemicals, and for those hazard indices above 1 , separating chemicals by target organ(s) or effect.

Action: (1) Receptors will be added to the table.

(2) Hazard quotients will be summed across all chemicals in a scenario and the sum presented in the section 5 tables. In addition, chemicals that are major contributors to the HI and their target organ(s) will be noted for those scenarios with a total HI greater than 1.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
277 Original Comment # 20)
Comment: Permeability Constants. Where is the table of PCs used in this assessment? Values for PCs have not been reveiwed previously.

Response: The permeability constants used in the dermal exposure models are attached (see Attachment II at the end of this document).

Action: A table presenting these permeability constants with references will be added to Section 3.4 (and cited on page 3-71) of Part II.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Part II Pg. #: Line #: Code:
278 Original Comment # 21)
Comment: Dermal Exposure Pathways. How were dermal exposures (water, soil, sediment) calculated? Intake calculations are not applicable to dermal exposures, and an Absorbed Dose should be calculated instead. Toxicity values given in IRIS and HEAST can not be combined with the Absorbed Dose to give a risk/HQ. Toxicity

values must be adjusted using the oral absorption value for the chemical (need list of oral absorption values used for this adjustment and the adjusted tox values). Guidance is provided in RAGS, Appendix A, for making adjustments for dermal absorption pathways.

Response: The methods used for calculating dermal exposure are described in the Risk Assessment Workplan Addendum, Section 7.2.1.7. It is not always known whether a toxicity value is based on absorbed or applied dose. Also, oral absorption values are not available in the guidance. Appendix A states that if an oral absorption value is not available, it should be assumed to be equal to 1, which would not change the toxicity value used. Given the lack of available data, all oral absorption factors were assumed to be equal to 1.

Action: New dermal guidance will be followed in operable unit-specific risk assessments submitted after November 30, 1992.

Commenting Organization: U.S. EPA Commentor: Pat Van Leeuwen, Toxicologist
Section #: Appendix S Pg. #: Line #: Code:
279 Original Comment # 22)
Comment: Calculation Methods. The ILCR methods outlined in Appendix S, will give incorrect risk calculations. For example, it is assumed that there is a linear relationship between the exposure point concentration of a constitient in a given medium and the calculated health risk from exposure to the constituent in the medium, which is correct if you consider each exposure pathway separately. What is incorrect is the assumption that one unit risk factor (expressed here as a ILCR) can be calculated for a constitient in a given medium, and that the ILCR can be used for all exposure pathways to that medium. For example, in Table S-9, was the ILCR for benzene for the "Farmer using GM River" water, calculated using the parameter values for ingestion of river water as a source of drinking water, or using the parameter values for the inhalation of benzene during showering or using the parameter values for incidential ingestion during swimming, etc. The parameter values are different for each exposure pathway. The toxicity values also differ for different routes of exposure for each chemical. If ILCRs are to be calculated, there must be a separate ILCR for each chemical in each medium and for each exposure pathway and each receptor population. This is more complex than the EPA method of calculating an intake value for an exposure pathway and specific receptor population, which is then combined with the chemical concentration in the medium and the toxicity value for that chemical for each route of exposure to give a risk values.

Response: DOE disagrees. DOE has calculated the Unit Risk Factors used in the SWCR by considering the risks incurred by a receptor from one constituent in one media via a number of pathways simultaneously. Appropriate parameter values and exposure models were used and the results summed to produce one medium specific concentration to risk conversion factor for that unique receptor. Since the parameter values and exposure models used to assess receptor exposures are not concentration dependent, the concentration to risk relationship is linear. The slope of the linear concentration vs. risk plot is the Unit Risk Factor for that receptor from that constituent in that medium.

The answer to the commenter's example question is, "Yes, all of them are combined to produce the unit risk number."

Action: DOE recognizes that the methodology used to calculate the Unit Risk Factors is not evident from the current presentation provided in the SWCR. Additional explanations and examples will be provided in the next revision as part of an expanded Appendix S.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: General Pg. #: Line #: Code:
280 Original Comment #
Comment: Where appropriate, figures should be duplicated in the report rather than simply referenced. This is especially true when the figures are maps, for instance, showing the location of sampling points. It is difficult and time-consuming to try to go back and locate figures in different parts of the document.

Response: This is a potential problem in a large report, but it is time-consuming and expensive to duplicate all the figures referenced in later sections of the report.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.1.3.3, Part I Pg. #: 3-38, paragraph 2 Line #: Code:
281 Original Comment # 1
Comment: Please clarify what samples were taken at point W3. It is unclear how often grab samples were taken there from 1981 through 1984.

Response: Comment noted. The surface water grab sample collection at sampling point W3 was conducted on a daily basis, similar to the procedure for point W1.

Action: The following text modification is suggested for page 3-38, lines 11-12: "The surface water sampling at W3 was modified to a daily grab sample during the monitoring efforts for 1981 through 1984."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.1.3.3, Part I Pg. #: 3-40 Line #: Code:
282 Original Comment # 2
Comment: Figure 3-10. Figure 3-10 is missing from the report.

Response: Figure 3-10, which is a foldout figure, was inadvertently omitted in the initial submission to EPA and was supplied separately. The revised draft will include the figure.

Action: Check future submissions to ensure all figures are included.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.1.3.3, Part I Pg. #: 3-43, paragraph 1 Line #: Code:
283 Original Comment # 3
Comment: It should be explained how specific W1 and W3 samples were "selected" to undergo more in-depth analysis.

Response: Comment noted.

Action: The following text modification is suggested for page 3-43, lines 5-6: "At least one sample per week from each of the Great Miami River sampling points was analyzed for pH, fluoride, nitrate, chloride, and radiological parameters such as gross alpha, gross beta, and uranium."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.1.3.3, Part I Pg. #: 3-43, paragraph 2 Line #: Code:
284 Original Comment # 4
Comment: Please clarify what samples were taken for point W5. Weekly grab samples (from 1985 to 1989) are noted. However, it is also stated that weekly composites from W5 were analyzed (from 1985 to 1988), although no mention is made of collecting such samples.

Response: Comment noted. The text will be modified to improve clarity.

Action: The following text revision is suggested to replace the group of sentences on page 3-43 that begin on line 16 and end on line 20: "From 1985 to 1990, weekly grab samples were collected (flow permitting) from W5, W7, W8, W9, W10, and W11 and analyzed for total uranium and pH. These weekly samples were composited and analyzed on a monthly basis for uranium content, alpha and beta radioactivity, and pH. One grab sample from each location was analyzed monthly for fluoride, chloride, and nitrate."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 4.1.3.1, Part I Pg. #: 4-40, paragraph 1 Line #: Code:
285 Original Comment # 5
Comment: The trends in the data should be summarized in the text, although it is appropriate to provide the more detailed information in tables.

Response: Comment noted.

Action: The following descriptive text will be added to the discussion on page 4-40, after the sentence that ends on line 4: "The information presented in Table 4-15 indicates that higher levels of uranium in discharged wastewater occurred during the late 1950s and 1960s. The peak discharge of 10,504 kg of total uranium occurred during fiscal year 1964 (Table 4-15). Since fiscal year 1970, the quantity of total uranium in discharged wastewater has been less than 2,000 kg per fiscal year. Although records were maintained concerning the discharge of uranium in wastewater, other radionuclides were not as closely monitored. Certain isotopes such as radium-226, radium-228, or total thorium, were often monitored in the wastewater discharged to the Great Miami River. Beginning in 1969, estimates were made for several other radionuclides, based on long-term composite samples each year (Table 4-16). Overall, with a few exceptions (i.e., technetium-99, isotopic plutonium, etc.) there appears to be a general reduction in the quantity of the radionuclides discharged in wastewater to the Great Miami River."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 4.1.3.4, Part I Pg. #: 4-93 Line #: Code:

286 Original Comment # 6

Comment: Figure 4-37. It is recommended that the letter "M" should be replaced by another reference symbol or used as a superscript. The present use could be confused with the use of "M" to mean 10^6.

Response: Footnote "e" of Table 4-37 clearly identifies the the symbol "M" as representing the greatest constituent concentration observed from multiple analyses of the same sample. The selection of qualifiers for the data was exactly as it was presented in the source document.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 4.3.2, Part I Pg. #: 4-334, paragraph 1 Line #: Code:

287 Original Comment # 7

Comment: This section should include a discussion to clarify when data will be validated according to the specific radiological methodologies and requirements that are set forth in the Sit-Wide CERCLA Quality Assurance Project Plan.

Response: Agreed.

Action: Delete the sentence beginning with "Specific methodologies.... "starting on Line 31, page 4-335.

Insert the following lines at line 35, page 4-335

"Radiological data validation procedures were developed on the Data Validation guidelines in an Appendix to the RI/FS QAPP, and modified to incorporate the laboratory's standard operating procedures and QA plan. All of the RI/FS data were were validated prior to the issuance of the Site-Wide CERCLA Quality Assurance Project Plan; however, the RI/FS data validation criteria used are essentially the same as those set forth in the Site-Wide QA Plan. Minor differences exist in the evaluation criteria for particular quality control samples, but do not significantly alter the outcome of the final qualifiers.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.2.1.4, Part II Pg. #: 5-30 Line #: Code:

288 Original Comment # 8

Comment: Table 5-9. The text of the section on sediment notes that dermal contact with sediment is one of the pathways evaluated. However, this pathway does not appear to be included with risks in Table 5-9. Please correct or clarify.

Response: It is not reasonable to include dermal absorption as a viable exposure mechanism for radioisotopes of the elements listed in Table 5-9.

Action: In Part II, Section 5.2.1.4, page 5-29, insert the following text on line 8 between the first and second sentences of the paragraph: "It is not reasonable to include dermal absorption as a viable exposure mechanism for radioisotopes of the elements listed in Table 5-9; therefore, a risk contribution from the dermal contact pathway is not included in the risks presented in Table 5-9."

In addition, on page 5-29, line 9, change "5 x 10^{-5}" to "less than 1 x 10^{-9}".

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.2.2.5, Part II Pg. #: 5-49, paragraph 1 Line #: Code:
289 Original Comment # 9
Comment: This section states that the risks in this scenario (trespassing child when access controls are discontinued) are higher than for the scenario when access controls are in effect. However, the text then goes on to cite as risk estimates the exact numbers calculated for the scenario with access controls. Please justify why more in-depth calculations were not performed for this scenario in order to estimated how much greater the risks would be without access controls.

Response: The risks with and without access controls are both included in Table 5-9. The text will be clarified.

Action: In Part II, Section 5.2.2.5, page 5-49, paragraph 1, change the two references to "Section 5.2.1.5" to "Section 5.2.1.4".

In addition, in line 7 change "less than 10^{-8}" to "approximately 1 x 10^{-8}."

In addition, in line 9 change "1.1 x 10^{-8} risk" to "4.1 x 10^{-6} risk."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.3, Part II Pg. #: Line #: Code:
290 Original Comment # 10
Comment: Surface water sediments are not included in the discussion on risks under future land-use scenarios, although they are considered under current land-use scenarios. The surface water models noted appear to provide a means of modelling future contaminant concentrations in sediments. The omission of sediments from the discussion of risks should be justified.

Response: Additional justification will be added to the text on page 5-66. Similar justification is already included in Section 3.3.5.2 (page 3-59), which addresses future exposure point concentrations for sediment, and Section 5.1.4.2 (page 5-6), which addresses future land use exposure scenarios for sediment.

Action: In Part II, Section 5.3, page 5-66, line 3, delete the word "sediment." In addition, delete the last sentence of the first paragraph of Section 5.3 (lines 6 to 8). In addition, add the following text as a new paragraph between lines 8 and 9 on Page 5-66 in Section 5.3: The risks from exposures to sediment under the future land use scenario are not quantitatively evaluated. Potential future sediment concentrations can be estimated using transport models and contaminated soil source terms; however, modeled future sediment concentrations would be lower than the contaminant concentrations present in the soil and waste source terms. Therefore, the risks from exposures to potential future sediment concentrations would be bounded by the risks from exposures directly to the contaminated soil and waste itself. For this reason, the risks from exposures to sediment under the future land use scenario are not quantified separately.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 7.2.1, Part II Pg. #: 7-10 Line #: Code:
291 Original Comment # 11
Comment: Table 7-3. It should be stated why radionuclides are not considered as constituents of concern for FEMP waters.

Response: Radionuclides are considered as constituents of potential concern for FEMP surface waters. However, Table 7-3 presents OEPA water quality criteria only for those constituents of potential concern in FEMP surface waters for which criteria exist. OEPA does not provide water quality criteria for radionuclides; thus, they are excluded from the table. The footnote to the title of Table 7-3 will be expanded to clarify this.

Action: Add the following sentence to footnote "a": "This table presents OEPA water quality criteria only for those constituents of potential concern in FEMP surface waters for which criteria exist."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 7.2.1, Part II Pg. #: 7-11, paragraph 1 Line #: Code:
292 Original Comment # 12
Comment: Supporting data or modelling results should be cited to support the conclusion that "FEMP impacts on Great Miami River sediments are also unlikely to be of concern due to dilution by the river."

Response: Agree. Flow rates for the Great Miami River and the two sources responsible for releases to the river, Paddys Run and the main effluent line, will be provided. Sediment sampling data in Part I, Section 4.1.3 will be referenced.

Action: Replace the last sentence of paragraph 1, page 7-11 with: "FEMP impacts on Great Miami River sediments are also unlikely to be of concern due to dilution of contaminants that enter the river via Paddys Run and the main effluent line. Flow in the river averages over 3,000 ft^3/s, compared to an average flow range of 0.2 to 4.0 ft^3/s in Paddys Run, and an average inflow of 1.1 ft^3/s from the main effluent line. Radionuclides detected in river sediments collected between 1985 and 1990 had low concentrations, as shown in Table 4-14 of Part I, Section 4.1.3."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: P.4.0, Appendix P Pg. #: P-4-1, paragraph 1 Line #: Code:
293 Original Comment # 13
Comment: Results from modelling for the one-year, 24-hour storm event should be summarized here.

Response: Agreed.

Action: The following insert will be added to Appendix P, Section P.4.0: "Future surface water concentrations in the Great Miami River estimated by this model are below 1 pCi/ℓ for all radionuclides except the uranium isotopes. Activity concentrations for U-234, U-235/236 and U-238 are estimated at 24 pCi/ℓ, 1.3 pCi/ℓ, and 28 pCi/ℓ, respectively. Modeled concentrations for organic compounds range from 4.9×10^{-11} mg/ℓ to 1.1×10^{-4} mg/ℓ and are all below usual analytical detection levels. Modeled concentrations for inorganics except uranium range from 3.8×10^{-7} mg/ℓ to 1.4×10^{-5}

mg/ℓ, also below analytical detection levels. The modeled concentration for total uranium is 0.084 mg/ℓ."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Summary, Part II Pg. #: S-4, paragraph 4 Line #: Code:
294 Original Comment # 14
Comment: Explain why cattle could not drink from Waste Pit 5.

Response: Section 3.2.4 states that these surface water bodies are considered as sources of site-related exposures. Section 3.3.3.1 presents exposure point concentrations for these impoundments. Section 5.1.3 states the intent to quantify risks from these areas. Section 5.2.2.4 presents calculated risks to users of meat and dairy products from cattle drinking from Pits 5 and 6, and the Clearwell.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 2.0, Part II Pg. #: 2-11, paragraph 1 Line #: Code:
295 Original Comment # 15
Comment: This comment is generic. Once a list of contaminants of concern is developed for a particular media it should be used consistently for assessments in that media. For example, say contaminants A, B, and C have high concentrations and D has a low concentration in well 1 while radionuclides B, C and D are found in well 2 in high concentrations and A has a low concentration. Then the proper list of contaminations for assessment for both wells is A, B, C and D. D should not be omitted for well 1 and A should not be omitted for well 2.

Response: Selection of COCs is the general issue in this comment. The comment states that the list of COCs for a medium should be consistent for all assessments that involve that medium. The comment presents the example of contaminant concentrations in groundwater from wells. Concerning the specific example of contaminant concentrations in groundwater, pages 2-9 and 3-20 state that statistical evaluations are performed on <u>all</u> potential COCs in <u>each</u> of the wells selected as potential RME groundwater well locations. The results of the statistical evaluations are presented in separate data summary tables for each potential RME well location in Appendix R. The wells are statistically evaluated separately in order to facilitate selection of an RME location for groundwater. The list of COCs selected in each of those data summary tables varies because sample analytical results for each of the wells vary. Therefore, the list of COCs in groundwater is not necessarily the same from well location to well location.

The list of COCs in other media varies because the media are considered in discrete subsets (e.g., distinct waste areas or distinct areas of contamination) to facilitate evaluating distinct areas rather than averaging data for a medium over the entire FEMP site. The list of COCs selected in each of those areas varies because sample analytical results for each of those areas vary. Other examples of this type of comment are requested from the commentor.

Action: As discussed at the meeting with EPA in Chicago on November 5, 1992, the target analyte list for groundwater that has been given in the RI/FS Work Plan will be presented in Section 2.0 of Part II of SWCR.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 2.1.1.5, Part II Pg. #: 2-13, paragraph 1 Line #: Code:
296 Original Comment # 16
Comment: Further explanation should be given for use of 0-18 inches for exposure assessments. One ARAR will be 40 CFR 192 which uses 15 cm (6 inch) averaging areas. The proposal to use 18 inch averaging areas is in conflict with this ARAR. Further, averaging over deeper depths may tend to reduce near surface gamma exposure values.

Response: Sample analytical results for soil depths between 0 and 6 inches (0 - 0.15m) and soil depths between 0 to 18 inches (0 - 0.46m) are summarized separately in order to select constituents of potential concern in surface soil. The reason for summarizing these data sets separately by depth range is to address different needs in fate and transport modeling and exposure assessment. Data summary for depth range of 0-6 inches (0-0.15 m) was needed for air and surface water modelings and exposure assessments for pathways such as incidental soil ingestion, dermal contact with soil, etc. These modelings and pathways involve soil in the top layer of the surface. A data summary for the depth range of 0-18 inches (0-0.46 m) was needed for groundwater modeling and exposure assessments such as root uptake of vegetables, on-site home builders, etc. These modeling and pathways involve exposure to deeper layers of soil. Furthermore, the surface gamma exposure value was based on the sample analytical results for soil depths between 0-6 inches.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 2-14, paragraphs 2 & 3 Line #: Code:
297 Original Comment # 17
Comment: Explain why field radiation measurements and subsurface soil data are only used qualitatively.

Response: Radiation Measurement programs used portable instruments such as FIDLERs (field Instruments for Detection of Low-Energy Radiation) to perform external radiation surveys. The purpose of this program was to identify locations of elevated levels of radioactivity in the soil. The quality of these measurements is limited and the level of analytical uncertainty surrounding these measurements is not quantitated and may be large. These data are therefore only used qualitatively in the risk assessment. The identified locations of elevated levels of radioactivity were selected for soil sampling in a subsequent study, the Surface Soil Sampling Program. The measurements from this program have been employed quantitatively in the risk assessment.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 2.1.2, Part II Pg. #: Line #: Code:
298 Original Comment # 18

Comment: Background data taken during removal actions would indicated that it was taken from once contaminated areas. This is not a proper place from which to select background data because of the credibility of such data in representing the natural conditions. The fallback protocol of using background as zero may lead to overestimations of background. For series radionuclides, equilibrium can be used before assuming zero.

Response: 1) DOE agrees that "including data collected during removal actions" was mistakenly stated and will be removed.
2) The assumption of a background level of zero is only applicable to fission products, transuraniums, and organic chemicals. For series radionuclides, equilibrium has been assumed for appropriate short-lived progeny for which background levels are not available.

Action: Delete the clause "including data collected during removal actions" from line 20 on page 2-15. Add the following sentence to line 31 on page 2-15: "For series radionuclides, equilibrium has been assumed for appropriate short-lived progeny for which background levels are not available as of December 1, 1991."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 2-16 Line #: Code:
299 Original Comment # 19
Comment: Table 2-2. The Myrick et al. paper is not an acceptable source for sediment and soil background data. It was taken along interstate highways, generally far removed from the local FEMP geology.

Response: The Myrick et al. paper was the only source available as of December 1, 1991 for background soil data around the FEMP for the SWCR. Sampling for site-specific background soil concentrations was conducted in 1992 and the data will be used in the risk assessments for subsequent operable unit RIs. The site-specific sediment background data will be gathered for the Operable Unit 5 RI, as discussed at the meeting with EPA in Chicago on November 5, 1992.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 2.2, Part II Pg. #: Line #: Code:
300 Original Comment # 20
Comment: Further justification should be given for bullet 2 since it appears to eliminate many potential contaminants of concern. Compare this to other common methods such as 2 or 3 times background or to low limit of detection type methods.

Response: The Upper Tolerance Limit (UTL) for background data is a parameter to which site-related data are compared as one criterion for determining chemicals of concern. It is a recognized method that has a sound statistical basis for evaluating whether site-related data are within the natural background distribution. Use of UTLs was proposed in the Risk Assessment Work Plan Addendum that has been approved by U.S. EPA.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: Line #: Code:
301 Original Comment # 21
Comment: Table 2-3 to Table 2-28. Describe for these tables if these will be the only radionuclides used in the risk assessment. Specifically, clarify how series radionuclides will be handled. For example, in Table 2-6, since U-238 and Ra-226 concentrations are shown for the drainage ditches, describe how Th-230 concentrations will be handled since it is found between U-228 and Ra-226 in the Uranium Series.

Further, the background levels listed for some radionuclides are much higher than would be expected normally (e.g., Table 2-8). The use of the UCL to set background apparently biases the background level very high. This will tend to eliminate contaminants of concern and bias net concentrations low, thus underestimating risk. As before, justify the use of the UCL over the straight mean method.

Explain how radiological net values will be obtained. It appears that the background UCL will be subtracted from the sample UCL.

Describe how blank entries will be handled. For example, in Table 2-8, uranium is listed for the drainage ditches, but U-238 is not listed. Explain how the blank will be dealt with.

Response: The radionuclides listed in these tables are the radiological constituents of potential concern, as the table titles state. However, these are not the only radionuclides that will be included in risk calculations. Appropriate series radionuclides are also included in risk estimates presented in Section 5.0. For example, in Table 2-6, U-238 and Ra-226 are identified as constituents of potential concern. When the risks are characterized in Section 5.0, the exposure point concentrations for U-238 and Ra-226 are multiplied by the unit risk factors for U-238 plus short-lived daughters and Ra-226 plus short-lived daughters, respectively. Appendix S presents all of the radionuclide unit risk factors. Table 2-6 also includes Th-230 as a constituent of potential concern; therefore, it is handled separately from U-238. However, if Th-230 was not identified as a constituent of potential concern separately from U-238, it would not be assumed that it is in equilibrium with U-238 because the relationships of the half-lives in the uranium decay series from U-238 to Th-230 do not support the equilibrium assumption except in the case of undisturbed ore.

Considering background concentrations presented in the tables, the numerical values presented are upper 95% tolerance limits (UTLs) not upper 95% confidence limits (UCLs) as the comment states. The use of the UTL on background is consistent with the methodology in the Risk Assessment Work Plan Addendum; therefore, use of the UTL rather than a mean is justified. In addition, net radionuclide concentrations are not used to calculate risks in Section 5.0; the concentrations used to calculate risks include background. The risks associated with exposure to the background concentrations are calculated and presented separately in Section 5.0.

Considering blank spaces presented in the tables, if the space in the tables is blank for a constituent for a given portion of the site, the constituent is not of potential concern for that portion of the site. In the specific cases of thorium and uranium, the isotopic data are always used in the risk assessment rather than the data from mass analysis.

Action: In Part II, Section 3.3, page 3-16, insert the following text as a new paragraph between lines 22 and 23:

"Exposure point concentrations presented in Section 3.3 are not net concentrations. They include background because no attempt has been made to subtract the contribution from background concentrations. The risks associated with exposure to background concentrations are calculated and presented separately in Section 5.0."

In addition, in Part II, Section 5.1, page 5-3, insert the following text between lines 13 and 14 as a new paragraph:

"The radionuclides listed in tables of exposure point concentrations are the radiological constituents of potential concern; however, these are not the only radionuclides that are included in risk calculations. Appropriate short-lived decay series radionuclides are also included in risk estimates presented in Section 5.0. For example, where U-238 is identified as a constituent of potential concern, the exposure point concentration for U-238 is multiplied by the unit risk factor for U-238 plus short-lived daughters obtained from Appendix S even though the short-lived daughters may not be identified as constituents of potential concern themselves. Long-lived decay product constituents of potential concern are handled separately from U-238. For example, if Th-230 is not identified as a constituent of potential concern separately from U-238, it is not assumed that it is in equilibrium with U-238 because the relationships of the half-lives in the uranium decay series from U-238 to Th-230 do not support the equilibrium assumption, except in the case of undisturbed ore."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 2-21 Line #: Code:
302 Original Comment # 22
Comment: Table 2-3. Clarify what the blanks for silos 1 and 2 mean (e.g., Ac-227, Pa-231, Ra-224, Ra-228). It would seem reasonable that, given the presence of other radionuclides in their series, that they would have some measurable concentrations.

Response: The radiological constituents of potential concern presented in Table 2-3 for silo contents are based on the analytical results obtained from a WMCO silo-content sampling plan (see Table R.1-1 in Appendix R). This is the only data source available as of December 1, 1991. Since Ac-227, Pa-231, Ra-224, and Ra-228 were not detected for Silos 1 and 2, they have no entries in Table 2-3. However, concentrations for series radionuclides have been assumed to have reached equilibrium for appropriate short-lived progeny for exposure and risk estimations in the later sections.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 2-30 Line #: Code:
303 Original Comment # 23
Comment: Table 2-10. Explain how for Waste Pit 4, Waste Pit 5 and the Clearwell there can be upper confidence limits on the mean but no means.

Response: As indicated in footnote c in Table 2-10 of Part II, the mean concentration is not calculated if sample size for a constituent is equal or less than 2. In this case, the maximum detected concentration, not the confidence limit, is given in the table.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.1.4, Part II Pg. #: Line #: Code:
304 Original Comment # 24
Comment: Dermal exposure to radionuclides should be included in some of these scenarios, specifically where digging and swimming are likely. This is separate from any dermal uptake assumed.

Response: DOE disagrees with the comment. The radiation exposure pathway from receptor activities involving dermal contact with radionuclides of concern at the FEMP is of minor concern in comparison to pathways that involve much more frequent and longer duration exposures to radionuclides of concern from inhalation, ingestion, and gamma-ray exposure from residence on contaminated soil.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.2.1, Part II Pg. #: Line #:23 - 27 Code:
305 Original Comment # 25
Comment: Clarify whether this justification will apply if beta dermal exposure is considered.

Response: The radiation exposure pathway from receptor activities involving dermal contact with radionuclides of concern at the FEMP is of minor concern in comparison to pathways that involve much more frequent and longer duration exposures to radionuclides of concern from inhalation, ingestion, and gamma-ray exposure from residence on contaminated soil.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.2.1, Part II Pg. #: Line #:19 - 23 Code:
306 Original Comment # 26
Comment: Since radons have high risk factors, clarify what the threshold exposure duration to be used is.

Response: No threshold criterion for exposure duration or exposure frequency is employed. This determination is based on judgement. The text on page 3-14, lines 19 to 23 states that the trespassing child and the hunter are potential receptors for whom the frequency of exposure on property is "...relatively short."

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.2.1, Part II Pg. #: Line #:27 - 30 Code:
307 Original Comment # 27

Comment: Clarify whether ingestion of pond water by cattle has been considered for scenarios of loss of control. This might be from one of the waste pits such as Waste Pit 5.

Response: Section 3.2.4 states that these surface water bodies are considered as sources of site-related exposures. Section 3.3.3.1 presents exposure point concentrations for these impoundments. Section 5.1.3 states the intent to quantify risks from these areas. Section 5.2.2.4 presents calculated risks to users of meat and dairy products from cattle drinking from Pits 5 and 6, and the Clearwell.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.2.3, Part II Pg. #: Line #: Code:
308 Original Comment # 28
Comment: When it is stated that sufficient potable water is not available for a farm, clarify whether this assumes drinking water only for residents only or for all farm activities requiring potable water.

Response: The statement that the perched water deposits do not contain sufficient volumes of water to serve as sustained sources of potable water for a farm includes consideration of all farm activities requiring potable water. These farm activities include drinking water, use of water in the home for domestic purposes, use of water to irrigate food crops and animal feed, and use of water for consumption by livestock. This will be clarified in the text.

Action: In Part II, Section 3.2.3, page 3-15, add the following text to the end of the paragraph on line 21: "The farm activities that are assumed to involve use of water include drinking water, use of water in the home for domestic purposes, use of water to irrigate food crops and animal feed, and use of water for consumption by livestock."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.1, Part II Pg. #: Line #:10-13 Code:
309 Original Comment # 29
Comment: It was understood by EPA that, because of the difficulties at the K-65 silos, that an attempt would be made to use AMS data to estimated offsite radon-222 concentrations. This sentence seems to nullify that approach. Please clarify.

Response: The air concentrations used as exposure point concentrations at on-property and off-property locations are modeled using the ISCLT model for the reasons stated in the text. However, the airborne radon measurements collected in the K-65 Silo area, in particular, are used to estimate the radon activity release rate source term for current land use scenarios. This is discussed in the air modeling text presented in Appendix Q. Additional clarification will be provided in the text.

Action: In Part II, Section 3.3.1, page 3-17, revise the sentence beginning on line 10 to read: "Since air concentrations are needed for all on-property and off-property locations it was determined that, with the exception of airborne radon data, AMS data could not be used to determine exposure point concentrations to identify RME locations."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section

Section #: 3.3.1.2, Part II Pg. #: Line #: Code:

310 Original Comment # 30

Comment: With respect to the K-65 silos, it appears that an assumption will be made that there is no side or top containment to control fugitive dust and radon emission. Clarify if this will be assumed. If so, then Table 3-3 would appear to be substantially understated for radon.

Response: It is assumed that the domes fail completely on Silos 1, 2, and 3, the side walls of Silo 3 also fail, but the side walls of the K-65 Silos remain because the berms support those walls. The modeled airborne radon concentration in Table 3-3 is 24,000 pCi/m^3 (24 pCi/ℓ), not a trivial outdoor airborne radon concentration. It should be noted that radon releases from the K-65 silos have been reduced significantly by the installation of bentonite inside the silos. This is evident in airborne radon concentration measurements collected adjacent to the silos before and after installation of the bentonite. The radon source term used for air modeling for current land use scenarios takes this reduction into account.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section

Section #: Part II Pg. #: 3-18 Line #: Code:

311 Original Comment # 31

Comment: Table 3-2. Common units for radionuclides in air are pCi/ℓ rather than pCi/m^3. Clarify why pCi/ℓ was not used to avoid confusion.

Response: The units pCi/m^3 are more convenient for use with the unit risk factors derived for air pathways (risk per pCi/m^3) and are presented in Appendix S. The relationship between the units pCi/m^3 and pCi/ℓ is simple enough that there should not be confusion.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section

Section #: 3.3.2.1, Part II Pg. #: 3-20 Line #:10 - 16 Code:

312 Original Comment # 32

Comment: Use of concentrations alone may result in errors. The concentration in conjunction with the slope factor will determine the most significant contaminants. Use of concentration alone assumes equal slope factors, which is fallacious. Selection based upon concentration and slope factor should be considered for all media, not just groundwater.

Explain why one set of contaminants of concern was not used for all wells.

Response: The passage referenced in the comment presents the basis for identifying potential RME well locations. The passage on page 3-20, lines 31-33 states that risk calculations are performed to identify the potential RME well locations that yield the highest overall risks; therefore, both concentration and toxicity are considered in the determination of the RME well locations.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.2.1, Part II Pg. #: 3-20 Line #:beginning at line 31 Code:
313 Original Comment # 33
Comment: Clarify how this process merges with the process of lines 10-16 on this same page. It appears that they are contradictory.

Response: The process discussed beginning on line 31 is a further extension of the process that began in lines 10 to 16. They are not contradictory. The process is intended to provide a simple means to narrow the number of potential RME locations for groundwater exposure pathways based on concentration (lines 10 to 16) and risk calculations (beginning on line 31).

Action: Replace the first sentence (starting Line 4) of the first paragraph on page 3-20, Part II with the following: "In order to identify the potential RME well location(s) that yield the highest overall risks, both concentration and toxicity are considered in the process of the identification. Wells that contain high concentrations of constituents that have high toxicity values are more likely to be selected as a potential RME well location. Therefore, the first step of the process is to select wells that contain the highest (or the few highest) concentrations of the analyzed constituent. The second step of the process is to estimate the risk posed by all constituents in these selected wells. The well(s) that show the highest overall risks will then be identified as the potential RME well location(s)."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.2.2, Part II Pg. #: Line #: Code:
314 Original Comment # 34
Comment: Explain how radiological ingrowth was considered for other than present scenarios. Such ingrowth might be most pronounced with Thorium Decay Series radionuclides.

Response: The groundwater transport modeling work is performed on contaminant source terms expressed in terms of mass (e.g. total mg of each contaminant available). The groundwater modeling process incorporates an exponential term (e^{-X}, where X = decay constant x time) that accounts for radiological decay with time. Ingrowth of short-lived decay products is accounted for in the risk calculation process rather than in the groundwater modeling process. When the risks are characterized in Section 5.0, the exposure point concentrations are multiplied by the unit risk factors that include short-lived daughters. Appendix S presents all of the radionuclide unit risk factors. Also refer to the response to comment 301.

Action: Refer to the action for comment 301. No additional text change is required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 3-29 Line #: Code:
315 Original Comment # 35
Comment: Table 3-7. Explain why decay products of long-lived radionuclides are not listed in this table. Ingrowth periods should be long enough to produce some.

Response: Ingrowth of short-lived decay products is accounted for in the risk calculation process rather than in the process of estimating exposure point concentrations. When the risks are characterized in Section 5.0 the exposure point concentrations are multiplied by the

unit risk factors that include appropriate short-lived daughters. Appendix S presents all of the radionuclide unit risk factors.

Action: Refer to the action for comment 301. No additional text change is required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 3-47 Line #: Code:
316 Original Comment # 36
Comment: Table 3-11. Explain why decay products of long-lived radionuclides are not listed in this table. Ingrowth periods should be long enough to produce some.

Response: Ingrowth of short-lived decay products is accounted for in the risk calculation process rather than in the process of estimating exposure point concentrations. When the risks are characterized in Section 5.0 the exposure point concentrations are multiplied by the unit risk factors that include appropriate short-lived daughters. Appendix S presents all of the radionuclide unit risk factors.

Action: Refer to the action for comment 301. No additional text change is required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.5.2, Part II Pg. #: 3-59 Line #:15 - 16 Code:
317 Original Comment # 37
Comment: Clarify why, if future pathways require use of soil plus sediment concentrations, only the soil concentration will be used.

Response: The text does not state that future pathways require the use of soil plus sediment concentrations. Pathways identified for exposure to soil are the same as pathways identified for exposure to sediment. Since estimated future sediment concentrations are less than the soil concentrations, the risks from soil exposure pathways will bound the risks from sediment pathways. Thus, soil concentrations are used in the exposure pathways.

Action: In Part II, Section 3.3.5.2, page 3-59, revise lines 15, 16, and 17 to read: "Since estimated future sediment concentrations are less than the soil concentrations, the risks using soil concentrations bound the risks from sediment concentrations via the same pathways. Thus, soil concentrations are used as exposure point concentrations."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.6, Part II Pg. #: 3-59 Line #:33 - 35 Code:
318 Original Comment # 38
Comment: Explain why only uranium is used for dust contamination when many more radionuclides, including uranium decay products, should be expected.

Response: Uranium concentration in dust is used as the primary source, but not the only source, for ingestion of contaminants. Concentration measurements for other α-emitters and β-emitters in dust (Boback et al., 1987), including some of the uranium decay products, have shown minor contributions to the ingestion risk. Risks associated with these other radionuclides in dust have also been considered.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 3-62 Line #: Code:
319 Original Comment # 39
Comment: Table 3-13. Explain why they geometric mean is used for removable alpha when it has been practice throughout this document to use the UCL.

Response: The radiological surveys of abandon-in-place (AIP) equipment for Operable Unit 3 only provided the data of "highest alpha removable (DPM)", instead of the "average alpha removable (DPM)" for each piece of equipment surveyed. The UCL for the highest measurements obtained from a plant would highly overestimate the contamination level that a scavenger is likely to encounter when he salvages equipment in the plant. The geometric mean of these highest measurements should be more representative of the contamination level that a scavenger could exposed to and does not underestimate it.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.3.7, Part II Pg. #: 3-63 Line #:21 - 24 Code:
320 Original Comment # 40
Comment: Explain why dose rates are measured above the pits, not at the edges. Clarify how high above the pits the measurements were made.

Response: Radiation dose rates are not measured above the pits. They are calculated, as the text states, using the MICROSHIELD model. A suitable geometry for approximating a receptor position at the edge of a pit is not available. The dose rates for the pits are calculated at a height of one meter.

Action: In Part II, Section 3.3.7, page 3-63, insert the following text at the end of the paragraph on line 24: 'All dose rates calculated using the MICROSHIELD computer code are estimated at a height of one meter."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.6.1, Part II Pg. #: 3-73 Line #:28 - 33 Code:
321 Original Comment # 41
Comment: Clarify why other radionuclides that may contribute to inhalation dose significantly, e.g., Ac-227 and Pa-231, are not listed here. They are listed in Table 2-3 as being present in Silo 3 and should be present in Silos 1 and 2. Rn-220 and Rn-219 might also be present if their precursors were airborne.

Response: Section 3.6 presents only summary discussion of the highlights of the exposure assessment; therefore, not every constituent is specifically mentioned in the summary. This does not mean that constituents are not included in the risk assessment. The risk characterization in Section 5.0 includes risk calculations for airborne constituents that exceed the screening levels.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 3.6.5, Part II Pg. #: Line #: Code:

322 Original Comment # 42

Comment: Relying solely upon concentration as a determinant of significance will result in errors. This is equivalent to assuming equal slope factors. Consequently, there are radionuclides omitted from this list that could contribute significantly to risk.

Response: Section 3.6.5 simply presents a discussion of contaminants detected in soil and waste media. No discussion of concentration or concentration-toxicity screening/selection is presented in Section 3.6.5.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 4.2.2, Part II Pg. #: 4-26 Line #:19 Code:

323 Original Comment # 43

Comment: There is some evidence that longer lived radon-220 progeny migrate out of the lung to other organs.

Response: The comment is noted.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 5-12 and 5-16 Line #: Code:

324 Original Comment # 44

Comment: Tables 5-1 and 5-2. Explain why there are so few radionuclides listed in these tables. Clarify whether all the decay products of the three natural decay series have been included.

Response: Ingrowth of short-lived decay products is accounted for in the risk calculation process rather than in the process of estimating exposure point concentrations. When the risks are characterized in Section 5.0, the exposure point concentrations are multiplied by the unit risk factors that include appropriate short-lived daughters. Appendix S presents all of the radionuclide unit risk factors.

Action: Refer to the action for comment 301. No additional text change is required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 5-21 Line #:1 - 8 Code:

325 Original Comment # 45

Comment: It is not reasonable to assume Rn-222 and Ra-226 are in equilibrium in groundwater. For natural conditions, radon-222 has a range of a few hundred to a few thousand picoCuries per liter while radium-226 is seldom over 5 - 10 pCi/ℓ. A factor of 100:1 would appear more likely. This would increase the estimated risk to 3×10^{-4}.

Response: Agreed.

Action: In Part II, Section 5.2.1.2, page 5-21, replace the sentence beginning on line 4 and ending on line 5 with the following sentence: "Radon concentration is estimated by assuming that radon is present in groundwater at concentrations 100 times greater than the Ra-226 concentration."

In addition, on line 8, replace "3 x 10^{-6}" with "3 x 10^{-4}".

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 5-22 Line #: Code:
326 Original Comment # 46
Comment: Table 5-4, footnote b. Establish the basis for this footnote with environmental data.

Response: Appropriate series radionuclides are also included in risk estimates presented in Section 5.0. When the risks are characterized in Section 5.0 the exposure point concentrations are multiplied by the unit risk factors that include appropriate short-lived daughters. Appendix S presents all of the radionuclide unit risk factors.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.2.1.3, Part II Pg. #: Line #:12 Code:
327 Original Comment # 47
Comment: Explain why a child is not the proper receptor for this scenario.

Response: Section 5.2.1.3 addresses surface water exposure pathways under current land use with access controls. The exposure pathways identified in Section 5.2.1.3 are based on the assumption that water from the Great Miami River is used. As the text states, the Great Miami River is the only water body with sufficient volume to support the activities associated with these pathways. The child receptor under current land use is a trespassing child who is exposed on property. Thus, the child may be exposed in Paddys Run and other on-property water courses. The off-property farmer is quantified for this section since the risks would bound the risks to the child off property.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.2.1.4, Part II Pg. #: Line #:3 Code:
328 Original Comment # 48
Comment: Explain whether the dermal contact risk arises from gamma only or also includes beta.

Response: The dermal contact pathway accounts for absorption of contaminants through the skin, not for skin beta dose. The radiation exposure pathway from receptor activities involving dermal contact with radionuclides of concern at the FEMP is of minor concern in comparison to pathways that involve much more frequent and longer duration exposures to radionuclides of concern from inhalation, ingestion, and gamma-ray exposure from residence on contaminated soil.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: Line #: Code:
329 Original Comment # 49
Comment: Table 5-12. Explain whether risks in this table arise from decay products as well as the parent.

Response: Appropriate series radionuclides are also included in risk estimates presented in Section 5.0. When the risks are characterized in Section 5.0, the exposure point concentrations are multiplied by the unit risk factors that include appropriate short-lived daughters. Appendix S presents all of the radionuclide unit risk factors.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: 5.2.2.6, Part II Pg. #: 5-50 Line #:20 - 31 Code:
330 Original Comment # 50
Comment: Considering the number of drinking water sources in the immediate area for cows, it is not unreasonable for them to return to Waste Pit 5 for water. Moreover, the site is in excess of 1000 acres, which is not such a small area for livestock production. It is not necessary to discredit the results, since Waste Pit 5 is recognized to be a highly contaminated area.

Response: The referenced section describes calculated risks to users of meat and dairy products from cattle grazing on exposed areas of the site. The potential for cattle to drink from the pits, and the calculated risks from this behavior are presented elsewhere. Section 3.2.4 states that these surface water bodies are considered as sources of site-related exposures. Section 3.3.3.1 presents exposure point concentrations for these impoundments. Section 5.1.3 states the intent to quantify risks from these areas. Section 5.2.2.4 presents calculated risks to users of meat and dairy products from cattle drinking from Pits 5 and 6, and the Clearwell.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Part II Pg. #: 5-64 Line #: Code:
331 Original Comment # 51
Comment: Table 5-28. The zero risk for the trespassing child on silo 1 or 2 does not seem plausible. Assuming that 10^{-6} risk is treated as indistinguishable from zero, then the risk drops 1000 to 10,000 times from the top of silos to the base. This drop off seems much too precipitous.

Response: It should be noted that the risk for the trespassing child on Silo 1 or Silo 2 is not zero. It is estimated to be potentially as high as 1.1E-02, as presented in Table 5-28. In the next two columns of Table 5-28 the risks for the trespassing child are presented as essentially indistinguishable from zero for locations adjacent to the K-65 berm or adjacent to Silo 3 and 100 meters from the K-65 berm or Silo 3.

Risks of 10^{-6} are not treated as indistinguishable from zero anywhere in this risk assessment. As noted in the comment there is a tremendous reduction in the risk for locations on top of the K-65 silos versus adjacent to the K-65 silos at the base of the berm. This is consistent with the considerable shielding expected from the large mass of berm material present around the K-65 silos. The modeled dose rates at the base of the berm and 100 meters from the berm were so vanishingly small that they would be ridiculous to present in comparison to background dose rates. Post-bentonite radiation dose rate measurements were not available for locations adjacent to the base of the K-65 berm; therefore, the dose rates had to be modeled using MICROSHIELD.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix E Pg. #: -1-6, Line #: Code:
332 Original Comment # 52
Comment: Table E-1-1. The conclusion for this appendix should note which radionuclides were included in the analysis and note which, potentially critical radionuclides, were not part of the analysis. This could include radiums (bone uptake) and lead-210 (vegetative uptake).

Response: It is unclear what purpose would be served by discussing what radionuclides are not part of the routine effluent monitoring at the FEMP. The results of the effluent toxicity testing suggest that toxic effects of the effluent would not be detectable in the Great Miami River, regardless of its composition, if that composition is similar to that during the testing periods.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix F Pg. #: F-10 Line #: Code:
333 Original Comment # 53
Comment: Table F.3-1. The thorium isotopes listed comprise only 33% to 74% of the total thorium concentration. The uranium isotopes listed comprise 56% to <100% of the total uranium concentration. Explain what isotopes are present in the remaining fractions and clarify how these may impact the conclusions for these tests.

Response: The units for isotopic thorium and uranium are pCi/g and the units for total thorium and uranium are µg/g. This accounts for the apparent discrepancy and is noted in footnote a.

Action: In Appendix F, Page F-10, Table F.3-1, add a superscript "a" to the Total Thorium and Total Uranium column headings, to clarify the table.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: H.3.0, Appendix H Pg. #: H-11 Line #: Code:
334 Original Comment # 54
Comment: Explain why 11 of the 302 biological samples were not analyzed.

This section should include a separate conclusions section. Section 5.0 can be referenced, even for more detailed discussion, but this section (H.3.0) should state conclusions.

Conclusions should not the radionuclides for which analysis was done and discuss the reasons certain, possibly critical radionuclides, were not analyzed for (e.g., why was radium, a bone seeker, not analyzed for).

Response: The 11 samples were archived. As discussed in the response to Comment 1, it is not the intent of the SWCR to draw conclusions about the nature and extent of contamination at the FEMP. The nature and extent discussions will be provided in the operable unit RI reports, which will contain the validated data required for remedial

action decision-making. The samples were analyzed following the 1988 RI/FS Work Plan, which was approved by U.S. EPA.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.1, Appendix R.1.0 Pg. #: R-1-2 Line #: Code:
335 Original Comment # 55
Comment: This discussion should include some mention of how the constituents of concern were selected in Tables R.1-1 and R.1-2. Clarify whether or not this is an abridged list and, if so, explain why and what things were left out.

Explain why the list in Table R.1-1 is shorter than the list in Table R.1-2.

Response: The selection process for the constituents of potential concern in all the statistical summary tables in Appendix R used the UTL test to compare concentration measurements for a given constituent at the site with measurements obtained in the background area. The methodology of the UTL test, as indicated in Section 2.2.1 of Part II, has been given in detail in Section 4.0 of the Addendum (DOE 1992), and is not reproduced in the SWCR.

Statistical summary tables in Appendix R are not abridged lists. However, due to the size of the report, constituents that were analyzed but not detected were not included in the summary tables. Because some constituents were detected for Silo 3 but not for Silos 1 and 2, they appear in Table R.1-2 (for Silo 3) but not in Table R.1-1 (For Silos 1 and 2).

Action: Add the following sentence to the end of the first line of the second paragraph in the introduction section of Appendix R (page R-1-1): "(Constituents that were analyzed but not detected are not included in the summary tables)".

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.2, Appendix R.2.0 Pg. #: R-2-1 Line #: Code:
336 Original Comment # 56
Comment: This discussion should temper the usability of the radon data based upon the difficulties encountered with K-65 measurements and projections after the bentonite was installed.

Response: It is not clear what the reviewer is requesting, particularly "the difficulties encountered with K-65 measurements and projections after the bentonite was installed". The text in Section R.2 (page R-2-1) simply states that the radon measurements were taken from 13 sample locations before and after the bentonite installation and the data were used for exposure assessment.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.3, Appendix R.3.0 Pg. #: R-3-1 Line #: Code:
337 Original Comment # 57

Comment: Discussion should be make here or reference made to elsewhere in this document as to how the constituents of concern were selected, whether or not background is included, why there is not the same list in every table, why related radionuclides do not always appear together, and whether concentrations, compared isotopically to gross alpha and gross beta levels, do or do not account for all the radionuclides present. In the fourth case, for example, clarify why radium-228 is not listed in Table R.3-1 when thorium-228 is present. In the last case, clarify whether radium-226/228 + technetium-99 + uranium-234/235/236/238 sums to the gross alpha and gross beta concentrations measured.

Explain how series radionuclides will be treated, if not already done elsewhere in this total document. Specifically, clarify whether only the listed radionuclides be used or whether estimates will be made for unlisted radionuclides. For example, if only thorium-228 were listed, explain how thorium-232, its precursor, would be treated.

Response: The method for selecting contituents of concern is described in Part II, Section2.0. Background concentrations are included in the reported analytical results and in the calculated statistics (e.g., UCL) for each radionuclide or chemical. Tables of constituents of concern include constituents that are detected in a medium in the specific location or area. Constituents for which there are no results above the detection limit are not included in these tables. Analytical results for gross alpha or gross beta concentrations in water do not equal the sum of the reported analyses for specific alpha or beta emitters, since isotopic analyses are not performed for all alpha or beta emitters that can occur in samples. For example, there are numerous naturally-occurring alpha and beta emitters that contribute to the gross alpha and gross beta results, but these specific radionuclides are not analyzed in samples. This is especially important for short-lived radionuclides such as polonium-212 (alpha emitter) or lead-212 (beta emitter) in the thorium-232 decay chain. Potassium-40 (a long-lived naturally-occurring beta emitter) is a good example of a radionuclide that contributes to the gross beta concentration in water but does not have a specific analysis performed.

Radionuclides in naturally-occurring series for which analytical results are reported are included in the process of selecting constituents of concern. Generally, no assumptions of secular equilibrium are made for long-lived radionuclides since disequilibrium can occur due to natural or man-made processes. Risks are calculated for the specified radionuclides of concern using exposure point concentrations that are either measured or modeled. Risks due to short-lived progeny are included in the calculation results for long-lived parent radionuclides of concern. For example, if thorium-228 is listed as a constituent of concern and thorium-232 is not listed as a constituent of concern, health risks are calculated for thorium-228 and its short-lived progeny, and no risks are calculated for thorium-232.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.4.2.2, Appendix R.4.0 Pg. #: R-4-2 Line #: last sentence Code:
338 Original Comment # 58
Comment: Elaborate on how the comparison was made to determine that perched groundwater was not a significant source.

Response: As stated in the text, perched water was a significant source under plants 2/3, 6, 9 and the Pilot Plant. Perched water under other areas having contaminant concentrations at least one order of magnitude lower than under these buildings was not considered to be a significant source. The comparison can be made by contrasting the statistical summary tables in Appendix R for these buildings with that for other areas.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix R.4.0 Pg. #: Line #: Code:
339 Original Comment # 59
Comment: Tables R.4-1 to R.4-70. Discuss, as in the first set of comments in 6 above.

Response: Request clarification for the comment.

Action: Need clarification for the comment from EPA Region V.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.5, Appendix R.5.0 Pg. #: R-5-1 Line #: Code:
340 Original Comment # 60
Comment: Discuss here why data is combined, as with Pu-239/240 and U-235/236. Clarify how this can be valid when dose conversion factors will be isotopically unique.

Response: "Data in combined form" means that data collected under different sources or sampling plans were combined together, as appropriate, for statistical analysis. It does not mean that different isotopes are combined together for data analysis. The reason why the analytical results of Pu-239/240 and U-235/236 were reported together is that the energies of α particles from the pair of radionuclides are so close that they cannot be distinguished from one another by α-spectroscopy used in the laboratory. Futhermore, since the pair of Pu isotopes have the same slope factors (risk/pCi) as do uranium isotopes, the fact that they can not be discerned in the laboratory does not impact their risk characterization.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: R.5.0 Pg. #: Line #: Code:
341 Original Comment # 61
Comment: Tables R.5-1 to R.5-42. Discuss, as in the comments in 6 and 8 above.

Response: Need clarification for the comment.

Action: Request clarification for the comment from EPA Region V.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix R.6.0 Pg. #: Line #: Code:
342 Original Comment # 62
Comment: Tables R.6-1 to R.6-71. Discuss, as in the comments in 6, 8, and 10 above.

Response: Need clarification for the comment.

Action: Request clarification for the comment from EPA Region V.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix S Pg. #: S-1 Line #: Code:
343 Original Comment # 63
Comment: It should be made clear that unit risk factors are derived based upon the latest EPA guidance and will be modified if this guidance changes.

Response: Agreed.

Action: Add the following sentence to the end of line 12: "Unit risk factors and unit toxicity factors are derived based on the latest EPA guidance available at the time of the draft and they will be modified in the appropriate RI/FS risk assessment draft reports for the FEMP to reflect changes in EPA guidance."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix T Pg. #: Line #: Code:
344 Original Comment # 64
Comment: The upper 95% confidence interval on the mean for radiological backgrounds is not correct. Background is based upon the mean by itself. This should be applied with all radiological backgrounds.

Response: The Upper 95% Confidence Limit on the Mean (UCL) for background data is a statistic that is considered to be representative of the true mean of the background data, with a 5% probability that the true mean exceeds the UCL. The use of the UCL was presented in the Risk Assessment Work Plan Addendum that has been approved by the U.S. EPA.

Action: None required.

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix T Pg. #: T-2 Line #: Code:
345 Original Comment # 65
Comment: Table T-1. Clarify the time period in October and December over which the radon measurements were made. The usability of a long-term average is much better than for a grab sample.

Response:
1. The radon measurements were made once an hour, 24 hours a day, for the entire months of October and December 1991.
2. Since the radon measurements were taken hourly and were continued for an entire month, the average of these measurements is analogous to a long-term average.

Action: Add the following sentence at the end of line 15 (page T-1):
"These measurements were made once an hour, 24 hours a day, for the whole months of October and December 1991."

Commenting Organization: U.S. EPA, Region 5 Commentor: Radiation Section
Section #: Appendix T Pg. #: T-13 Line #: Code:
346 Original Comment # 66

Comment: Table T-8, footnote b. The conversions necessary for the U-235 series would be easier to make using 4.6% U-235 by activity rather than 0.72% by mass.

Response: Agreed.

Action: Add "or 4.6% by activity" in the first parenthesis of footnote b on Page T-13.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-1,6-3 Line #:12,17-19 Code:
347 Original Comment # 1
Comment: For any operable unit, suboperable unit or specific waste disposal area not already expected to be remediated to "low risk" contaminant levels, perform separate risk assessment calculations. For each area, perform these calculations using the mean and upper 95% confidence interval concentrations for that area for each contaminant of concern.

Response: There are no operable units expected to not be remediated to levels protective of human health, if that is what is meant by "low risk." U.S. EPA and OEPA have previously agreed that operable unit-specific ecological assessments will not be required. If this additional level of detail is necessary, it is suggested that it be provided in the Operable Unit 5 Sitewide Ecological Assessment, which will be able to rely on a complete and fully validated data set, which was not available for the SWCR.

Action: None required. Discuss the required level of detail in the Operable Unit 5 Sitewide Ecological Assessment with U.S. EPA and OEPA.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: Part II Pg. #: 6-9 Line #: Code:
348 Original Comment # 2
Comment: Table 6-3. The values used for "fraction ingested from contaminated source" should be further justified; compare these animals' home ranges to the total area of the FEMP site (since the site-wide mean was used in risk calculations). For those animals with home ranges smaller than the FEMP site, the "fraction ingested..." should be 1.0. That value for animals with home ranges larger than the site.

Response: Refinements of the kind suggested would be appropriate for the Operable Unit 5 Sitewide Ecological Assessment. However, it should be noted that the requested change will not have a major effect on the conclusions of the assessment, as it would increase estimates of radiation dose and hazard index by two-fold at most. The effort required to address this issue would be better directed at the OU5 assessment, which will have more complete and validated data.

Action: See action for Helmer Comment 1.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-11 Line #:25 Code:
349 Original Comment # 3
Comment: For the data reported on omnivorous rodents, state which of the two values is muscle and which is whole body.

Response: The values stated are ratios of whole body to muscle concentrations.

Action: In Part II, Page 6-11, Line 23, insert "the ratio of" before "whole body". In Part II, Page 6-11, Line 24, replace "did...more" to "to muscle concentrations was less."

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: Appendix H Pg. #: Line #: Code:
350 Original Comment # 4
Comment: Please describe sample locations 28 (Table H-4) and 9A (Table H-5) and state whether there is any obvious reasons for their respective elevated uranium and mercury levels.

Response: Location 9A is in a seep below the waste storage area on the eastern bank of Paddys Run, as described on Page H-6. Location 28 is approximately 100 feet south of the Active Flyash Pile. Both of these locations are shown in Figure H.2-2. Elevated uranium in samples from Location 9A could be associated with the nearby waste pits. It is not known why mercury was detected in elevated levels from samples at location 28.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-25, 6-32 Line #:27-29, 1-5 Code:
351 Original Comment # 5
Comment: For arsenic and mercury perform risk calculations with measured as well as estimated plant contaminant concentrations. Additional vegetation samples should be collected to confirm whether contaminant concentrations in plants were higher because the plant was in operation. Planning of this sampling effort must be coordinated with EPA.

Response: See response to Helmer Comment 2. Any U.S. EPA requirements for additional vegetation sampling will affect the schedule for the Operable Unit 5 RI report, with no clear benefit to remedial action decision-making. It is suggested that the existing WEMCO environmental monitoring program, which analyzes annual vegetation samples for uranium, would provide an indicator of the effects of plant operation on contaminant concentrations in vegetation.

Action: The WEMCO data will be examined and interyear variations discussed in the SWCR. If U.S. EPA requires additional vegetation sampling, the schedule for the Operable Unit 5 report will need to be extended.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-32, 6-35 Line #:30,12 Code:
352 Original Comment # 6
Comment: Please give home range of white-tailed deer and raccoon in km^2, hectares, or acres, or else state that this is the radius of the home range.

Response: The values stated are the radii of the home ranges.

Action: In Part II, Page 6-30, Line 29, insert "radius of the" between "The" and "home range". In Part II, Page 6-35, Line 29, insert "radius of the" between "The" and "home range," and omit the word "across".

SITE-WIDE CHARACTERIZATION REPORT
TECHNICAL COMMENTS

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-33 Line #: Code:
353 Original Comment # 7
Comment: Table 6-15. It is not clear where soil to earthworm transfer coefficients of 1.0 were used instead of the literature values listed in Table 6-6 (page 6-15). Based on those values, a transfer coefficient of 1.0 is not always conservative (e.g., for zinc and cadmium), and this property should be highlighted in the text. Of the literature values cited, higher values in the literature for lead and zinc have been measured, which indicates the fair amount of variability in earthworm bioaccumulation of contaminants (e.g., see Environmental and Contaminant Toxicology Vol. 47:296-301).

Response: The default soil to earthworm coefficient of 1.0 was used for all constituents of concern. Table 6-6 was provided for illustration. The reviewer's point about variability in bioaccumulation is well taken and will be noted in the text. It would be useful to discuss the values to be used for the Operable Unit 5 Site-Wide Ecological Assessment in advance, if possible.

Action: In Part II, Page 6-14, Line 26, after "earthworms," add the following:

"The assumption of a transfer coefficient of 1.0 may not be always conservative, as illustrated by the values for cadmium and zinc (Table 6-6). However, this variability is balanced in part by the expectation that earthworms will contain higher concentrations of FEMP contaminants than insects."

In Part II, Page 6-14, Lines 26-27, omit "This is...insects."

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-68 Line #:21-25 Code:
354 Original Comment # 8
Comment: As stated in previous comments, the data collected on FEMP biota should not be relied upon. It was not collected in such a way as to show causal effect.

Response: The referenced text does not make any claim about effects, but rather discusses exposure based on both modelled uptake and available data. Both support the suggestion that food chain uptake is not a significant pathway for exposure to organic chemicals on a sitewide basis.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: Line #: Code:
355 Original Comment # 9
Comment: In light of the risk assessment which has been performed, and the results of area-specific risk analyses, field studies should be proposed which have stated objectives such as: to determine level of small mammal/earthworm exposure in a given area; infer ecologically safe clean-up levels, etc.

Response: The requested studies would affect the schedule for the Operable Unit 5 RI report with no clear benefit to remedial action decision-making. U.S. EPA has not provided

guidance on ecologically safe clean up levels other than the use of ambient water quality criteria as PRGs.

Action: None required. If U.S. EPA requires additional studies, the schedule for the Operable Unit 5 RI report will need to be extended.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-111 Line #:24-30 Code:
356 Original Comment # 10
Comment: The toxicity tests discussed here only have meaning relative to the contaminant concentrations present in the samples tested. Please provide a discussion of those contaminant levels relative to the toxicity observed and relative to contaminant concentrations in the various waste disposal areas and other on-site soils, or normal effluent concentrations. If toxicity tests will be used in further field investigations, please provide a workplan which shows how samples will be selected which represent the different types/levels of on-site contamination.

Response: It is not clear how the results of effluent toxicity tests are to be used for comparisons with contaminant concentrations in waste disposal areas or on-site soils. The constituent concentrations in the effluent samples tested were "normal," in the sense that the values were not extremes. There is no intent to conduct further toxicity testing at the FEMP.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-69 Line #:6-14 Code:
357 Original Comment # 11
Comment: Please clarify why deer assimilation of radionuclides into muscle was calculated using plant to beef transfer coefficients.

Response: Plant to deer transfer coefficients were used because plant to deer coefficients are not available.

Action: Part II, page 6-69, LIne 10, insert "because plant-to-deer coefficients are not available" after "beef transfer coefficients."

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-103 Line #:4-30 Code:
358 Original Comment # 12
Comment: When discussing risk assessment results, describe specifically which contaminants show risk and why a certain element may be a site contaminant: describe its probable source and migration pathway. For example, describe which contaminants showed HIs greater than 1.0 for fox and hawk, and in lines 16-25, describe where elevated arsenic concentrations were derived.

Response: It is not the intent of the SWCR to describe the nature and extent of contamination at the FEMP. The nature and extent discussions will be provided in the operable unit RI reports, which will contain the validated data required for remedial action decision-

making. Tables 6-43, 6-44, and 6-46 state the HI values for all constituents of potential concern for ecological receptors.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-108 Line #:4-23 Code:
359 Original Comment # 13
Comment: Provide a much expanded summary of radionuclide toxicity data used to determine exposure effect levels. A good way to do this is to produce a summary table showing the following: test organism, exposure, effects (description plus levels: NOELs, LOELs, and/or LD50s), and reference.

Response: Refinements of the kind suggested would be appropriate for the Operable Unit 5 Sitewide Ecological Assessment. The effort required to address this issue would be better directed at the OU5 assessment, which will have more complete and validated data.

Action: See action for Helmer Comment 1.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-110 Line #:3-9 Code:
360 Original Comment # 14
Comment: Please provide the Osborne and Jones document which describes the studies of American robins on the site.

Response: The Osborne and Jones studies are available from WEMCO/FERMCO.

Action: Request that WEMCO supply copies of the Osborne and Jones studies to U.S. EPA.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-113 Line #:4 Code:
361 Original Comment # 15
Comment: Please address above-background mercury and arsenic concentrations in plants.

Response: It is not clear what the reviewer is requesting.

Action: Request clarification of the comment.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist
Section #: 6.0, Part II Pg. #: 6-113 Line #:9-10 Code:
362 Original Comment # 16
Comment: Please note that individual areas must be assessed separately, rather than using a site-wide mean.

Response: See response to Helmer Comment 1.

Action: See action for Helmer Comment 1.

Commenting Organization: U.S. EPA, Region V Commentor: Eileen Helmer, Ecologist

Section #: 6.0, Part II Pg. #: 6-113 Line #:26-32 Code:

363 Original Comment # 17

Comment: Field investigations thus far conducted are not adequate to make the statement that deleterious effects have not been observed in the field... please re-state. Some effects have in fact been observed in the field (e.g., the Robin study).

Response: The statement will be qualified.

Action: In Part II, Page 6-113, Lines 29-30, replace "deleterious effects" with "persistent deleterious effects attributed to contaminant exposure."

Commenting Organization: U.S. EPA, Region V Commentor:

Section #: Cultural Resource Pg. #: Line #: Code:

364 Original Comment # 1

Comment: In order to locate potential archaeological sites eligible for nomination to the National Register of Historic Places, State Historic Preservation Officers (SHPOs) and the professional community recognize standard surface and subsurface methods for site identification. The report addresses compliance with the Ohio SHPO's request for an archaeological survey beyond the boundaries of the FEMP.

Response: The OHPO has requested an archaeological survey beyond the boundary of the FEMP <u>only</u> in those instances when ground disturbing activity is projected to take place. The survey conducted by the US Army Corps of Engineers for the South Plume Removal Action is an example of this activity.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:

Section #: Cultural Resource Pg. #: Line #: Code:

365 Original Comment # 2

Comment: For areas within the boundaries of the FEMP it is stated that "remedial activity... will not affect any properties listed on or eligible for the NRHP". In order to verify this statement, documentation should be provide indicating that a systemic survey has already been completed within the FEMP boundary and that this evidence was reviewed by the SHPO indicating the there are no unknown sites potentially eligible for National Register of Historic Places (NRHP) status present within the area being considered for mitigation. Section 2.2.6.6 of the report indicates a high concentration of prehistoric mound sites, some on the NHRP, within close proximity to the FEMP; these sites should be located on Figure 2-32. Consequently, there appears to be a high potential for previously unknown sites to be on or under soils slated for cleanup. The subsurface remnant of burial mounds, maybe of a particular concern because they may have had their surface evidence removed by earlier facility activities. Documentation should verify that this concern has been addressed.

Response: The documentation deemed necessary by the OHPO to make the referenced determination was provided to that office. It is beyond the scope of this document to provide that information in the SWCR. The locations of the archaeological sites discussed in this document are sensitive in nature and cannot be released via publication in any document that is to be released to the public. The locations are available to site personnel on a "need to know" basis only, as specified in Public Law

96-95. Locations of archaeological sites are also exempt from the Freedom of Information Act under this law. As agreed with the OHPO, the issue of previously undiscovered cultural resources is addressed through a field procedure implemented by DOE-FN. This procedure identifies actions to be taken by field personnel and site personnel to protect the discovery and reach consensus with the OHPO and the Advisory Council on the action to be taken.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:
Section #: Cultural Resource Pg. #: Line #: Code:
366 Original Comment # 3
Comment: Historic properties near the FEMP have been identified in the report. However, are there structures that are representative of the DOE mission still standing within the boundary of the FEMP? What is the position of the DOE Historian and DOE Federal Preservation Officer (FPO) about the potential significance of any structures which might exist?

Response: An analysis of the structures on the site for a determination of significance in terms of the history of the DOE is not complete. No determination is as yet available from the DOE Historian. To date, the outlook for a finding of significance is negative. As soon as the information is available, it will be included in NEPA documentation for the next operable unit feasibility study scheduled for completion. This information will be included in NEPA documentation for Operable Unit 3.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:
Section #: Cultural Resource Pg. #: Line #: Code:
367 Original Comment # 4
Comment: Documentation should be provided regarding a search for any treaties in place giving Native American Indians rights to lands or resources in the project area.

Response: The purpose of the SWCR is to provide a summary of available data to describe the on-property and regional environment. It is not the purpose of the SWCR to provide a comprehensive survey of FEMP compliance with other laws of this nature, including the American Indian Religious Freedom Act. The Iroquois were not often this far south in this area. The Shawnee passed through this area, however, they were nomadic and did not establish any permanent settlements here. Also, there is no traceable lineage from the Adena, Hopewell, or Fort Ancient peoples to any present day tribe. For this reason, it can be said that there are no known Native American tribes that have a traditional interest or treaty interests in the lands in the vicinity of the FEMP. Some discussion of these compliance issues is included in the Operable Unit 2 FS-EIS.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:
Section #: Cultural Resource Pg. #: Line #: Code:
368 Original Comment # 5

Comment: The NHPA, American Indian Religious Freedom Act (AIRFA), Archaeological Resources Protection Act (ARPA), and Native American Graves Protection and Repatriation Act (NAGPRA) require consultation with Native Americans, in the case of FEMP-the Shawnee and Iroquois, regarding interest in historical areas, cultural sites and natural resources areas. Documentation should be provided regarding this consultation process and its results.

Response: The purpose of the SWCR is to provide a summary of available data to describe the on-property and regional environment. The cultural resources section is intended to describe identified resources in the vicinity of the FEMP and to discuss the possibility of the existence of undiscovered resources in the area that could potentially be disturbed during remedial activities. To satisfy this goal, we include a discussion of the communication among the site, the OHPO, and the Advisory Council. It is not the purpose of the document to provide a comprehensive survey of FEMP compliance with other laws of this nature, including AIRFA, ARPA, and NAGPRA. Some discussion of these compliance issues is included in the Operable Unit 2 FS-EIS.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:
Section #: Cultural Resource Pg. #: Line #: Code:
369 Original Comment # 6
Comment: Previous and future field studies at the FEMP could potentially result in the accumulation of artifacts. Under 36 CFR Part 79, Curation of Federally-Owned and Administered Archaeological Collections, proper storage conditions must be maintained. Documentation should be provided regarding artifact/record storage.

Response: The purpose of the SWCR is to provide a summary of available data to describe the on-property and regional environment. It is not the purpose of the document to provide a comprehensive survey of FEMP compliance with other laws of this nature, including NAGPRA and 36 CFR Part 79. In the event of an unexpected discovery of artifacts during remediation, arrangements will be made through the OHPO for curation.

Action: None required.

Commenting Organization: U.S. EPA, Region V Commentor:
Section #: Cultural Resource Pg. #: Line #: Code:
370 Original Comment # 7
Comment: NAGPRA requires that artifacts and records be examined for possible repatriation to Native Americans. Documentation should be provided regarding an inventory of the FEMP collection and action taken under NAGPRA.

Response: The purpose of the SWCR is to provide a summary of available data to describe the on-property and regional environment. It is not the purpose of the document to provide a comprehensive survey of FEMP compliance with other laws of this nature, including NAGPRA. Again, in the event of an unexpected discovery of artifacts during remediation, arrangements will be made through the OHPO for curation.

Action: None required.

GENERAL COMMENTS

Commenting Organization: Ohio EPA Commentor:
Section #: Pg. #: Line #: Code:

371 Original Comment # 1

Comment: Ohio EPA previously expressed concerns about the availability of site specific background data (ground water, soil, and surface water) in our comments (12/91) on the Background Soil Sampling and Analysis Plan. Our review of the Site Wide Characterization Report (SWCR) has supported these concerns. Detailed below are specific concerns with background data for perched and buried valley aquifer groundwater as well as surface water. The general lack of surface water background data and the questionable quality of the groundwater background data will be increasingly important with the development of the operable unit specific Remedial Investigation reports.

Response: It is more appropriate to address the background issue in the operable unit RI reports, which will be used to support remedial action decision-making, than in the SWCR, which will not. The RI reports will contain complete and validated data, and will be able to rely on the site-specific background soils data which was not available for the SWCR. The SWCR is intended as a data summary, not as a justification for any particular sampling program.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Pg. #: Line #: Code:

372 Original Comment # 1

Comment: DOE should include a discussion concerning background analyses for each media within Section 4.0. These discussions should provide criteria for background locations and detail background concentrations and UTLs.

Response: The SWCR does provide background concentrations where comparisons are made to background, for example, in the risk assessment and in the selection of constituents of potential concern in Appendix R.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Pg. #: Line #: Code:

373 Original Comment # 2

Comment: Consistency should be maintained within the report when using chemical names (e.g., trichloroethylene/trichloroethene, tetrachloroethylene/tetrachloroethene/-perchloroethylene). Such consistency will assist the non-technical reader in following contaminants throughout the text.

Response: Consistency of chemical names in the text will be checked.

Action: Check text for consistent use of names for the same chemical.

SPECIFIC COMMENTS

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-5 Line #:12-14 Code:
374 Original Comment # 1
Comment: Aroclor-1254 is not a VOC, but is a PCB. Please correct text.

Response: The text will be corrected.

Action: Page ES-5, Line 12, omit the word "volatile."

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-6 Line #: 10 Code:
375 Original Comment # 2
Comment: Correct "this streams" to "these streams."

Response: Noted.

Action: Page ES-6, Line 10, change "this streams" to "these streams."

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-9 Line #:16 Code:
376 Original Comment # 3
Comment: Correct "1.540 pCi/g" to "1,540 pCi/g."

Response: Noted.

Action: Page ES-9, Line 16, change "1.540" to "1,540."

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-9 Line #:17-19 Code:
377 Original Comment # 4
Comment: The Inactive Flyash Pile Removal Action RSE reported much higher concentrations of uranium from the CIS sampling. Please review these data and revise the text.

Response: The surface soil data from the Inactive Flyash Pile Removal Action RSE also included data taken from areas outside the boundaries of the Inactive Flyash Pile. The higher concentrations of uranium were actually detected within the boundaries of the South Field. Some of these higher concentrations can be found in the tables showing results from the South Field. However, some CIS surface soil samples were collected in areas outside the boundary of the South Field/flyash pile area defined in the Operable Unit 2 RI (DOE 1992). These results were not included in the summary of results for the SWCR.

Action: The set of CIS data collected in areas beyond the defined boundaries of the South Field/flyash pile area will be presented in an appendix at the end of the SWCR. A summary of this data will also be added to the existing text.

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-14 Line #:8-10 Code:
378 Original Comment # 5
Comment: This sentence is unclear and fails to define what is being compared. Define what "were markedly higher than the upstream station."

Response: Uranium concentrations in fish are being compared.

Action: On page ES-4, lines 9 and 10, insert the following: "uranium concentrations in fish from" after the word "although" and "in those from" after the phrase "higher than."

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-15 Line #:20-27 Code:
379 Original Comment # 6
Comment: Changes Resulting.... Monitoring data should be available for the Pit 6 Removal Actions which have been completed.

Response: Monitoring data available for Pit 6 would not apply to air quality. Pit 6 was covered with water, therefore, the soils and associated contaminants were saturated. Since there was no concern for fugitive dust, no air monitoring was required.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-23 Line #:17 Code:
380 Original Comment # 7
Comment: It is unclear what is meant by the text "insects (earthworms)." Earthworms are not insects. The text needs to be rewritten to clarify this.

Response: Earthworms were used as surrogates for insects, due to the lack of bioaccumulation factors for insects. The text will be clarified.

Action: Page ES-23, Line 17, replace "(earthworms)" with "(using earthworms as surrogates)".

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-23 Line #:24-29 Code:
381 Original Comment # 8
Comment: DOE fails to define what it believes is a "significant source of risk" if a hazard index (HI) of 5.0 isn't. HI's exceeding 1.0 for four inorganic contaminants would seem to be a source of risk. DOE should define within the document what it is considering a "significant source of risk" when making such conclusions.

Response: The intent was a comparison of the relative importance of soil exposures compared to surface water exposures. This will be clarified in the text.

Action: On page ES-23, lines 27-29, replace the existing text with the following: "Surface water exposures generally appear to be a less important source of risk to terrestrial receptors than do surface soil exposures."

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-23 Line #:30-35 Code:
382 Original Comment # 9
Comment: The paragraph should include a discussion of the risks posed by external radiation doses to terrestrial organisms.

Response: If calculations of external radiation doses to terrestrial organisms are required, it is suggested that this be done in the Operable Unit 5 Sitewide Ecological Assessment, which will be based on a complete and validated database.

Action: None required. Discuss required level of detail in the Operable Unit 5 Sitewide Ecological Assessment with OEPA and U.S. EPA.

Commenting Organization: Ohio EPA Commentor:
Section #: Executive Summary Pg. #: ES-28 Line #:2 Code:
383 Original Comment # 10
Comment: Delete the word ", through".

Response: Noted.

Action: Page ES-28, Line 2, delete ", through".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: S-4 Line #: Code:
384 Original Comment # 11
Comment: Investigation and Results. This section is a reiteration of that previously stated in the Executive Summary. Please incorporate revisions based upon previous comments into this section also.

Response: Noted.

Action: On page S-5, Line 4, omit the word "volatile;" on page S-6, Line 5, change "this streams" to "these streams;" on page S-9, Line 9, change "1.540" to "1,540."

Commenting Organization: Ohio EPA Commentor:
Section #: 1.2.2, Part I Pg. #: 1-9 Line #: Code:
385 Original Comment # 12
Comment: Include the Experimental Treatment Facility Removal Action into the list of those previously completed.

Response: Disagree. The Pit 5 Experimental Treatment Facility Removal Action was not begun until December 13, 1991. The SWCR only includes those removal actions completed or underway as of December 1, 1991.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 1.2.2, Part I Pg. #: 1-9 Line #:12-13 Code:
386 Original Comment # 13

Comment: This sentence is referring to the Silos 1 and 2 Removal Action, but it is not the "latter" in the list. Please correct list or text.

Response: Agree.

Action: Replace "latter" with "Silos 1 and 2 Removal Action".

Commenting Organization: Ohio EPA Commentor:
Section #: 2.1.3.1, Part I Pg. #: 2-11 Line #:23-16 Code:
387 Original Comment # 14
Comment: The text needs to be revised to reflect the content of the work plan actually submitted by DOE. Otherwise, the uninformed reader will be expecting DOE to follow through with this action.
Response: To prepare an appropriate response to this comment, clarification from Ohio EPA is required.

Action: Request clarification from Ohio EPA.

Commenting Organization: Ohio EPA Commentor:
Section #: 2.1.3.2, Part I Pg. #: 2-12 Line #:25-26, 31-32 Code:
388 Original Comment # 15
Comment: These sentences must be revised to reflect the fact that the lime sludge ponds are RCRA unit due to the "routing" of hazardous waste to them. See Table 2-5, pg. 2-21.

Response: Agree. The sentences in question have been deleted.

Action: Delete the last sentence in both bullets describing the Lime Sludge Ponds: "Records do not indicate the routing of any hazardous chemicals or radioactive materials to this pond."

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 2-16 - 2-18 Line #: Code:
389 Original Comment # 16
Comment: Table 2-3. The table refers several times to "tetrachloroethylene" and "perchloroethylene." These are the same chemical and should be referred to as tetrachloroethylene. Please correct the table.

Response: Agree. All references to "perchloroethylene" have been changed to "tetrachloroethylene."

Action: Change the word "perchloroethylene" in Section 2 to "tetrachloroethylene" each time it appears.

Commenting Organization: Ohio EPA Commentor:
Section #: 2.2.5.2, Part I Pg. #: 2-62 Line #:7-12 Code:
390 Original Comment # 17
Comment: The text is unclear in stating which of the habitats listed are being discussed in the referenced lines.

Response: The habitat being described is in the inactive flyash pile/South Field. The text will be clarified.

Action: Part I, Page 2-62, Line 7, replace "These areas" with "The inactive flyash pile and the South Field".

Commenting Organization: Ohio EPA Commentor:
Section #: 2.2.5.5, Part I Pg. #: 2-71 Line #: Code:
391 Original Comment # 18
Comment: Indiana Bat: The section should discuss the fact that although no bats were found within the FEMP boundary, echolocations for the same genus were detected and that mist net locations within the excellent/good habitat on-property were generally not conducive to bat capture. The data gathered under the RI/FS survey fail to eliminate the possibility that Indiana bats are using habitat on the FEMP property.

Response: Agree. Text has been expanded.

Action: Add the following sentence to line 2 of page 2-74: "Although no Indiana bats were found within the FEMP boundary, echolocations for bats of the same genus (Myotis) were detected and mist net locations within the excellent/good habitat on the property may not have been conducive to bat capture due to difficulty in positioning the nets, as discussed in Appendix G."

Commenting Organization: Ohio EPA Commentor:
Section #: 2.2.5.5, Part I Pg. #: 2-74 Line #:35 Code:
392 Original Comment # 19
Comment: DOE must define the habitats being used at the FEMP by the northern harrier and consider the potential effects remedial actions will have on this state endangered species. Additional information concerning this organism will become increasingly important as DOE begins the development of Feasibility Studies and assess compliance with ARARs.

Response: Agree. The text has been expanded to indicate that the northern harrier has been observed flying over the pasture areas of the FEMP by Facemire, et al. The potential effects of remedial actions on this species will be addressed in operable unit-specific NEPA documentation.

Action: Replace the fourth paragraph on page 2-74 with the following: The northern harrier (Circus cyaneus) is listed as state endangered (ODNR, DOW Order 1501:31-23-01) and was observed flying over the pasture areas of the FEMP during the summer of 1986 (Facemire, et al. 1990). The red-shouldered hawk (Buteo lineatus), classified by ODNR as a species of special interest, was observed over the northern woodland of the FEMP during the winter of 1986 and 1987. No other sightings have been reported and neither species is known to nest at the FEMP.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.1.2.8, Part I Pg. #: 3-54 Line #: Code:
393 Original Comment # 20

Comment: Bullets. DOE should incorporate additional inorganics: antimony, beryllium, thallium, and vanadium into any future surface water sampling due to their presence as site contaminants.

Response: This suggestion will be considered in the design of any future surface water sampling plans.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 3-81 Line #: Code:
394 Original Comment # 21
Comment: Table 3-18. The table states that RCRA groundwater samples were analyzed for perchloroethylene and tetrachloroethylene. These are generally synonymous names for the same VOC. DOE should define what perchloroethylene is.

Response: The comment has been noted. The perchloroethylene in Table 3-18 on Page 3-81 was a typographical error. It will be deleted from the list in the revised SWCR.

Action: Page 3-81, Line 40, "Perchloroethylene" will be deleted from Table 3-18.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.1.5, Part I Pg. #: Line #: Code:
395 Original Comment # 22
Comment: This section should include a discussion of sampling results from the following investigations/removal actions: 1) Waste Pit Area Removal Action, 2) ETF Removal Action, and 3) EWMF Sampling and Analysis Plan.

Response: Data from these programs was not available on December 1, 1991, the cutoff date for data to be included in the SWCR.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 3-108 Line #: Code:
396 Original Comment # 23
Comment: Table 3-22. This table is confusing and is not explained in the text. Additional description should be provided in the text, title, and/or footnote.

Response: Agreed. This particular sampling program underwent changes on almost an annual basis. The biggest changes that took place in sampling locations were between the years 1987 and 1988. In providing information about this program, an attempt was made to provide the reader with a base figure and table that showed the changes and overlaps in sampling locations from year to year.

Action: The figure and table will be reorganized into two tables and two figures to reduce confusion over dates and locations of soil sampling. Furthermore, the text will be edited to say: "During 1988, the routine soil sampling and parallel soil and vegetation sampling programs were reviewed. Routine soil sampling meant that only soil is

sampled at a location, while parallel soil and vegetation sampling meant that samples of both soil and vegetation were taken at the same location at the same time. It was found that many of the sampling locations of both programs were situated very close to one another. The programs were combined to increase sampling efficiency and effectiveness, reducing the number of sampling locations to 29 from 38 (Fig. 3-36B, Table 3-22B and Table 3-23). In addition, care was taken to avoid fertilized areas where sample results could have been biased from high concentrations of uranium found in some fertilizers. Soil samples were collected at a depth of 0-5 cm and 5-10 cm at the 29 selected locations."

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 3-113 Line #: Code:
397 Original Comment # 24
Comment: Table 3-23. This table is confusing and is not explained in the text. Additional description should be provided in the text, title, and/or footnote.

Response: This table shows the changes that took place when the sampling and analysis of soil and vegetation was combined with the soil sampling program. The table shows those locations from both the soil sampling program and the parallel soil and vegetation sampling program of 1987 which were incorporated into the new soil sampling program used in 1988.

Action: Please see Comment #396 (OEPA).

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 3-143 Line #: Code:
398 Original Comment # 25
Comment: Table 3-26. Correct Spotfin shiner to Notropis spilopterus.

Response: Noted.

Action: Part I, Page 3-143, Table 3-36, Line 15, change "Notropus" to "Notropis".

Commenting Organization: Ohio EPA Commentor:
Section #: 3.1.7.3, Part I Pg. #: 3-171 Line #:12 Code:
399 Original Comment # 26
Comment: Define the acromyn RVR the first time it is used.

Response: Noted.

Action: Part I, Page 3-171, Line 12, change "fresh RVR water" to "fresh water from Round Valley Reservoir (RVR) in Lebanon, New Jersey". Part I, Page 3-174, Lines 33-34, omit "Water...Jersey" and substitute "Fresh RVR water".

Commenting Organization: Ohio EPA Commentor:
Section #: 3.1.7.3, Part I Pg. #: 3-174 Line #:32-35 Code:
400 Original Comment # 27
Comment: Discuss within the text the reason for acquiring sediment and water samples from New Jersey rather than from an upgradient control area.

Response: The additional sediment sample is routinely run to ensure that any effects observed can be attributed to properties of the field samples, rather than to experimental error. The tests are intended to test soil and sediment effects, not water effects, so the water used was collected from a site known to have high and consistent water quality. This will be noted in the text.

Action: Part I, Page 3-174, Line 35, add the following to the paragraph: The additional sediment sample is routinely run to ensure that any effects observed can be attributed to properties of the field samples, rather than to experimental error. The tests are intended to test soil and sediment effects, not water effects, so the water used was collected from a site known to have high and consistent water quality.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-10 Line #: Code:
401 Original Comment # 28
Comment: Table 4-3B. Were any of these samples liquids or TCLP analyses? If so, the results should be reported in mg/L.

Response: Agree.

Action: The table will be edited to show the correct units for the samples taken.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.3.1, Part I Pg. #: 4-40 Line #:25-27 Code:
402 Original Comment # 29
Comment: This sentence is not complete and needs to be rewritten to clarify it.

Response: Noted.

Action: On page 4-40, line 26, insert "than" after "higher".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-55 Line #: Code:
403 Original Comment # 30
Comment: Table 4-22. The table does not include the footnotes referenced within it. Please correct.

Response: Comment noted. The page identifying the footnotes for Table 4-22 was inadvertently omitted. It will be included in the revised version.

Action: The footnotes for Table 4-22 will be added, as described in Comment #158.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-56 Line #: Code:
404 Original Comment # 31
Comment: Table 4-23. a) The range on the table should be reported as ND- "#.#" when the frequency of detection is less than 100%.
b) The frequency of detection should be reported as 0/"#" when frequency of detection is 0%. This will allow the reader to know the number of samples collected.

Response: The table is intended to present only those constituents detected. A full surface water database will be provided in the Operable Unit 5 RI Report.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-58 Line #: Code:
405 Original Comment # 32
Comment: Table 4-24. a) See previous comment 31 on table format. b) RI/FS sampling should have included analysis for contaminants including: antimony, beryllium, thallium, and vanadium. c) Pg. 4-59, Mercury: The average for "Between..." should be more significant digits than 0.0. Please correct or justify.

Response: a)See response to Comment #404 (OEPA31).

b)The title of Table 4-24 states that the listed chemical and parameters were detected during RI/FS sampling. Those constituents that were not detected at any stations during the course of RI/FS sampling along the Great Miami River were not listed on the table.

c)The last two digits of the number 0.001 for the mean concentration of mercury were inadvertently truncated from the table.

Action: a)See Action for Comment #404 (OEPA31).

b)None required.

c)The mean concentration of mercury in Table 4-24 will be modified to indicate the correct value of 0.001 mg/ℓ.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: Line #: Code:
406 Original Comment # 33
Comment: Tables 4-25, 4-31, 4-32. See previous comment 31 on table format.

Response: See response to Comment # 404 (OEPA31).

Action: See action to Comment # 404 (OEPA31).

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: Line #: Code:
407 Original Comment # 34
Comment: Tables 4-31 and 4-32. These tables fail to provide any upgradient or background sampling data. DOE should provide this information and if it is not collected must address this data gap immediately.

Response: See response to Comment # 162 (EPA128).

Action: See action to Comment # 162 (EPA128).

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-80 Line #: Code:
408 Original Comment # 35
Comment: Table 4-33. The table suggests that Technetium-99 was not detected during RI/FS sampling. This fact should be discussed in the text, since it was regularly detected in the environmental monitoring data (see Table 4-28).

Response: The noted difference will be mentioned in the text.

Action: Add to Part I, page 4-79, line 7: Technetium-99 was not detected during RI/FS sampling, despite its presence in environmental monitoring samples (Table 4-28)."

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-81 Line #: Code:
409 Original Comment # 36
Comment: Table 4-34. a) See previous comment 31 on table format.
b) When one sample is collected and a detection is made the range should be reported as a single value, not as two.

Response: See response to Comment # 162 (EPA128).

Action: See action to Comment # 162 (EPA128).

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.3.3, Part I Pg. #: 4-84 Line #:14-15 Code:
410 Original Comment # 37
Comment: DOE should provide a summary of the sampling results in a table.

Response: A reference to Table R.3-17 (Appendix R) will be included in the text to assist the reader in locating the metals and organic analytical data for these samples.

Action: Include a citation for Table R.3-17 after the sentence that ends on line 15, page 4-84.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.3.3, Part I Pg. #: 4-84 Line #:15 Code:
411 Original Comment # 38
Comment: The text should define the background levels being used to make such an assertion.

Response: Comment noted. The sentence will be reworded to improve clarity.

Action: Replace the last sentence on line 15, page 4-84 with the following: The observed levels of inorganic compounds for ASIT-001 and ASIT-002 were similar to concentrations observed in background samples from the Great Miami River.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-85 Line #: Code:
412 Original Comment # 39
Comment: Table 4-36. DOE should provide the reason for including 1,1,1-TCA, TCE, PERC in the table when analyses for these constituents were never requested.

Response: Comment noted. The constituents listed in Table 4-36 are those identified in the original source document. The listed organic constituents will be removed from Table 4-36.

Action: The listed organic constituents will be removed from Table 4-36.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-95 Line #: Code:
413 Original Comment # 40
Comment: Table 4-39. See previous comment 31 on table format.

Response: See response to Comment #404 (OEPA31).

Action: See action to Comment #404 (OEPA31).

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-96 Line #: Code:
414 Original Comment # 41
Comment: Table 4-40. See previous comments 31 and 36 on table format.

Response: See responses to Comment #404 (OEPA31).

Action: See actions to Comment #404 (OEPA31).

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.3.4, Part I Pg. #: 4-100 Line #: Code:
415 Original Comment # 42
Comment: Surface Water: A table should be provided to more clearly provide this information.

Response: See response to Comment #171 (EPA137).

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.3.6, Part I Pg. #: 4-103,last paragraph Line #: Code:
416 Original Comment # 43
Comment: The text fails to include a discussion of the results of the general chemical parameters analyses. A discussion of these data should be included in the text.

Response: See response to Comment #171 (EPA137).

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.1.1, Part I Pg. #: 4-104 Line #: Code:
417 Original Comment # 44
Comment: A reference should be included in the text to the figure which provides the location of these wells.

Response: Agreed. A reference will be included in the revised SWCR for the locations of those wells sampled during the litigation study.

Action: The following sentence will be added at the beginning of Line 28 on Page 4-104: "Locations of these wells can be found in Figure 3-20".

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.1.1, Part I Pg. #: 4-105 Line #: Code:
418 Original Comment # 45
Comment: Bullets. A search of Figure 3-20 did not locate well 12-3 (2123). It is essential to provide references to figures locating the wells being discussed.

Response: This comment has been noted. Well 12-3 was inadvertently omitted from Figure 3-20. This well will be included in a revised Figure 3-20.

Action: The location of Well 12-3 will be added to Figure 3-20 in the revised SWCR.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.2.2, Part I Pg. #: 4-111 Line #:28-31 Code:
419 Original Comment # 46
Comment: When referencing "DOE guidelines" the basis for these guidelines should be provided. Or more importantly included relevant MCLs.

Response: This comment has been noted. A reference of the DOE guidelines will be provided in the revised SWCR. The MCL or proposed MCL have been referred to for radionuclides at several points in Section 4.1.4. However, Section 4.1.4.2 is derived directly from the Annual Environmental Reports. Only selective data (i.e., data with significant indications) were presented in these reports, and these data were generally compared to the DOE guidelines in these reports. Without the complete data set, SWCR can not compare the data to the MCL or proposed MCL and can only quote statements made in these reports.

Action: Page 4-111, Lines 25-26 will be revised to: "The DOE guidelines (based on 100 mrem for all pathways, as noted in DOE Order 5400.5, February 1990), the numbers of samples with concentrations higher than the DOE guidelines,....".

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.2.3, Part I Pg. #: Line #:13-14 Code:
420 Original Comment # 47
Comment: USEPA has proposed an MCL for nickel which should be included in the discussion.

Response: Agreed. The proposed MCL for nickel (0.1 mg/ℓ) will be included in the discussion, and the text will be revised accordingly.

Action: Page 4-114, Line 13 will be revised as: "Of the metals analyzed for, no DOE or EPA standards have been established for calcium, potassium, magnesium, and sodium".

Page 4-114, Lines 17-18 will be revised to: "...copper, lead, nickel, and zinc in groundwater samples collected from the off-property private wells have always been less than their respective MCLs or SMCLs".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-116 Line #: Code:
421 Original Comment # 48
Comment: Table 4-45. The table fails to include footnote "e". Please correct.

Response: Agreed. Footnote e was inadvertently left out of the report. A definition of Footnote e will be included in the revised SWCR.

Action: A footnote "e", will be added: "Only one sample has been collected in Wells 1124 and TOAB, which occurred in 1984".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-132 Line #: Code:
422 Original Comment # 49
Comment: Table 4-50. Define "trace" under well 1019 for Methylene chloride.

Response: This comment has been noted. A footnote will be used to define "trace" in Table 4-50 as a concentration level that is below the detection limit.

Action: A "d" will be superscripted next to "trace" for methylene chloride in Well 1019 in Table 4-50, Page 4-132. A footnote "d" will be added to the end of the table, Page 4-136 and will read "The compound was detected but at a concentration below the detection limit".

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.1, Part I Pg. #: 4-137 Line #: Code:
423 Original Comment # 50
Comment: The range of uranium concentrations and the presence of several VOCs in the "background" wells chosen questions the integrity of these locations as background. DOE should provide a more indepth discussion of the selection criteria for these wells.

Response: Please see the response to comment #218.

Action: Please see the proposed action for comment #218.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.1, Part I Pg. #: 4-142 Line #:34-36 Code:
424 Original Comment # 51
Comment: Due to the high concentration UTL for inorganic constituents, a comparison should also be made to the respective MCL and proposed MCL when available.

Response: Agreed. Among the metals detected in groundwater samples collected from 1000 Series background wells, the UTLs of aluminum, beryllium, cadmium, iron, manganese, and nickel exceed the respective MCLs or SMCLs. Also, the UTL of lead exceeds the action level of 0.015 mg/ℓ. These facts will be discussed in the text.

Additional discussion of the quality of perched groundwater relative to MCLs or SMCLs will be presented in the revised SWCR.

Action: The following sentence will be added after the last sentence of last paragraph on Page 4-142: "It should be noted that the UTLs calculated from the background samples for aluminum, beryllium, cadmium, iron, manganese, and nickel exceed their respective MCLs or SMCLs, and the UTL of lead exceeds the action level of 0.015 mg/ℓ."

The following paragraph will be added after Line 18, Page 4-149: "Average concentrations of aluminum, beryllium, cadmium, lead, iron, manganese, and/or nickel in various perched groundwater wells, although not exceeding their specific UTLs, exceed the MCL, SMCL, or action level. Alumium concentrations in 7 perched groundwater wells located in the waste storage area (i.e., Wells 1025, 1028, 1031, 1052, 1073, 1080, and 1082) and 4 wells located in the raffinate area inside the production area (i.e., Wells 1208, 1209, 1212, and 1213) exceed the SMCL of 0.2 mgℓ. Beryllium concentrations of greater than the 0.001 mgℓ MCL were found in a total of 25 perched groundwater wells. These wells are either located in the waste storage area or the former production area. In addition to the wells found with cadmium concentrations that are above the 0.009 mgℓ UTL, another 17 perched groundwater wells were also found with cadmium concentrations that exceed the MCL of 0.005 mgℓ. These wells are located in the vicinity of the waste storage area, the production area, the fire training area, and the sewage treatment plant, and Well 1047 located east of Paddys Run.

Lead concentrations that exceeded the EPA action level of 0.015 mgℓ were found only once in Wells 1040, 1048, and 1064 with concentrations ranging from 0.05 to 0.118 mgℓ. Well 1040 is located approximately 1900 feet north of the northwestern corner of the FEMP; the higher lead concentration at this well should not be related to the former operation of the FEMP. Wells 1048 and 1064 are located between the South Field and the SSOD.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-145 Line #: Code:
425 Original Comment # 52
Comment: Table 4-53. The fact that a number of inorganic contaminant UTLs exceed their respective MCL or proposed MCL supports the question of the integrity of background wells.

Response: Please see response to Comment #218.

Action: Please see action to Comment #218.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.1, Part I Pg. #: 4-149 Line #:4-5 Code:
426 Original Comment # 53
Comment: Molybdenum was detected in several 1000-series wells (see Table 4-54). Correct the text.

Response: The comment has been noted. The sentence referred to by the commentor will be removed from the text to correctly reflect molybdenum detections in perched groundwater.

Action: The sentence in Lines 4-5 on Page 4-149 will be removed from the revised SWCR.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.2, Part I Pg. #: 4-157 Line #:20-35 Code:
427 Original Comment # 54
Comment: a) The selection criteria for wells for background concentrations is not provided. A discussion of the criteria should be provided. This is especially important in light of the fact that the draft "Groundwater Report" shows little, if any, information available on the construction of several of the "background wells."
b) Provide a reference to the figure(s) locating the listed wells.

Response: a) Noted.
b) Locations of background wells are shown in Figure 3-27.

Action: a) The text will be expanded to discuss the criteria used to select background monitoring wells for the Great Miami Aquifer.
b) The sentence on page 4-127, line 4-29, will be changed to: "Background wells designated in these groups are shown in Figure 3-27 and are listed below: ..."

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.2, Part I Pg. #: 4-159 Line #:29-32 Code:
428 Original Comment # 55
Comment: The presence of multiple organic contaminants within the background well samples calls into the locations of the background wells as well as the quality of the laboratory data.

Response: Organic compounds found in the background wells may be due to very low levels of laboratory contamination or may be due to off-site sources of contamination. The data will undergo validation and will be thoroughly evaluated as part of the Operable Unit 5 RI Report preparation.

Action: The organic compound data for background wells will be presented and possible causes for the occurrence of organics in the wells will be discussed.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.2, Part I Pg. #: 4-160 Line #:6 Code:
429 Original Comment # 56
Comment: The text on page 4-159 suggests that Tc-99 is a laboratory contaminant in background wells, yet an UTL is provided here. DOE should discuss this within the text. Additionally, the presence of Tc-99 at such a level would otherwise suggest a poor background location.

Response: Comment noted.

Action: The selection of background wells in perched groundwater and their respective data are being reevaluated for purposes of the RI reports. New UTLs will be calculated based on new well selection and/or revision of the data set used to calculate UTLs. The text will fully explain how wells were selected to represent background and how UTLs were calculated. The claim that Tc-99 could be a laboratory contaminant will be eliminated from the text.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: Line #: Code:
430 Original Comment # 57
Comment: Figures 4-2 and 4-3. These figures provide data only through the second quarter of 1990, certainly data is available from the second quarter of 1990 up to Dec 1, 1991. These figures should be revised to include data available up to Dec 1, 1991.

Response: Agreed.

Action: Figures 4-2 and 4-3 will be revised to include all the data available in the Fernald Database as of December 1, 1991.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.4.4.2, Part I Pg. #: 4-168 Line #:4 Code:
431 Original Comment # 58
Comment: Table 4-59 provides "elevated metal concentrations," not "metals detected." Please correct the text.

Response: This comment has been noted. The text will be revised to clarify this issue.

Action: Page 4-168, Lines 4-5 will be replaced by: "Metals detected in groundwater collected from 2000, 3000, and 4000 Series wells are summarized in Tables M-10 to M-12 of Appendix M. Sand and gravel aquifer monitoring wells containing elevated concentrations of metals (relative to the UTLs) are listed in Table 4-59".

432 Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-176 Line #: Code:
Original Comment # 59
Comment: Table 4-60. DOE should have analyzed background samples for all metals listed as well as antimony. The reasoning for not acquiring adequate background data is unclear. DOE should have conducted analyses for all metals detected or expected to be present as contaminants on the site.

Response: The background issue is being discussed with respect to the Operable Unit 5 RI Report.

Action: No change in the SWCR is required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-186 Line #:26 Code:
433 Original Comment # 60
Comment: Correct "band" to "bend".

Response: Noted.

Action: Part I, Page 4-186, Line 26, change "band" to "bend".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: Line #: Code:
434 Original Comment # 61
Comment: Figure 4-6. a) The figure should provide all sampling locations and concentrations used to develop contours.
b) The figure should include a reference to the report/document which generated it.

Response: a) The original report from which the figure was generated did not include the locations and concentrations used to develop contours. Consequently, the requested modification cannot be provided for the reviewer.
b) Agreed.

Action: a) None required.
b) The figure will be edited to include a reference to the report which generated it.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: Line #: Code:
435 Original Comment # 62
Comment: Table 4-68, 4-198. See previous comment 31 on table format.

Response: a) Agreed.
b) The purpose of the tables is to provide the reader with those constituents that were detected during the investigations, and not those which were not detected. The complete set of analyses, including the number of samples taken, will be included in the operable unit RIs.

Action: a) The table will be revised to show ND - "#.#" when the frequency of detection is less than 100 %.
b) None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-203 Line #: Code:
436 Original Comment # 63
Comment: Table 4-70. a) Cr and 1,1 Dicl should not be included if no detects are reported.
b) DOE should describe the circumstances under which a blank becomes contaminated with barium.

Response: a) Agreed.
b) The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. It is not intended to evaluate the usefulness or rationales of previous sampling efforts at the FEMP. The original report neither described nor explained the circumstances under which a blank becomes contaminated with barium.

Action: a) The table will be edited to exclude those chemicals which were not detected and the text will contain an addition pointing out that these chemicals were analyzed for but not found in the samples taken.
b) None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-215 Line #: Code:
437 Original Comment # 64
Comment: Table 4-73A. a) See previous comment 31 on table format.
b) Pg. 4-216: Continue column headings on additional pages.

Response: a) Agreed.
b) The purpose of the tables is to provide the reader with those constituents that were detected during the investigations, and not those which were not detected. The complete set of analyses, including the number of samples taken, will be included in the operable unit RIs.
b) Agreed.
Action: a) The table will be revised to show ND - "#.#" when the frequency of detection is less than 100 %.
b) The table will be edited so that column headings are continued on additional pages.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.6.1, Part I Pg. #: 4-236 Line #:15-18 Code:
438 Original Comment # 65
Comment: The relevance of radionuclides being present at less than 600 pCi/g should be included in the section.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. The text was intended to point out concentrations of constituents that may be of interest to the reader. In this instance, 600 pCi/g was used as an arbitrary cutoff. There is no significance in the choice of this value.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.6.1, Part I Pg. #: 4-236 Line #:25-27 Code:
439 Original Comment # 66
Comment: The relevance of radionuclides being present at less than 500 pCi/g should be included in the section.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. The text was intended to point out concentrations of constituents that may be of interest to the reader. In this instance, 600 pCi/g was used as an arbitrary cutoff. There is no significance in the choice of this value.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.6.1, Part I Pg. #: 4-236 Line #:31-32 Code:

440 Original Comment # 67
Comment: The relevance of organics being detected in excess of 500 µg/kg should be included in the section.

Response: The purpose of the SWCR is to provide a summary of the environmental data collected at the FEMP. The text was intended to point out concentrations of constituents that may be of interest to the reader. In this instance, 600 pCi/g was used as an arbitrary cutoff. There is no significance in the choice of this value.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.6.1, Part I Pg. #: 4-266 Line #:28 Code:
441 Original Comment # 68
Comment: Define "traces" or rewrite text.

Response: Agreed.

Action: The text will be edited to clarify the use of the term "traces".

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-270 Line #: Code:
442 Original Comment # 69
Comment: Table 4-76. Total U should be reported as mg/kg.

Response: Agreed.

Action: Table will be edited to note that Total U is reported in mg/kg.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-273 Line #: Code:
443 Original Comment # 70
Comment: Table 4-77. Total U should be reported as mg/kg.

Response: Agreed.

Action: Table will be edited to note that Total U is reported in mg/kg.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.1.7, Part I Pg. #: 4-300 Line #: Code:
444 Original Comment # 71
Comment: This section should include a more detailed discussion of the results of endangered species investigations.

Response: Disagree. As discussed in the first paragraph of Section 4.1.7, the results of threatened and endangered species investigations are not included in the section in order to avoid duplication. The paragraph refers the reader to Section 2.0 of Part I for a summary of the results, which, in turn, refers the reader to Appendix G for an in depth discussion of methodology and results.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-316 Line #: Code:
445 Original Comment # 72
Comment: Table 4-88. The strontium-90 columns show positive detects but provide ranges with < signs. If positive detects are found, then the concentration detected should be reported.

Response: The detected values were lower than the highest detection limits. The raw data supporting this table are provided in Appendix H. Strontium-90 values are in Table H-3.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part I Pg. #: 4-327 Line #: Code:
446 Original Comment # 73
Comment: Table 4-97. The High rad soils and sediment samples don't appear to be very high in relation to concentrations reported in other sections of this report for soil and sediment. DOE should provide the basis for using such relatively low High Rad samples.

Response: The terms "high" and "low" were intended to be relative. The samples were intended to represent a range of the concentrations common outside the more contaminated areas of the FEMP.

Action: No change is required in the text.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
447 Original Comment # 74
Comment: The use of the 95th upper confidence limit (UCL) on the geometric mean as the exposure point concentration (EPC) when the distribution is lognormal and the number of detects is below 7 or the frequency of detection is below 50% does not appear to be appropriate and is not a method recommended in USEPA (1989) guidance. The use of the 95th UCL on the arithmetic mean as the EPC is based on general assumptions regarding the pathway (e.g., children may randomly contact different locations across the site over the duration of the exposure period) and not the distribution of the chemical. If it is not reasonable to estimate the 95th UCL on the arithmetic mean given the available data (i.e., high likelihood that the estimate will greatly exceed the maximum concentration), then the maximum concentration should be used at 95th UCL on the geometric mean as presented in Volume 5, Appendix R by as much as an order of magnitude. Therefore, use of the maximum concentration in these cases may impact the ultimate risk estimates.

Response: Random contact across the site involves both temporal and spatial distributions. The arithmetic mean concept addresses the temporal distribution, but even EPA in recent guidance (EPA 1992) suggests that a lognormal spatial data distribution from sampling data collected at one point in time should be accounted for by evaluating the arithmetic

mean of the log-transformed data, which is mathematically equivalent to the geometric mean. We default to a maximum concentration if the calculated UCL is greater than the maximum value.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
448 Original Comment # 75
Comment: Many of the estimated cancer risks were not summed by pathway for evaluating the risks from the chemical mixture (i.e., Tables 5-16, 5-20, 5-23, 5-34, and 5-37). In addition, hazard quotients were not summed for each exposure pathway. According to guidance, the hazard quotients should be summed by pathway(s) or target organ (which is more accurate) for evaluating the total noncarcinogenic hazard associated with exposure to a chemical mixture (USEPA 1989). Hazard quotients were only presented in the text by chemical.

Response: Agreed to sum chemical risks and hazard quotients. Target organ(s) will be indicated only where the HI is greater than 1.

Action: Cancer risks and hazard quotients will be summed across all chemicals in a scenario and the sum presented in the section 5 tables. In addition, chemicals that are major contributors to the HI and their target organ(s) will be noted for those scenarios with a total HI greater than 1.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
449 Original Comment # 76
Comment: In several instances, chemical-specific carcinogenic risks exceeded 10 2. According to USEPA (1989) guidance, a modified cancer risk equation should be used when estimating cancer risks in excess of 10 2.

Cancer Risk - 1 - e (CDI 5F)

Response: DOE has compared the impacts of using the one-hit equation instead of the conventional methodology used in the SWCR. Figure 76 presents the results of this comparison. As can be seen from this figure, risk estimates produced by the two methodologies agree to within 10% for calculated risks less than 2.0×10^{-1}. The highest risk from one constituent in one media calculated using HEAST slope factors and reported in the SWCR is below this number. DOE feels the impact of this minor change will not affect the results of the preliminary baseline risk assessment.

Action: No changes in the text are proposed at this time.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
450 Original Comment # 77
Comment: Several errors were found in the risk tables presented in Section 5 of Volume 3 based on limited spot-checking of some of the risk calculations using the EPCs and

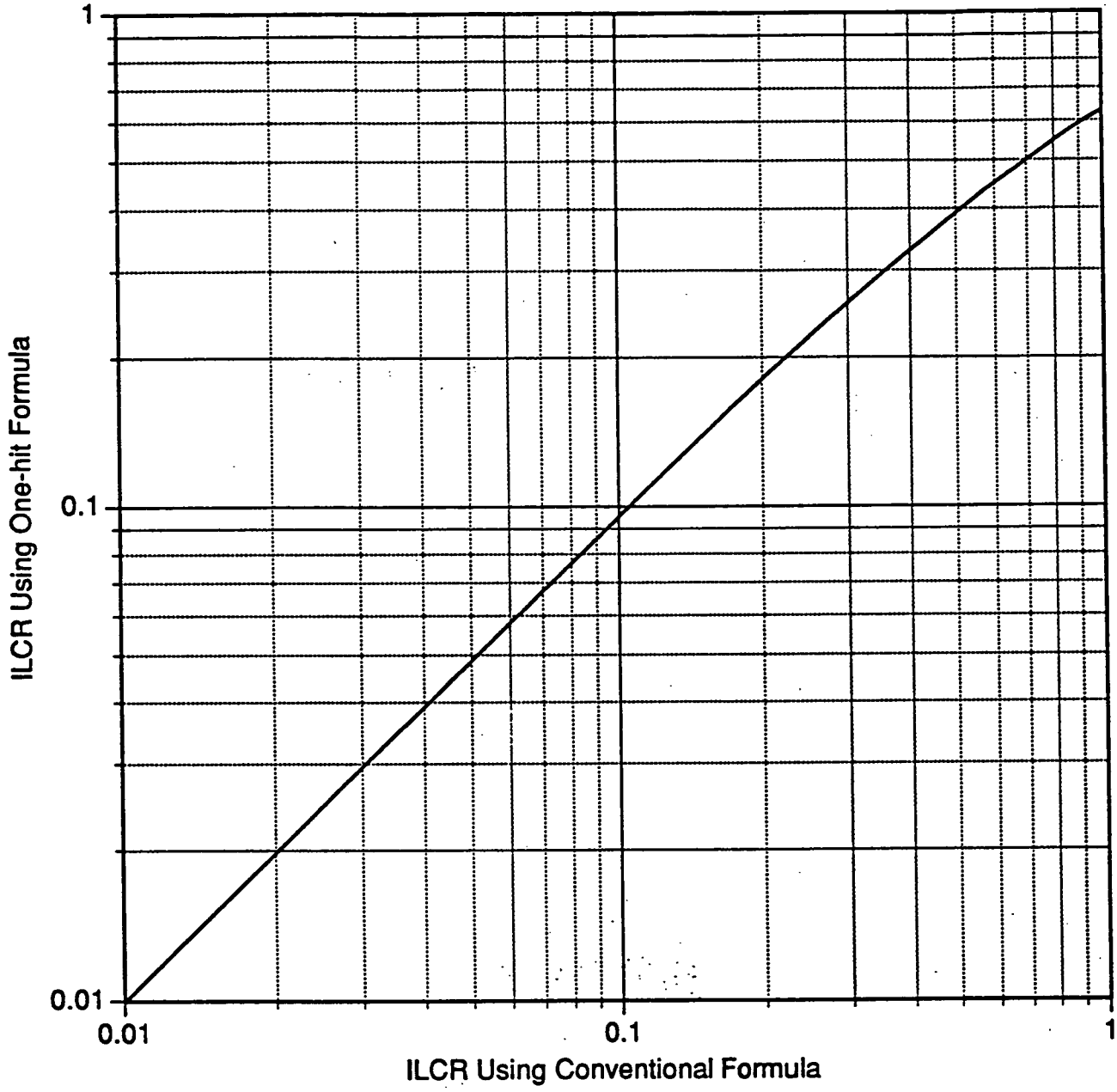

FIGURE 76 Comparison of Risks as Calculated by Conventional HHEM Methodology and the One-Hit/High Risk Methodology

URF/UTF values (as presented below in the page specific comments). It may be necessary to systematically check the risk calculations and supporting documentation (i.e., EPCs and UTF/URF values).

Response: Agree that there are some errors in the Section 5 tables, as noted in further OEPA comments. However, it is difficult to address this general comment.

Action: Any errors will be addressed where noted in specific OEPA comments.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
451 Original Comment # 78
Comment: It does not appear that sufficient effort was used to derive appropriate wildlife toxicity criteria. For example, toxicity criteria for avian species were often derived from human toxicity criteria (which are often based on mice or rat studies) rather than evaluating the open literature on avian-specific subchronic and chronic studies. Several on-line databases (e.g., HSDB, TRECS) available through the Chemical Information System (CIS) and the National Library of Medicine (NLM) should be accessed to identify more appropriate toxicity data. Another source includes the series of "Hazard" documents produced by the Fish and Wildlife Service.

Response: The Fish and Wildlife Service documents have been consulted in the preparation of the ecological assessment, as well as the open literature on avian-specific subchronic and chronic studies. DOE welcomes the assistance of OEPA in identifying wildlife toxicity criteria it deems more appropriate than those used. Any more appropriate values identified will be used in preparing the Operable Unit 5 Sitewide Ecological Assessment.

Action: None required. Request OEPA assistance in identifying satisfactory wildlife toxicity criteria for use in the Operable Unit 5 Sitewide Ecological Assessment.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: Line #: Code:
452 Original Comment # 79
Comment: The conclusions regarding the ecological risk assessment do not appear to be supported by the data. Specific comments regarding the methods and characterization of the ecological risks are presented below.

Response: DOE does not agree.

Action: See actions in response to specific comments on the ecological assessment.

Commenting Organization: Ohio EPA Commentor:
Section #: Summary, Part II Pg. #: S-7 Line #:17 Code:
453 Original Comment # 80
Comment: It is unclear what is meant by the statement "..of insects (earthworms),..". This suggests that earthworms are insects which is not true. The text should be clarified to explain this.

Response: Earthworms were used as surrogates for insects, due to the lack of bioaccumulation factors for insects. The text will be clarified.

Action: Page S-7, Line 17, replace "(earthworms)" with "(using earthworms as surrogates)".

Commenting Organization: Ohio EPA Commentor:
Section #: Summary, Part II Pg. #: S-7 Line #:27-29 Code:
454 Original Comment # 81
Comment: DOE fails to define what it believes is a "significant source of risk" if a hazard index (HI) of 5.0 isn't. HI's exceeding 1.0 for four inorganic contaminants would seem to be a source of risk. DOE should define within the document what it is considering a "significant source of risk" when making such conclusions.

Response: The intent was a comparison of the relative importance of soil exposures compared to surface water exposures. This will be clarified in the text.

Action: In Part II, on page S-7, lines 27-29, replace the existing text with the following: "Surface water exposures generally appear to be a less important source of risk to terrestrial receptors than do surface soil exposures."

Commenting Organization: Ohio EPA Commentor:
Section #: Summary, Part II Pg. #: S-8 Line #:12-14 Code:
455 Original Comment # 82
Comment: The field studies conducted were not specifically designed to assess the impact of contaminants on terrestrial communities. A limited extent of tissue sampling was conducted. Studies were not focused on specific areas of contamination and the effects on local populations.

Response: RI/FS field studies have been designed to investigate potential exposures of FEMP biota to radionuclides via uptake. The limited terrestrial mammal sampling conducted found only one detect. The relatively low radionuclide concentrations in vegetation and fish do not suggest that food sources are highly contaminated. The assessment does not discount the possibility of substantially higher levels of exposure at specific waste units, and suggests that remedial actions are appropriate to prevent ecological harm.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-23 Line #: Code:
456 Original Comment # 83
Comment: Table 2.4. DOE should detail within the figure what is the source of background for silo contents.

Response: Agreed.

Action: Table 2-4 will be revised to indicate the source of background data to which silo contents are compared.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-25 Line #: Code:
457 Original Comment # 84
Comment: Table 2-6. The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-26 Line #: Code:
458 Original Comment # 85
Comment: Table 2-7. The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-28 Line #: Code:
459 Original Comment # 86
Comment: Table 2-8. a) The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization. b) Tc-99 was detected in the SSOD. See Table 4-35.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-29 Line #: Code:
460 Original Comment # 87
Comment: Table 2-8. The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-30 Line #: Code:
461 Original Comment # 88
Comment: Table 2-10. DOE should detail within the figure what is considered the source of background for standing water in the waste pits.

Response: Since standing water is included in the medium of surface water, the background values used for standing water are the same as that for surface water. The source of background for surface water has been given in Section 2.1.2 of Part II.

Action: Add the following sentence to footnote b in Tables 2-10 and 2-11 fo Part II: "Background values used for standing water are the same as that for surface water."

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-31 Line #: Code:
462 Original Comment # 89
Comment: Table 2-11. Fluoride should be included in this table. See Table 4-40, Part I.

Response: The tables in Section 2.0 of Part II, including Table 2-11, present only the selected constituents of potential concern for each subarea (location) of interest in each medium. Since the fluoride concentration in standing water in the waste storage area is within its background level (see the corresponding statistical summary tables in Appendix R), it is not a constituent of potential concern and hence it is not listed in Table 2-11.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-36 Line #: Code:
463 Original Comment # 90
Comment: Table 2-13. The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-43 Line #: Code:
464 Original Comment # 91
Comment: Table 2-15. The lack of available background data to complete this table supports Ohio EPA's concerns about the adequateness of DOE's background characterization.

Response: As discussed with Ohio EPA previously, and as noted in the Risk Assessment Work Plan Addendum, background concentrations are assumed to be equal to zero in the absence of background measurement results.

Action: The referenced table will indicate that background concentrations are assumed to be equal to zero in the absence of background measurement results.

Commenting Organization: Ohio EPA Commentor:
Section #: 2.0, Table 2-19 Pg. #: 2-53 Line #: Code:
465 Original Comment # 92
Comment: DOE should not provide the reason for including contaminants that were not detected at levels exceeding the background UTL.

Response: In Table 2-19, Page 2-53 of Part II, the average and the UCLs of some contaminats may appear to be lower than their respective background UTLs. However, as shown in its corresponding statistical summary Table R.5-30 in Appendix R, these contaminants have at least one measurement exceeding their UTLs. As described in Risk Assessment Work Plan Addendum (DOE 1992), this meets the criterion to be included as a constituent of potential concern.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-68 Line #: Code:
466 Original Comment # 93
Comment: Table 2-26. The title of this table should be rewritten to just state OU2 waste units, since the lime sludge ponds are hazardous waste units.

Response: The title of Table 2-26 will be revised.

Action: The title of Table 2-26 will be changed to read:
"Radiological Constituents of Potential Concern for Subsurface Soil in OU2 Waste Units."

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-72 Line #: Code:
467 Original Comment # 94
Comment: Table 2-27. The background values presented in this table differ somewhat from those presented in Table 2-23. The tables should be reviewed to ensure consistency.

Response: The background values listed in Tables 2-27 and 2-23 are essentially the same except that the number of significant figures used for presentation in the two tables is slightly different for some of the constituents. Differences associated with rounding error in the last digits of these background values are probably not of great concern because they are within the uncertainties involved in the background samplings and measurements.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Part II Pg. #: 2-79 Line #:34 Code:
468 Original Comment # 95
Comment: Is the proper reference cited herein? It would seem that RAGS 1989b is the correct reference.

Response: Agreed.

Action: The reference cited in line 34 on Page 2-79 of Part II will be changed to RAGS 1989b.

Commenting Organization: Ohio EPA Commentor:
Section #: Part III Pg. #: 3-15 Line #:6 Code:
469 Original Comment # 96
Comment: Insert the word "in" between the words "given" and "Table 3-1".

Response: Agreed.

Action: The word "in" will be inserted between the words "given" and "Table 3-1" in line 6 on Page 3-15 of Part II.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.3.2 Pg. #: 3-17 Line #: Code:
470 Original Comment # 97
Comment: DOE should provide justification within the text for not calculating risk for the potential receptor using the perched groundwater (1000 series well) for a water supply. Several of the perched zones provide sufficient water to supply residential usage.

Response: DOE disagrees with the comment that the perched water zones (1000 series wells) provide sufficient water to supply residential useage (a 70 year lifetime for all water uses for residing on a farm).

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0, Table 3-2 Pg. #: 3-18 Line #: Code:
471 Original Comment # 98
Comment: The table does not include a reference to footnote "b."

Response: Agreed.

Action: In Part II, Table 3-2, page 3-18, add a superscript "b" between "radionuclides" and "(pCi/m^3)".

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0 Pg. #: 3-19 Line #: Code:
472 Original Comment # 99
Comment: Some of the estimated EPCs under future land-use conditions (which assumes no containment) were <u>lower</u> than the current land-use EPCs (which assumes containment)

(e.g., highest off-property concentrations for uranium). Explain these discrepancies or reevaluate the model.

Response: DOE agrees that the air concentrations for U-234, U-235, and U-238 in Table 3-3 (future land use) for the highest off-property concentration are lower than they are in Table 3-2 (current land use) for the highest off-property concentration. Examination of the air transport modeling work reveals that the reason stems from the source term designations for current versus future conditions. Under current conditions the source terms include a contribution from the incinerator/waste water treatment area surface soil contamination. However, under future conditions (caps and surface soils have failed or eroded) a source term contribution from the incinerator/waste water treatment area is not included. The reason is that a judgement was made that the incinerator area would be a minor contributor to risk from air pathways under the future cap failure conditions considering the substantial number of more highly contaminated source terms that are included under future cap failure conditions. This is confirmed by the fact that the risks from air pathways are dominated by radon (see Figures 5-1, 5-2, and 5-3), which is essentially coming from one source (the K-65 Silos).

Thus, while the incinerator area is a significant contributor to modeled airborne uranium concentrations, the risk contribution is relatively small. Note that the incinerator area source term only impacts modeled airborne uranium concentrations, as revealed in the comment. This is because this source term is not a significant contributor for other contaminants relative to other source terms.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0 Pg. #: 3-34 Line #: Code:
473 Original Comment # 100
Comment: The estimated future EPCs for constituents of potential concern CPCs) for the Great Miami River (GMR) are several orders of magnitude below current monitored levels for several chemicals. Explain these discrepancies, or is the model simply not providing reliable results? In addition, it seems that the modeled concentations should be added to the current levels of CPCs in order to evaluate the total risk from use of water from the GMR as is being performed for other pathways. Otherwise, it should be clearly expressed in other portions od the document that the future land-use scenario for use of the GMR are not the total risks, but rather only the faction from the contribution of surface water runoff from the site.

Response: Estimated future surface water concentrations for the GMR are estimated in the model as the incremental (added) concentration from source areas on the site, not the concentrations resulting from a combination of site and upstream inputs.

Action: This will be clarified in the document by adding the following insert to the end of Section 3.3.3, page 3-33 and in Section 5.3.3: "Risks calculated for future land scenarios from use of surface water are not the total risks, but represent the incremental contribution from site-wide sources only."

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0 Pg. #: 3-59 Line #:8 Code:
474 Original Comment # 101
Comment: Insert a space in the word "forradionuclides."

Response: Agreed.

Action: In Part II, Section 3.3.5.1, page 3-59, line 8, insert a space between for and radionuclides in the word "forradionuclides".

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0 Pg. #: 3-71 Line #:15-18 Code:
475 Original Comment # 102
Comment: Update the dermal absorption guidance to "Dermal Exposure Assessment: Principles and Applications" (USEPA 1992).

Response: The new EPA 1992 guidance for dermal absorption was not available during the preparation of SWCR. However, it will be used in the risk assessments for subsequent operable unit RIs.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 4.0 Pg. #: 4-3 Line #: Code:
476 Original Comment # 103
Comment: Toxicity criteria are not presented in IRIS or HEAST for lead. Why was the integrated Uptake/Bokinetic Model not used for properly evaluating the porential risk from exposure to lead?

Response: It is acknowledged that the June 1992 work plan states that lead toxicity will be evaluated with the EPA Uptake/Biokinetic Model. There are, however, several limitations with the use of this model. First, the Uptake/Biokinetic model is available only in draft form. Second, because a child is recognized to be the most sensitive receptor to lead the model applies only to a child receptor from birth to seven years of age, not to any adult receptors. There are several receptor scenarios in the SWCR with an adult receptor. Finally, the model provides output in the form of blood lead levels; additional information would be needed to evaluate "risk" from this output (i.e., some measure of health risk as a function of blood lead levels).

Action: The latest available version of the Uptake/Biokinetic model (version 0.5) will be used for the child receptor in the current land use scenarios with and without access controls. For model parameters where site-specific values are not available, default parameters in the model will be used. Recognizing that the model is in draft form, blood lead levels for the child receptors will be presented in the revised Site-Wide Characterization Report and HI values deleted from the results. HI values estimated for lead will be deleted from the Site-Wide Characterization Report for adult receptor/scenarios and lead will be evaluated qualitatively.

Commenting Organization: Ohio EPA Commentor:

Section #: 4.0 Pg. #: 4-2/9 Line #: Code:

477 Original Comment # 104

Comment: A few errors were found in Table 4-1. IRIS reports a chronic RfD of 0.02 mg/kg/day for chlorobenzene, 0.1 mg/kg/day for ethylbenzene, and 2.5x10-4 for methyl paerathion.

Response: Agreed.

Action: The chronic oral RfDs will be corrected in Table 4-1 for chlorobenzene (0.02mg/kg-day), ethylbenzene (0.1 mg/kg-day) and methyl parathion (0.00025 mg/kg-day). A revised copy of Table 4-1 is attached.

Commenting Organization: Ohio EPA Commentor:

Section #: 5.0 Pg. #: 5-2 Line #:13 Code:

478 Original Comment # 105

Comment: The equation presented does not express the UTF, but rather the URF for chemicals.

Response: Agreed.

Action: The following changes will be made to clarify the text on page 5-2: "UTF" will be changed to "URF" in line 13; the phrase "and UTF" will be deleted from line 14; the sentence "The analogous term ... " in lines 10-11 will be deleted; and the following insert will be added after line 28: "Again, to derive a more useful calculation, equation 5-8 is combined with equation 5-2 to have:

$$HQ = (C)(CR)(EF)(ED)/[(BW)(AT)(RfD)]$$

In an analogous manner to URFs, the unit toxicity factor is calculated by:

$$UTF = (CR)(EF)(ED)/[(BW)(AT)(RfD)]$$ "

Please refer to the action for Comment #273. (EPARV16).

Commenting Organization: Ohio EPA Commentor:

Section #: 5.0 Pg. #: 5-18 Line #: Code:

479 Original Comment # 106

Comment: No URF values were presented in Appendix S by which to estimate the risks presented for Th-230.

Response: DOE disagrees. Th-230 is a member of the uranium series. Appendix S presents unit risks for radionuclides under their parent nuclide (uranium in this case), thus facilitating inclusion of daughter isotopes in risk calculations.

Action: None required.

Commenting Organization: Ohio EPA Commentor:

Section #: 5.0 Pg. #: 5-26 Line #: Code:

480 Original Comment # 107

Comment: Some of the cancer risk numbers presented in Table 5-26 appear to be incorrect (or rhe URF or EPCs used to derive these numbers are incorrect) (e.g., benzo(a)pyrene in the NE Quadrant). Check these estimates.

Response: Agreed.

Action: Tables 5-26 and 5-27 will be updated.

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-27 Line #: Code:
481 Original Comment # 108
Comment: No EPCs are presented in Table 3-8 for estimating some of the Ra-228 risk values presented in Table 5-7. Also, the upstream risk estimate for Ra-226 could not be duplicated. Check these estimates.

Response: The risk estimates in Table 5-7 will be checked.

Action: A check of the risks presented in Table 5-7 will be performed.

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-39 Line #: Code:
482 Original Comment # 109
Comment: Why are there different chemicals listed in Tables 5-16 and 5-26? It 5-59 appears that the chemicals should be the same.

Response: The land-use scenario addressed in Table 5-26 is based on the assumption that cattle would have access to different grazing areas.

Action: Refer to the action for comment 480 (OEPA107). No additional text change is required.

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0, Table 5-15 and 5-16 Pg. #: 5-39,-39 Line #: Code:
483 Original Comment # 110
Comment: The titles of these tables are confusing. Under current access controls, are cattle allowed to graze on the inactive flyash pile and the south field? If not, then the titles need to be rewritten.

Response: It is assumed that cattle may graze on areas of the Inactive Flyash pile and the South Field under current land use with existing access controls; thus, these source areas are included in Tables 5-15 and 5-16.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 3.0 Pg. #: 3-39 Line #:9 Code:
484 Original Comment # 111

Comment: "Aroclor-1760" should be changed to "Aroclor-1260". "Bis(2-ethylhexyl) should be changed to "Bis(2-ethylhexly)phthalate". "N-nitrosodiphenyla" should be changed to "N-nitrosodiphenylamine".

Response: Agree with the editorial comments assuming they refer to page 5-39, Table 5-16.

Action: The following changes will be made to Table 5-16: "Aroclor-1760" will be changed to "Aroclor-1260", "Bis(2-ethylhexyl) will be changed to "Bis(2-ethylhexyl)phthalate", and "N-nitrosodiphenyla" will be changed to "N-nitrosodiphenylamine".

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-46 Line #: Code:
485 Original Comment # 112
Comment: Benzene which is listed in Table 5-20, is not listed in the corresponding EPC Table 3-8. Also, the risk estimated for bis(2-ethylhexyl)phthalate in Waste Pit 6 could not be duplicated. Check these estimates.

Response: The risk estimates in Table 5-20 will be checked.

Action: Results in Table 5-20 will be checked and revised where necessary.

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-59 Line #: Code:
486 Original Comment # 113
Comment: Reference to "Table 5-17" should be changed to Table 5-16" in footnote "a".

Response: Agreed.

Action: Refer to the action for comment 480 (OEPA107).

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-67 Line #: Code:
487 Original Comment # 114
Comment: Some of the risk estimates presented in Table 5-30 could not be duplicated (e.g., Pa0231 and Ra-226). Check these estimates.

Response: The value listed for Pa-231 under the on-property resident farmer should read: "$4.6x10^{-8}$". The Ra-226 values are correct and are calculated using the exposure point concentrations in Table 3-3 and the Ra-226+5dtr unit risk factor for the RME resident farmer (e.g., $\{7.6x10^{-3}\}$ x $\{5.7x10^{-4}\}$ = $4.3x10^{-6}$).

Action: Change "$4.6x10-^{-7}$" to "$4.6x10^{-8}$" for Pa-231 risks for the on-property resident farmer in Table 5-30.

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-111 Line #:23 Code:
488 Original Comment # 115
Comment: Change to "3 x 10.3" to "3 x 10^{-3}".

Response: Agreed.

Action: In Part II, page 5-111, line 23 change "3 x 10^{-3}" to "3 x 10^{-3}".

Commenting Organization: Ohio EPA Commentor:
Section #: 5.0 Pg. #: 5-11 Line #:33 Code:
489 Original Comment # 116
Comment: Change "the for the" to "for the".

Response: Agree.

Action: In Part II, page 111, line 33, change "the for the" to "for the".

Commenting Organization: Ohio EPA Commentor:
Section #: 6.0 Pg. #: 6-3 Line #:17-20 Code:
490 Original Comment # 117
Comment: Why were site-wide arithmetic mean concentrations used as the EPCs for evaluating exposure to wildlife. Given the home ranges of certain indicator species (e.g., mouse, robin) it does not seem appropriate to average all the concentrations across the site given the size of the study area. In addition, it is not clear why the 95th UCL on the arithmetic mean as was used for aquatic organisms and human health. This will have a significant impact on the results since certain surface soild EPCs used in the human health risk assessment were over 2 orders of magnitude above the EPCs used in the ecological risk assessment. This is particularly crucial since certain inorganic EPCs estimated for the Waste Pit Area may result in exposures which are within the acute range for mice and robins.

Response: The site-wide arithmetic means were used as EPCs for wildlife as a "first cut" at the analysis. It is recognized that some waste-unit-specific exposures would be substantially higher than those based on a site-wide mean. However, given that most of the hazard indices calculated using the site-wide means were greater than 1.0, the conclusion that potential ecological risk exists at the FEMP would not be altered by the use of the 95th UCL or waste-unit-specific values. If greater detail is to be required, DOE urges that this issue be discussed in the context of the Operable Unit 5 Sitewide Ecological Assessment, which will be able to rely on a complete and fully validated data set, which was not available for the SWCR. Calculating the hazard indices for aquatic organisms based on a site-wide mean would not be difficult and can be done for purposes of comparison with the terrestrial data.

Action: Calculate aquatic organism hazard indices based on mean estimated constituent concentrations in Paddys Run and include in the text of the SWCR. Discuss the level of detail required in the Operable Unit 5 Sitewide Ecological Assessment with U.S. EPA and OEPA.

Commenting Organization: Ohio EPA Commentor:
Section #: 6.0 Pg. #: 6-3 Line #:28-30 Code:
491 Original Comment # 118
Comment: It is advised that an additional indicator species be evaluated for assessing impacts to piscivores (e.g., great blue heron or green-backed heron).

Response: Indicator species used in the ecological assessment are those stated in the approved Risk Assessment Work Plan Addendum.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 6.0 Pg. #: 6-16/18 Line #: Code:
492 Original Comment # 119
Comment: The methodology for estimating a chronic NOEL from acute LD_{50} data does not appear to be sufficiently protective. For example, if a species-specific LD_{50} were available, then a factor of 0.02 would be used to derive the chronic NOEL and this does not appear to be protective of chronic exposire. For example, the desired arsenic wildlife NOEL is over 100,000 lower than reported LD_{50}s. One area of concern is whether the 0.1 factor used to extapolate short-term exposure to chronic exposure is appropriate for converting acute levels to chronic. Typically, a 0.1 factor is used to convert subchronic studies (30 days) to chronic studies, but not acute studies to chronic studies. At least an additional factor of 0.1 should be incorporated to convert acute studies to subchronic studies, and then apply the 01. factor to convert subchronic results to chronic results.

Response: The text may not be clear on how NOELs were estimated from LD_{50}s. The calculation consists of three steps - first, the LD_{50} is multiplied by 0.2 to arrive at an acute NOEL. This acute NOEL is then multiplied by 0.1 to get the chronic NOEL. The chronic NOEL is then multiplied by a species/class factor of 0.1, if necessary, to arrive at the final criterion. The typical extrapolation used is thus 0.2 x 0.1 x 0.1 = 0.002. It is unclear what benefit would be gained by making this extrapolation more conservative, given that even background levels of inorganic constituents appear to be toxic given the criteria used in the draft assessment. It is also not clear what guidance indicates that the desired arsenic wildlife NOEL is over 100,000 times lower than reported LD_{50}s. As stated in the response to Comment 78, DOE welcomes the assistance of OEPA in identifying wildlife toxicity criteria it deems more appropriate than those used. Any more appropriate values identified will be used in preparing the Operable Unit 5 Sitewide Ecological Assessment.

Action: Nones required. Request OEPA assistance in identifying satisfactory wildlife toxicity criteria for use in the Operable Unit 5 Sitewide Ecological Assessment.

Commenting Organization: Ohio EPA Commentor:
Section #: 6.0 Pg. #: 6-98 Line #: Code:
493 Original Comment # 120
Comment: Several doses were not presented in proper scientific notation in Table 6-41.

Response: The values for sediment exposure to Cesium-137 and Plutonium-239/240 will be corrected.

Action: Part II, Page 6-98, Table 6-41, change Cesium-137 dose from sediments to "4.1E+00". Change Plutonium-239/240 dose from sediments to "1.4E-02".

Commenting Organization: Ohio EPA Commentor:

Section #: 6.5.2.1 Pg. #: 6-101 Line #: Code:

494 Original Comment # 121

Comment: Throughout Section 6.5.2.1 more discussion on the potential subchronic and acute effects, particularly from inorganic exposure to mice and robins, needs to be evaluated given the high HIs estimated (particularly given the use of site-wide averages to estimate EPCS). In addition, the magnitude of the HIs needs to be discussed.

Response: It is unclear what level of detail the reviewer is requesting. It is not generally considered appropriate to discuss the magnitude of HIs greater than 1.0, since an HI is not an estimate of risk but rather a comparison of an estimated intake with an intake considered acceptable.

Action: None required.

Commenting Organization: Ohio EPA Commentor:

Section #: 6.0 Pg. #: 6-103 Line #:22-23 Code:

495 Original Comment # 122

Comment: Eisler (1988) presents data which indicate the levels of arsenic in excess of 5 mg/kg FW in liver is idicative of arsenic poisoning in livestock. Arsenic levels in the liver of the white-tailes deer obtained on-site was 20 mg/kg dry weight or approximately 6 mg/kg FW. Therefore, it appears that the white-tailed deer evaluated on-site had arsenic poisoning. This needs to be discussed in the text.

Response: Ecological risk assessment staff were unable to locate the 5 mg/kg figure in Eisler, although there is a 15 mg/kg liver value given for toxicity. It does not seem reasonable to claim that poisoning was occurring on the basis of one sample. The existing text clearly identifies arsenic as a potential hazard to deer.

Action: None required.

Commenting Organization: Ohio EPA Commentor:

Section #: 6.5.2.3 Pg. #: 6-108/110 Line #: Code:

496 Original Comment # 123

Comment: Section 6.5.2.3 needs further discussion on the uncertainties and limitations of the field studies. It is very difficult to measure a "statistically significant" impact on biota. Include information on the alpha level of the test, actual difference in control and site study groups even if a statistically significant difference is not seen, sample size, and other uncertainties. When differences were seen in the robin nesting study or in population studies, the discussion implies that the differences were not associated with contamination but rather other environmental factors. Given the potential for acute effects in some groups of organisms, impacts from chemical contamination cannot be ruled out. With respect to rabbit population differences, what evidence is there to suggest by omission that the site contamination is not impacting rabbit population differences in the field. How is owl predation greater on-site than in off-site locations? Given the modeled HIs for mice, it is plausible that differences in vole populations are due in part to contamination on-site?

Response: The conclusions of the field studies cited are those of the investigators who conducted them, not of the SWCR. If there is no statistically significant difference between two

groups of organisms, there is no "actual" difference between them that is not attributable to sampling error. If an effect cannot be detected statistically, it is unclear how detailed discussion of it can usefully inform remedial action decision-making.

It is not the purpose of the SWCR, nor is it possible, to prove that any patterns observed in field studies are not a result of chemical exposure. However, given that site-wide mean inorganic chemical concentrations in soils are similar to the background values compiled in the USGS study, it seems unlikely. The degree of owl predation onsite compared to offsite is unknown. It is unclear what specific discussion the reviewer wishes added to the text.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: 6.0, ES Pg. #: 6-113 and ES-24 Line #: Code:
497 Original Comment # 124
Comment: The conclusions presented for the ecological risk assessment do not appear ti be supported by the data. The statement that "potential exposures predicted by modeling may not occur in the field or that the resulting potential effects may not occur" assues that the field studies can see impacts to the ecosystem and that those which were seen are not attributable to the site. As previously discussed, seeing a statistically significant impact in a field study is very difficult. Even obtaining a sample size large enough to show significance is very difficult given the natural variability and response that will be expected and the hundreds of variables which cannot be controlled in the field. What concerns me is the fact that only site-wide arithmetic mean concentrations were used (which would tend to dilute hot spot areas and assumes that the sample arithmetic mean is equal to the populations arithmetic mean (i.e., the 95th UCL should have been used) to estimate doses and yet very high HIs were found. In addition, certain field studies showed that impacts may be occurring (i.e., robin nesting study and arsenic poisoning of deer). Also, acute toxicity data were used to generate chronic wildlife NOELs using rather low uncertainty factors. Based on the modeling results and EPCs estimated for the human health risk assessment in certain study areas, it appears that certain doses may be well within acute toxicity ranges. Therefore, it does not appear appropriate to suggest that the risks are "low" and the emphasis of remediation is to prevent "future ecological harm." Although it does not appear that major gross ecological damage has been occurring, the characterization of ecological risks should be more balanced.

Response: The statements that present ecological risks appear to be low is based on the conclusions of the field studies and on the comparison of FEMP site-wide mean soil and water concentrations of constituents to background values. However, given that even use of site-wide means produces HIs above unity, it should be clear that use of site-wide 95% UCLs or waste-unit-specific values would result in much greater values, readily justifying the claim that remediation is appropriate to prevent future ecological harm as well as to protect human health. Indeed, there exist substantial differences of opinion as to whether the FEMP has had a measurable impact on human health, but there is a consensus that remediation is appropriate to prevent any potential impact, whether statistically detectable or not.

The conclusion that differences in variations in robin fledgling success on and adjacent to the FEMP is not related to contaminant exposure is that of the investigators, not of the SWCR. It is based on the observations that the observed differences have not persisted in recent followup studies and are explainable by factors other than contaminant exposure. Hazard indices based on the USGS soil data used for background estimates in the SWCR would be similar to those based on the FEMP site-wide means. It therefore seems highly improbable that the HIs estimated for the FEMP imply any ongoing acute exposure.

It is acknowledged that it is difficult to design field studies to detect impacts. However, as stated in the response to OEPA Comment 123, if an effect can not be detected, it is unclear how detailed discussion of it can usefully inform remedial action decision-making.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O General Comments Pg. #: Line #: Code:
498 Original Comment # 125
Comment: The unsaturated zone model is presented in great detail and appears to convey a high level of certainty in the results. This is not appropriate and clearly does not reflect the tremendous uncertainty associated with contaminant transport in the vadose zone. In contrast to the saturated zone modeling, the unsaturated zone lacks credibility. The issue of uncertainty is overshadowed with detailed tables. Confidence in the transport results is severely undermined by the use of single input parameters (instead of ranges) and inherent simplifying assumptions.

Response: Modeling of the unsaturated zone is very complex and complicated. Chemical constituents and water enter the unsaturated soil matrix. Under certain circumstances, saturated conditions may exist below the waste areas, but for most cases, the soil just below the waste area is unsaturated during most of the year. Some of the contaminants may remain close to the disposal source through such mechanisms as chemical precipitation, adsorption, or physical filtration. The remainder continues to flow vertically and perhaps laterally. Unsteady flow conditions, evaporation, redistribution and infiltration are usually present. Root uptake, soil matrix adsorption/desorption, chemical transformation, precipitation, biological degradation, dissolution, etc. may be acting simultaneously as the solute moves through the soil. In addition to solute complications, the movement of moisture in the unsaturated zone is an order of magnitude more complicated than under saturated conditions. The hydraulic conductivity under unsaturated conditions is a function of the moisture content (which may be continuously changing) and in a given problem may change over several orders of magnitude. Therefore, one can find the complexity and difficulty with the unsaturated zone modeling in contrast to the saturated zone modeling. Although this modeling has numerous assumptions and uncertainties, it nevertheless provides a practical means of evaluating contaminant migration from the source to the aquifer by considering the seepage velocity and dispersion coefficient in an unsaturated condition. The saturated zone modeling may be more credible than the unsaturated zone modeling, due to the complexity of the flow process in the later. However, the confidence and credibility in the unsaturated zone modeling is gained by

predicting the percolation rate using the unsaturated hydraulic conductivity function that affect the movements of contaminants due to advection and dispersion in the vadose media.

Action: Section O.6.0 "UNCERTAINTY IN MODELING RESULTS" will be added in the Appendix O of the revised Site-Wide Characterization Report.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O General Comments Pg. #: Line #: Code:
499 Original Comment # 126
Comment: The objective of the modeling is to predict how contaminants move from source areas to receptors. However,the local transport model does not include the well of the SOWC, according to Figure 5-1. Model predictions clearly show the plume moving toward these wells (e.g., Figure 5-9); these appear to be the logical discharge points for contamination. Why doesn't the model extend to these wells? Why is there not discussion of contaminant loadings to these wells?

Response: The Site-Wide Characterization Report evaluates the fate and transport of constituents as they migrate from the site-wide waste areas through the vadose zone, into the Great Miami Aquifer and to the site boundary. The RME locations are the locations of maximum concentrations within the site boundary below the waste areas and at the site boundary. Therefore, the local transport model does not include the SOWC wells. However, they will be incorporated in the Operable Unit 5 Remedial Investigation Report.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific Comments Pg. #: O-2-4 Line #:1-4 Code:
500 Original Comment # 127
Comment: What about the fracture-matrix interaction? Matrix diffusion can be extremely important. This issue is highly studied and well documented in high-level radioactive waste literature. Even at "high" velocities in the fill, matrix diffusion may significantly "retard" the movement. Also, this effect can greatly delay flushing and remediation in the fractured till.

Response: Agreed. But, the degree and extent of fracturing within the brown tills at the FEMP have not been characterized, therefore, it may not be wise to take credit for the significant retardation of the movements of contaminants due to matrix diffusion.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-2-4 Line #:21 Code:
501 Original Comment # 128
Comment: The discussion focuses on fracture transport, yet porosities reported appear to be total or primary. Seconday or fracture porosity should be listed as this will dictate contaminant transport. Furthermore, the use of total porosity to address fracture-controlled transport can lead to a gross underestimation of contaminant migration.

Response: As indicated in the discussion that fracturing is limited to the upper brown weathered tills and because the degree of fracturing within the brown tills at the FEMP has not been evaluated, to be conservative this layer of weathered zone is not included in the vadose zone modeling. Therefore the need for listing secondary or fracture porosity is eliminated.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-2-5 Line #:26-28 Code:
502 Original Comment # 129
Comment: The sentence states that communication is controlled by α. "Communication" is controlled by ΔH and $K_{2/b}$; dispersion effects concentration not quantity.

Response: Agreed. The focus here is that since the vertical hydraulic conductivity of the 10 to 20 feet clay aquitard is very low, contaminant migration from the upper to the lower zones will be highly restricted due to advection. Therefore, transverse (vertical) dispersion will be the only mechanism for the contaminant migration between the upper and the lower zones in the Great Miami Aquifer.

Action: Lines 26-28 will be revised to read as "Communication between upper and lower zones within the Great Miami Aquifer will be extremely limited due to the presence of a 10 to 20 feet thick clay aquitard."

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-2-5 Line #:29-33 Code:
503 Original Comment # 130
Comment: This discussion regarding matrix sorption appears to contradict previous discussion on p.O-2-4.

Response: Disagree. The discussion in lines 29-33 refers to the glacial overburden which represents the unweathered gray tills, and not the fractured brown tills.

Action: Lines 29-33 will be revised to read as "The unweathered gray tills generally have sufficient organic carbon content to cause retardation of organic constituents. .... used by solutes."

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-3-10 Line #: Code:
504 Original Comment # 131
Comment: Please provide example of how calculations were performed. What is the assumption to convert from mg/Kg to mg/l? What is the basis for a 95% confidence limit? Is this based on sorption? For example, in Waste Pit 1, the CS-137 is 1.27E-8 mg/Kg. This seems to be a very small number. When multiplied by the mass in the pit (45,140,00 Kg), the available S-137 is less than 1/2 a mg. But how is the source term (9.9E-11 Mg/L) calculated? Please annotate table to identify method used as basis for source term calculations for each constituent in each area.

Response: The UCL values (mg/kg) are calculated from RI/FS sampling data using the methods outlined in the FEMP RI/FS Risk Assessment Work Plan (DOE 1992). Total mass available for a constituents in a waste area is calculated by multiplying the UCL by the total waste mass in the waste area. The source terms or the leachate concentrations in mg/ℓ is estimated by several methods as discussed in Sections O.3.2.1 and O.3.3.2 and Figures O.3-1 and O.3-2.

Although 0.5 mg of Cs-137 looks very small, when multiplied by 8.657E+10 pCi/mg (the specific activity of Cs-137), it will become a significant number.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-3-50 Line #:26-35 Code:
505 Original Comment # 132
Comment: Based on the reported dispersion coefficient and veolcity, the calculated longitudinal dispersion if 5.5 cm (0.18 feet). These seem exceptionally low and innappropriate for migration distances of tens of feet. This needs to be substantiated.

Response: Disagree. The calculated longitudinal dispersivity of 0.18 feet is not exceptionally low and inappropriate for migration distances of tens of feet in the unsaturated conditions (EPA 1985).

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Specific ... Pg. #: O-3-51 Line #: Code:
506 Original Comment # 133
Comment: Shouldn't the variables be u^z and D_z, not u_x and D_x?

Response: Usually the subscript 'x' is used to represent the longitudinal direction irrespective of whether it is vertical or lateral direction.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Pg. #: O-5-1 Line #:27-32 Code:
507 Original Comment # 134
Comment: Add figure showing regional and local model boundaries or references figures in previous report.

Response: Local area model boundaries are shown in Figure O.5-1, regional model boundaries are shown in Figure 20-1 in the Groundwater Report (ASI/IT 1990).

Action: The revised SWCR will reference the Groundwater Report (ASI/IT 1990) for the regional model boundaries.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Pg. #: O-5-5 Line #: Code:

508 Original Comment # 135
Comment: Add figures showing model layering and boundary conditions or references figures in previous report.

Response: Figures 20-8 and 20-9 in the Groundwater Report (ASI/IT 1990) show geologic cross section showing model layers. The text will be revised to include this reference.

Action: Line 11 of page O-5-2 will be revised to read as "The regional and the local model each contain five layers {Figures 20-8 and 20-9 in the Groundwater Report (ASI/IT 1990)}."

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Pg. #: O-5-7 Line #:17-18 Code:

509 Original Comment # 136
Comment: It is unclear what is meant by loading periods of 1-200 years given Figures 401 through 405. Does this refer to time for peak loading? were loadings not included for full 1000 yr simulation period?

Response: In order to reduce the amount of data entry, the simulation period of 1000 years was divided into several loading periods. In general these loading periods ranged from 10 to 200 years in length based on the changes in the loading rates obtained from vadose zone modeling. For example, Figure O.4-5 indicates that loading rates vary sharply between 100 and 200 years, whereas the variation is insignificant between 200 and 1000 years. Therefore a steady state loading of 10 years period between the simulation time of 100 and 200 years and a steady state loading of 200 years period between the simulation time of 200 and 1000 years were used.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Pg. #: O-5-9 Line #:15-20 Code:

510 Original Comment # 137
Comment: Clarify why U238 was the only compound intialized in the transport model.

Response: The response to this comment can be found in lines 10-14, page O-5-9, of the Site-Wide Characterization Report.

Action: None required.

Commenting Organization: Ohio EPA Commentor:
Section #: Appendix O Pg. #: O-5-18 Line #:5-18 Code:

511 Original Comment # 138
Comment: Reference to Figure 5-6 appears to be erroneous as this figure is for t - 10 yrs.

Response: Agreed. References to Figure 5-6 will be changed to Figure 5-8.

Action: In line 6 on page O-5-18, "Figure 5-6" will be changed to "Figure 5-8".

Commenting Organization: Ohio EPA Commentor:

Section #: Appendix O Pg. #: O-5-18 Line #:14-16 Code:

512 Original Comment # 140

Comment: Some discussion of vertical contaminant extent (3-D model is used), sensitivity of predictions to variables and sources or error in numerical prediction of concentration should be added to this discussion.

Response: Agreed. A new section named "Uncertainty in Modeling Results" will be added in the revised Appendix O of the Site-Wide Characterization Report.

Action: Revise the text to incorporate the Section O.6.0 "UNCERTAINTY IN MODELING RESULTS".

TABLE 4-1

REFERENCE DOSES

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
INORGANICS								
Aluminum	ND	ND	ND	ND	ND	ND	ND	b
Antimony	0.0004	ND	ND	reduced lifespan, altered blood chemistries	cancer	1000	ND	c
Arsenic	0.0003	ND	ND	keratosis and hyperpigmentation	ND	3	ND	c
Barium	0.05	0.0001	0.0005	increased blood pressure	fetotoxcity	100	1000	b
Beryllium	0.005	ND	ND	None observed	ND	100	ND	c
Boron	0.09	ND	ND	testicular lesions	NA	100	NA	c
Cadmium (food)	0.001	ND	ND	renal damage	cancer	10	ND	c
Cadmium (water)	0.0005	ND	ND	renal damage	cancer	10	ND	c
Calcium	ND	ND	ND	ND	ND	ND	ND	ND
Chromium (VI)	0.005	0.00000057	2×10^{-6}	Not defined	nasal mucosa atrophy	500	300	b, c
Cobalt	0.06	3×10^{-7}	1×10^{-6}	cardiomyopathy	lung lesions	ND	ND	d, e
Copper	ND	ND	ND	local GI irritation	ND	ND	ND	b
Cyanide	0.02	ND	ND	weight loss, thyroid effects and myelin degeneration	ND	500	ND	c

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Iron	ND	ND	ND	ND	ND	ND	ND	b
Lead	ND	ND	ND	CNS effects	CNS effects	ND	ND	b
Magnesium	ND	ND	ND	ND	ND	ND	ND	ND
Manganese	0.1	0.00011	4×10^{-4}	No effect	respiratory symptoms; psychomotor disturbances	1	900	b, c
Mercury	0.0003	0.000086	3×10^{-4}	kidney effects	neurotoxicity	1000	30	b
Molybdenum	0.005	ND	ND	changes in biochemical indices	urine and blood chemistry	30	ND	f
Nickel	0.02	ND	ND	reduced body weight and organ weight	cancer	300	ND	b
Potassium	ND	ND	ND	ND	ND	ND	ND	ND
Selenium (selenourea)	0.005	ND	ND	selenosis	ND	15	ND	c
Silver	0.003	ND	ND	argyria	ND	2	ND	c
Sodium	ND	ND	ND	ND	ND	ND	ND	ND
Thallium (soluble salts)	0.00007	ND	ND	increased SGOT and serum LDH levels, alopecia	ND	3000	ND	b
Uranium	0.003	ND	ND	nephrotoxicity	ND	1000	ND	c
Vanadium	0.007	ND	ND	None observed	ND	100	ND	b

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TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Zinc	0.2	ND	ND	anemia	ND	10	ND	b
VOLATILES								
1,1,1-Trichloroethane	0.09	0.3	1	hepatotoxicity	hepatotoxicity	1000	1000	b
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	3	7.7		decreased body weight	decreased body weight	100	100	c
1,1-Dichloroethane	0.1	0.1	0.5	none	kidney damage	1000	1000	b
1,1-Dichloroethene	0.009	ND	ND	liver lesions	ND	1000	ND	c
1,2-c-Dichloroethene	0.01	ND	ND	decreased hematocrit & hemaglobin	ND	3000	ND	b
1,2-t-Dichloroethene	0.02	ND	ND	increased serum alkaline phosphatase	ND	1000	ND	b
2-Butanone	0.05	0.09	0.3	fetotoxicity	CNS	1000	1000	b, c
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	b
4-Methyl-2-pentanone (methyl isobutylketone)	0.05	0.02	0.08	liver and kidney effects	liver and kidney effects	1000	1000	b, c

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Acetone	0.1	ND	ND	increased liver; kidney weight, nephrotoxicity	ND	1000	ND	c
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.02	ND	ND	renal cytomegaly	ND	1000	ND	c
Carbon disulfide	0.1	0.0029	0.01	fetal toxicity, malformation	fetal toxicity	100	1000	b, c
Chlorobenzene	0.02	0.005	0.02	liver and kidney effects	liver and kidney effects	1000	10000	b, c
Chloroform	0.01	ND	ND	liver lesions	ND	1000	ND	c
Ethylbenzene	0.1	0.29	1	hepatotoxicity and nephrotoxicity	developmental toxicity	1000	300	b, c
Methylene chloride	0.06	0.86	3	liver toxicity	ND	100	100	b
Tetrachloroethene	0.01	ND	ND	hepatotoxicity	ND	1000	ND	c
Toluene	0.2	0.6	2	changes in liver and kidney weights	CNS effects, eyes and nose irritation	1000	100	c
Total Xylenes	2	0.09	0.3	hyperactivity, decreased BW; increased mortality at higher dosage	CNS effects, nose and throat irritation	100	100	b, c
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND
SEMI-VOLATILES								
2,4-Dimethylphenol	0.02	ND	ND	neurological signs and hematological changes	ND	3000	NA	c
2-Chlorophenol	0.005	ND	ND	reproductive effects	ND	1000	ND	c
2-Methylnapthalene	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol (o-cresol)	0.05	ND	ND	reduced body weight gain, neurotoxicity	ND	1000	ND	c
2-Propanol	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	ND	ND	ND	ND	ND	ND	ND	b
4-Methylphenol (p-cresol)	0.05	ND	ND	reduced body weight gain, neurotoxicity	ND	1000	ND	c
Acenaphthene	0.06	ND	ND	hepatotoxicity	ND	3000	ND	c
Anthracene	0.3	ND	ND	no effects	ND	3000	ND	c
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic acid	4	ND	ND	irritation, malaise	ND	1	ND	c
Bis(2-ethylhexyl) phthalate	0.02	ND	ND	increased relative liver weight	ND	1000	ND	c
Butyl benzyl phthalate	0.2	ND	ND	effects on body weight gain, testes,liver,kidney	ND	1000	ND	c
Chrysene	ND	ND	ND	ND	ND	ND	ND	b
Di-n-butyl phthalate	0.1	ND	ND	mortality	ND	1000	ND	c
Di-n-octyl phthalate	0.02	ND	ND	elevated liver and kidney weights, increased SGOT and SGPT	ND	1000	ND	b
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND	ND	b
Fluoranthene	0.04	ND	ND	nephropathy, liver weight changes,hematological changes	ND	3000	ND	c

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
Fluorene	0.04	ND	ND	hematological changes	ND	3000	ND	c
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	ND	ND
N-nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	ND	b
Napthalene	0.004	ND	ND	dereased body weight gain	ND	10000	ND	b
Pentachlorophenol	0.03	ND	ND	liver and kidney pathology	ND	100	ND	c
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	b
Phenol	0.6	ND	ND	reduced fetal body weight	ND	100	ND	c
Pyrene	0.03	ND	ND	renal effects	ND	3000	ND	c
PESTICIDES / PCBs								
Aroclor-1242	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1254	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.00006	ND	ND	liver necrosis	ND	1000	ND	c

TABLE 4-1
(Continued)

Chemical	Chronic Oral Reference Dose (mg/kg/day)	Chronic Inhalation Reference Dose[a] (mg/kg/day)	Reference Concentration (mg/m^3)	Effect of Concern		Uncertainty Factor		
				Oral	Inhalation	Oral	Inhalation	Reference
1,4-Dioxane	ND	ND	ND	ND	ND	ND	ND	ND
DDT	0.0005	ND	ND	liver lesions	ND	100	ND	c
Ethyl parathion	ND	ND	ND	ND	ND	ND	ND	ND
Methyl parathion	0.00025	ND	ND	reduced hemoglobin,hematocrit and RCBs, cholinesterase inhibition	ND	100	ND	c

List of references:
a - Where only a reference concentration for inhalation is available, derived by assuming a 70kg adult inhales 20m^3 of air per day.
b - US EPA, Health Assessment Effects Summary Tables, Annual FY-1991
c - USEPA IRIS database
d - Oral intake guidance value recommended by U.S. EPA 1992 memorandum from D.L. Forman, U.S. EPA Region III, Philadelphia, PA. Subject: Cobalt toxicity. March 12, 1992.
e - Inhalation RFD/RFC provided by U.S. EPA 1990 memorandum from Pei-Pung Hurst, ECAO, Cincinnati, Ohio to R. Riccio, EPA Region III, Philadelphia, PA. Subject: Toxicity of Cobalt (Halby Chemical/Wilmington, Delaware). October 9, 1990.
f - US EPA, Health Effects Assessment Summary Tables, Annual FY-1992

ND = no data available

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TABLE 4-2

CANCER POTENCY FACTORS

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk ($\mu g/m^3)^{-1}$	Tumor Site		Cancer Classification	Reference
				Oral	Inhalation		
INORGANICS							
Aluminum	ND	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	15	0.0043	skin	respiratory tract	A	b,c
Barium	ND	ND	ND	ND	ND	ND	ND
Beryllium	4.3	8.4	0.0024	total tumors	lung	B2	b
Boron	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	6.1	0.0018	ND	respiratory tract	B1	b
Calcium	ND	ND	ND	ND	ND	ND	ND
Chromium (VI)	ND	41	0.012	ND	lung	A	b
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	ND	ND	ND	ND	ND	ND
Cyanide	ND	ND	ND	ND	ND	D	b
Iron	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	B2	b

TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk $(\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
Magnesium	ND	ND	ND	ND	ND	ND	ND
Manganese	ND	ND	ND	ND	ND	D	b
Mercury	ND	ND	ND	ND	ND	D	b
Molybdenum	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	0.84	0.00024	ND	respiratory tract	A	b
Potassium	ND	ND	ND	ND	ND	ND	ND
Selenium (selenium sulfide)	ND	ND	ND	liver, lung	ND	B2	b
Silver	ND	ND	ND	ND	ND	D	b
Sodium	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	d
Uranium	ND	ND	ND	ND	ND	ND	e
Vanadium	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	ND	ND	D	b
VOLATILES							
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND

TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk $(\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
1,1,2,2-Tetrachloroethane	0.2	0.2	5.8×10^{-5}	liver	liver	C	b
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	hemangio sarcoma	ND	C	b
1,1-Dichloroethene	0.6	1.2	5×10^{-5}	adrenal	kidney	C	b
1,2-c-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
1,2-t-Dichloroethene	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	D	b
2-Hexanone	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND
Acetone	ND	ND	ND	ND	ND	ND	ND
Benzene	0.029	0.029	8.3×10^{-6}	leukemia	leukemia	A	b
Bromodichloromethane	0.13	ND	ND	liver	NA	B2	b
Carbon disulfide	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.0061	0.081	2.3×10^{-5}	kidney	liver	B2	b
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND

TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk $(\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
Methylene chloride	0.0075	0.0016	4.7×10^{-7}	liver	lung, liver	B2	b
Tetrachloroethene	0.051	0.0018	5.2×10^{-7}	liver	leukemia, liver	B2	d
Toluene	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.011	0.017	1.7×10^{-6}	liver	lung	B2	d
Vinyl chloride	1.9	0.29	8.4×10^{-5}	lung	liver	A	d
SEMI-VOLATILES							
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND
2-Chlorophenol	ND	ND	ND	ND	ND	ND	ND
2-Methylnapthalene	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol (o-cresol)	ND	ND	ND	ND	ND	C	b
2-Propanol	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol (p-cresol)	ND	ND	ND	ND	ND	C	b
Acenaphthene	ND	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND	ND

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TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk $(\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
Benzo(a)anthracene	5.8	6.1	ND	ND	ND	B2	d, f
Benzo(a)pyrene	5.8	6.1	0.0017	fore stomach	respiratory tract	B2	g
Benzo(b)fluoranthene	5.8	6.1	ND	ND	ND	B2	d, f
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	5.8	6.1	ND	ND	ND	B2	d, f
Benzoic acid	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) phthalate	0.014	ND	ND	liver	ND	B2	b
Butyl benzyl phthalate	ND	ND	ND	ND	ND	C	b
Chrysene	5.8	6.1	ND	ND	ND	B2	d, f
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	5.8	6.1	ND	ND	ND	B2	d, f
Dibenzofuran	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	5.8	6.1	ND	ND	ND	B2	d, f

3995

TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk ($\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
N-nitrosodiphenylamine	0.0049	ND	ND	urinary bladder	ND	B2	b
Napthalene	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	0.12	ND	ND	liver, adrenal, circulatory system	ND	B2	d
Phenanthrene	ND	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND	ND
PESTICIDES / PCBs							
Aroclor-1242	7.7	ND	ND	liver	ND	B2	b
Aroclor-1248	7.7	ND	ND	liver	ND	B2	b
Aroclor-1254	7.7	ND	ND	liver	ND	B2	b
Aroclor-1260	7.7	ND	ND	liver	ND	B2	b
Chlordane	1.3	1.3	0.00037	liver	liver	B2	b

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TABLE 4-2
(Continued)

Chemical	Oral Cancer Slope Factor [(mg/kg/day)-1]	Inhalation Cancer Slope Factor[a] [(mg/kg/day)-1]	Unit Risk ($\mu g/m^3)^{-1}$	Tumor Site: Oral	Tumor Site: Inhalation	Cancer Classification	Reference
1,4-Dioxane	0.011	ND	ND	nasal cavity, liver	ND	B2	b
DDT	0.34	0.34	9.7×10^{-5}	liver	liver	B2	b
Ethyl parathion	ND	ND	ND	ND	ND	ND	ND
Methyl parathion	ND	ND	ND	ND	ND	ND	ND

List of references:
a - Where only a unit risk for inhalation is available derived by assuming a 70 kg adult inhales $20m^3$ of air/day.
b - USEPA IRIS data base
c - The HEAST presented an inhalation slope factor of 50 (mg/kg-day)-1, based on absorbed dose (absorption factor of 0.3). A risk of 15 $(mg/kg\text{-}day)^{-1}$ based on ambient dose is the value used in this risk assessment.
d - US EPA, Health Effects Summary Tables, Annual FY-1991
e - No data for chemically induced carcinogenicity - radiocarcinogenicity of uranium isotopes are discussed elsewhere.
f - Slope factors for benzo(a)pyrene used for B2 PAHs.
g - U.S.EPA, Health Effects Summary Tables, Annual FY 1992.

ND = no data available

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ATTACHMENT I

Fernald Site-Wide Characterization Report
Additional Toxicity Profiles

ANTIMONY

Noncancer Toxicity

Chronic oral exposure studies in laboratory animals include two briefly reported lifetime drinking water studies with potassium antimony tartrate in rats and mice that reported reduced longevity in both species and reduced mean heart weight and altered blood chemistry in the rats (U.S. EPA, 1992). A verified chronic oral RfD of 0.0004 mg/kg-day was based on the rat study and an uncertainty factor of 1000.

Chronic effects from occupational exposure include irritation of the respiratory tract, pneumoconiosis, pustular eruptions of the skin called "antimony spots", allergic contact dermatitis, and cardiac effects, including abnormalities of the ECG and myocardial changes (Elinder and Friberg, 1986). Cardiac effects were also observed in rats and rabbits exposed by inhalation for six weeks and in animals (dogs, and possibly other species) treated by intravenous injection. Inhalation RfC values were not located. The heart, respiratory tract and skin are the principal target organs for antimony.

Carcinogenicity

Data were not located regarding the carcinogenicity of antimony to humans. Antimony fed to rats did not produce an excess of tumors (Goyer, 1991), but a high frequency of lung tumors was observed in rats exposed by inhalation to antimony trioxide for one year (Elinder and Friberg, 1986). U.S. EPA (1991) has not evaluated the carcinogenicity of antimony.

References for Antimony

Elinder, C.-G. and L. Friberg. 1986. Antimony. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 26-42.

Goyer, R.A. 1991. Toxic Effects of Metals. In: M.O. Amdur, J.Doull and C.D. Klaassen, eds. Casarett and Doull's Toxicology, The Basic Science of Poisons. Fourth Edition. New York: Pergamon Press. pp. 623-680.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

AROCLORS 1248, 1254, 1260 (PCBs)

Noncancer Toxicity

Epidemiologic studies of women in the U.S. associated oral PCB exposure with low birth weight or retarded musculoskeletal or neurobehavioral development of their infants (ATSDR, 1991). Oral studies in animals establish the liver as the target organ in all species, and the thyroid as an additional target organ in the rat. Effects observed in monkeys included gastritis, anemia, chloracne-like dermatitis and immunosuppression. Oral treatment of animals induced developmental effects, including retarded neurobehavioral and learning development in monkeys. Neither verified nor provisional chronic oral RfD values were located for any of the Aroclors.

Occupational exposure to PCBs was associated with upper respiratory tract and ocular irritation, loss of appetite, liver enlargement, increased serum concentrations of liver enzymes, skin irritation, rashes and chloracne, and, in heavily exposed female workers, decreased birth weight of their infants (ATSDR, 1991). Concurrent exposure to contaminants confound the interpretation of the occupational exposure studies. Laboratory animals exposed by inhalation to Aroclor 1254 vapors exhibited moderate liver degeneration, decreased body weight gain and slight renal tubular degeneration. Neither verified nor provisional chronic inhalation RfC values are available.

Target organs for PCBs include the skin, liver, fetus and neonate.

Carcinogenicity

U.S. EPA (1991) classified the PCBs as EPA cancer weight-of-evidence Group B2 substances (probable human carcinogens), based on inadequate data in humans and sufficient data in animals. The human data consisted of several epidemiologic occupational and accidental oral exposure studies with serious limitations, including poorly quantified concentrations of PCBs and durations of exposure, and probable exposures to other potential carcinogens (U.S. EPA, 1992).

The animal data consist of several oral studies in rats and mice with various Aroclors, Kanechlors or Clophens (commercial PCB mixtures manufactured in the U.S., Japan and Germany, respectively) that reported increased incidence of liver tumors in both species (U.S. EPA, 1992).

(U.S. EPA, 1991) presented a verified oral slope factor of 7.7 per mg/kg-day for all PCBs based on liver tumors in rats treated with Aroclor 1260.

References for Aroclors

ATSDR (Agency for Toxic Substances and Disease Registry). 1991. Toxicological Profile for Selected PCBs (Aroclor-1260, -1254, -1248, -1242, -1232, -1221, and -1016). Draft for Public Comment. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria

and Assessment Office, Cincinnati, OH.

ARSENIC

Noncancer Toxicity

The only noncancer effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (U.S. EPA, 1992). Similar effects were observed in persons exposed to high levels of arsenic in water in the western hemisphere. Occupational (predominantly inhalation) exposure is also associated with neurological deficits, anemia, and cardiovascular effects (Ishinishi et al., 1986). U.S. EPA (1991) presented an RfD of 0.0003 mg/kg-day for chronic oral exposure, based on a NOAEL from the Chinese data and an uncertainty factor of 1. The principal target organs for arsenic are the skin, nervous system, blood and cardiovascular system.

Carcinogenicity

Inorganic arsenic is clearly a carcinogen in humans (U.S. EPA, 1992). Inhalation exposure was associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant. Oral exposure to high levels in well water was associated with increased risk of skin cancer. U.S. EPA (1991) classified inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen). An inhalation slope factor of 50 per mg/kg-day, based on absorbed arsenic, was derived from occupational data. Applying an absorption factor of 0.3 yields an inhalation slope factor of 15 per mg/kg-day, based on ambient or inhaled dose. The slope factor based on inhaled, rather than absorbed, dose is the correct parameter to use in risk assessments. Assuming a human inhales 20 m^3 of air/day and weighs 70 kg, U.S. EPA (1991) estimated an inhalation unit risk of 0.0043 $\mu g/m^3$.

References for Arsenic

Ishinishi, N., K. Tsuchiya, M. Vahter and B.A. Fowler. 1986. Arsenic. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 43-83.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

BARIUM

Noncancer Toxicity

The acute oral toxicity of barium is manifested by gastrointestinal (GI) upset, altered cardiac

performance and transient hypertension, and convulsions and muscular paralysis (Reeves, 1986). Repeated oral exposures are associated with hypertension. Occupational exposure to insoluble barium sulfate induces benign pneumoconiosis (ACGIH, 1991). U.S. EPA (1991) presented a provisional chronic oral RfD of 0.05 mg/kg-day, based on increased blood pressure in a 16-month study in rats with barium chloride in drinking water, and an uncertainty factor of 100. A provisional chronic inhalation RfC of 0.0005 mg/m^3 is based on a NOEL for fetotoxicity of 0.8 mg/m^3 in a four-month intermittent-exposure inhalation study with barium carbonate in rats and an uncertainty factor of 1000 (U.S. EPA, 1991). The equivalent chronic inhalation RfD value is 0.0001 mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg. Barium is principally a muscle toxin. Its targets are the GI system, skeletal muscle and the cardiovascular system. The fetus also appears to be a target.

Carcinogenicity

The U.S. EPA (1991) has not yet evaluated the carcinogenicity of barium.

References for Barium

ACGIH (American Conference of Governmental Industrial Hygienists). 1991. Documentation of the Threshold Limit Values and Biological Exposure Indices. Sixth Edition. Cincinnati, OH. pp. 102-105.

Reeves, A.L. 1986. Barium. In: L. Friberg, G.F. Nordberg and V.B. Vouk, eds. Handbook on the Toxicology of Metals. Volume II. New York: Elsevier Science Publishers B.V. p. 84-94.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

BENZENE

Noncancer Toxicity

Chronic oral RfD or inhalation RfD or RfC values for benzene were not located. In humans, short-term exposure to benzene induces central nervous system (CNS) effects such as drowsiness, dizziness and headaches; long-term exposure may induce anemia (ATSDR, 1989). Oral dosing in animals induces hematopoietic effects. The CNS and the hematopoietic system are the target organs of benzene.

Carcinogenicity

U.S. EPA (1991) classified benzene in cancer weight-of-evidence Group A chemical (human carcinogen) based on several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, supported by an increased incidence of neoplasia in rats and mice exposed by inhalation and gavage. A verified oral and inhalation slope factor of 0.029 per mg/kg-day is based on the increased incidence of leukemia in several occupational (inhalation exposure) studies. The inhalation unit risk, based on the assumption that humans inhale 20 m^3 of air/day and weigh 70 kg, is 8.3 x 10^{-6} per ug/m^3.

References for Benzene

ATSDR (Agency for Toxic Substances and Disease Registry). 1989. Toxicological Profile for Benzene. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1991. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

BENZO(a)PYRENE

Noncancer Toxicity

In laboratory animals, oral treatment with benzo(a)pyrene gives rise to pancytopenia, induced hepatic and renal tissue enzyme activities, increased fetal loss, and increased incidence of malformations in fetal rats and mice (ATSDR, 1990). No provisional or verified oral RfD or inhalation RfC or RfD values were located. The liver, blood and fetus are the target organs of benzo(a)pyrene.

Carcinogenicity

U.S. EPA (1992) classified benzo(a)pyrene a cancer weight-of-evidence Group B2 compound (probable human carcinogen) and provided an oral slope factor of 5.8 per mg/kg-day based on the incidence of forestomach tumors in dietary studies in rats and mice. An inhalation slope factor of 6.1 per mg/kg-day, and an inhalation unit risk of 0.0017 per $\mu g/m^3$/day was based on the incidence of respiratory tract tumors in hamsters exposed by inhalation.

References for Benzo(a)pyrene

ATSDR (Agency for Toxic Substances and Disease Registry). 1990. Toxicological Profile for Polycyclic Aromatic Hydrocarbons: Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i,)perylene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Phenanthrene, Pyrene. Draft for Public Comment. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1992. Health Effects Assessment Summary Tables. Annual Update FY 1992, including Supplement A, July, 1992. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

BERYLLIUM

Noncancer Toxicity

Beryllium has a low order of toxicity when ingested because it is poorly absorbed from the GI tract (Reeves, 1986). Occupational exposure induces dermatitis, acute pneumonitis and chronic pulmonary granulomatosis (berylliosis). Berylliosis was also observed in humans living in the vicinity of a beryllium plant. Pulmonary effects also occur in laboratory animals subjected to inhalation exposure. A verified chronic oral RfD value of 0.005 mg/kg-day was based on a NOAEL of 0.54 mg/kg/day in a lifetime drinking water study with beryllium sulfate in rats and an

uncertainty factor of 100 (U.S. EPA, 1991). The target organ for inhalation exposure appears to be the lung; a target organ is not identified for oral exposure.

Carcinogenicity

U.S. EPA (1991) classified beryllium in cancer weight-of-evidence Group B2 (probable human carcinogen) based on inadequate human data and sufficient animal data. The human data consist of occupational studies that weakly associate exposure with increased risk of lung cancer, but confounding variables were not controlled and the studies lacked sensitivity. A significant increase in lung tumors occurred in three strains of rats and in rhesus monkeys subjected to inhalation exposure or intratracheal instillation of a variety of beryllium compounds. Osteogenic sarcomas were induced in rabbits and mice, but not in rats or guinea pigs injected intravenously with various beryllium compounds. Oral studies in animals yielded inconclusive results. U.S. EPA (1991) derived an oral slope factor of 4.3 per mg/kg-day from a slight but statistically non-significant increase in total tumors in a lifetime drinking water study with beryllum sulfate in rats. An inhalation unit risk of 0.0024 per $\mu g/m^3$, equivalent to 8.4 per mg/kg-day (assuming humans inhale 20 m^3 of air/day and weigh 70 kg), was derived from a human occupational study.

References for Beryllium

Reeves, A.L. 1986. Beryllium. In: L. Friberg, G.F. Nordberg and V.B. Vouk, eds. Handbook on the Toxicology of Metals. Volume II. New York: Elsevier Science Publishers B.V. pp. 95-116.

U.S. EPA. 1991. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

BORON

Noncancer Toxicity

Acute exposure to boron compounds induces GI irritation and CNS depression (ACGIH, 1991). Occupational exposure induces respiratory tract irritation. Several dietary and drinking water studies with boron (form not specified) in dogs, rats and mice identified testicular atrophy and impaired spermatogenesis as the critical effect of oral exposure to boron (U.S. EPA, 1992). Other effects include reduced body and organ weights, reduced ovulation in female rats, and possibly increased extramedullary hematopoiesis in the spleen. U.S. EPA (1991) presented a verified RfD of 0.09 mg/kg-day for chronic oral exposure to boron, based on a NOAEL in a two-year dietary study in dogs (form of boron not specified). An uncertainty factor of 100 was used. The principal target organs of boron are the testis, respiratory mucosa and CNS.

Carcinogenicity

The carcinogenicity of boron has not been evaluated by the U.S. EPA (1991).

References for Boron

ACGIH (American Conference of Governmental Industrial Hygienists). 1991. Documentation of the Threshold Limit Values and Biological Exposure Indices. Sixth Edition. Cincinnati, OH. p.

141-142.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

2-BUTANONE (METHYL ETHYL KETONE)

Noncancer Toxicity

Data for oral exposure to 2-butanone were not located. U.S. EPA (1991) presented a verified RfD for chronic oral exposure of 0.05 mg/kg-day, based on a NOAEL in a 12-week inhalation exposure study in rats. An uncertainty factor of 1000 was applied.

Humans exposed to 2-butanone vapor concentration of 100 ppm for 10 minutes reported slight nose and throat irritation (U.S. EPA, 1992). Exposure to 300 ppm was intolerable. The critical effect of 2-butanone in animals appears to be developmental toxicity. U.S. EPA (1991) presented a provisional chronic inhalation RfC of 0.3 mg/m^3, equivalent to 0.09 mg/kg-day for a 70-kg human inhaling 20 m^3 of air/day, based on a NOAEL for developmental effects in mice. An uncertainty factor of 1000 was applied. Target organs for 2-butanone are the fetus, respiratory tract and the CNS.

Carcinogenicity

2-Butanone is classified by the U.S. EPA (1991) as a verified cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans).

References for 2-Butanone

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991 Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

CADMIUM

Noncancer Toxicity

U.S. EPA (1991) presented verified chronic oral RfD values of 0.0005 mg/kg-day for cadmium ingested in water and 0.001 mg/kg-day for cadmium ingested in food. Medium-specific oral RfD values reflect the assumption that cadmium is more efficiently absorbed from water than from food. The RfD values are based on a NOAEL for proteinuria, a sensitive indicator of renal toxicity, determined from several human exposure studies and an uncertainty factor of 10.

Occupational exposure to fumes of cadmium induce metal fume fever (ACGIH, 1991). The principal target organ for oral exposure to cadmium is the kidney.

Carcinogenicity

Cadmium is classified as an EPA cancer weight-of-evidence Group B1 chemical (probable human carcinogen) based on limited evidence from occupational studies and sufficient evidence of carcinogenicity in rats and mice following inhalation exposure or parenteral injection (U.S. EPA, 1991). There is insufficient information to classify cadmium as carcinogenic to humans by the oral route. A provisional inhalation slope factor of 6.1 per mg/kg-day and a unit risk of 0.0018 per ug/m^3 (assuming humans weigh 70 kg and inhale 20 m^3 of air/day) is based on the incidence of lung cancer in cadmium smelter workers.

References for Cadmium

ACGIH (American Conference of Governmental Industrial Hygienists). 1991. Documentation of the Threshold Limit Values and Biological Exposure Indices. Sixth Edition. Cincinnati, OH. p. 190-194.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

CHROMIUM (VI)

Noncancer Toxicity

Little chromium (VI) exists in biological materials, except shortly after exposure, because reduction to chromium (III) occurs rapidly (Langård and Norseth, 1986). Chromium (III) is considered a nutritionally essential trace element and is considerably less toxic than chromium (IV). Acute oral exposure of humans to high doses of chromium (VI) induces neurological effects, GI hemorrhage and fluid loss, and kidney and liver effects. Parenteral dosing of animals with chromium (VI) is selectively toxic to the kidney tubules. A NOAEL of 2.4 mg chromium (VI)/kg-day in a one-year drinking water study in rats with potassium permanganate and an uncertainty factor of 500 was the basis of a verified RfD for chronic oral exposure of 0.005 mg/kg-day (U.S. EPA, 1991).

Occupational (inhalation and dermal) exposure to chromium (VI) induces ulcerative and allergic contact dermatitis, irritation of the upper respiratory tract including ulceration of the mucosa and perforation of the nasal septum, and possibly kidney effects (ACGIH, 1991). A provisional chronic inhalation RfC for total chromium of 0.002 μg/m^3, equivalent to 0.00057 μg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg, is presented by U.S. EPA (1991). The derivation was based on human data and an uncertainty factor of 300.

Target organs for dermal and inhalation exposure include the skin and respiratory mucosa.

Carcinogenicity

U.S. EPA, (1991) classified chromium (VI) a cancer weight-of-evidence Group A substance (human carcinogen), based on the consistent observation of increased risk of lung cancer in occupational studies of workers in chromate production and the chrome pigment industry. Parenteral dosing of animals with chromium (VI) compounds consistently induced injection-site tumors. There is no evidence that oral exposure to chromium (VI) induces cancer. A verified inhalation unit risk of 0.012 per $\mu g/m^3$, equivalent to 41 per mg/kg-day (assuming humans inhale 20 m^3 of air/day and weigh 70 kg), was based on increased risk of lung cancer deaths in chromate production workers.

References for Chromium

ACGIH (American Conference of Governmental Industrial Hygienists). 1991. Documentation of the Threshold Limit Values and Biological Exposure Indices. Sixth Edition. Cincinnati, OH. pp. 312-315.

Langård, S and T. Norseth. 1986. Chromium In: L. Friberg, G.F. Nordberg and V.B. Vouk, eds. Handbook on the Toxicology of Metals. Volume II. New York: Elsevier Science Publishers B.V. pp. 185-210.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

COBALT

Noncancer Toxicity

Acute high oral or parenteral doses of cobalt in humans and animals induce myocardial degeneration often leading to mortality, erythropoiesis, enlarged thyroid, and, in animals, renal tubular degeneration (Elinder and Friberg, 1986). Chronic ingestion from the consumption of beer containing high concentrations of cobalt is associated with a condition called "beer-drinkers cardiomyopathy", which includes polycythemia, goiter, as well as marked myocardial degeneration and mortality. The therapeutic use of 0.16 to 0.32 mg cobalt/kg-day in anemic, anephric dialysis patients for 12 to 32 weeks induced a significant, but reversible, rise in blood hemoglobin concentration (U.S. EPA, 1992a).

Occupational (inhalation and dermal) exposure is associated with allergic dermatitis, chronic interstitial pneumonitis, reversibly impaired lung function, occupational asthma, and myocardial effects (ACGIH, 1991). Cobalt has been determined to be the etiologic factor in hard metal disease, the syndrome of respiratory symptoms and pneumoconiosis associated with inhalation exposure to dusts containing tungsten carbide with cobalt powder as a binder (Elinder and Friberg, 1986). The lowest occupational air concentration of cobalt associated with hard metal disease was 0.003 mg cobalt/m^3 (Sprince et al., 1988). It should be noted that the workers were also exposed to tungsten and sometimes to titanium, tantalum and niobium (Elinder and Friberg, 1986). Similar lung effects are seen in animals exposed to cobalt by inhalation.

The developmental toxicity of cobalt was tested in rodents treated orally with cobalt chloride (U.S. EPA, 1992a). Maternal effects (unspecified) were reported in rats treated with 5.4 to 21.8 mg cobalt/kg-day from gestation day 14 through lactation day 21. Effects on the offspring included stunted growth at 5.4 mg cobalt/kg-day and reduced survival at 21.8 mg cobalt/kg-day. In rats treated with 6.2, 12.4 or 24.8 mg cobalt/kg-day on gestation days 6-15, maternal effects included reduced food consumption and body weight gain and altered hematologic parameters, although it is unclear at what dose level(s) these effects occurred. There were no effects on fetal survival, although a nonsignificant increase in fetal stunting was observed in rats treated with ≥12.4 mg cobalt/kg-day. In mice, treatment with 81.7 mg cobalt/kg/day caused reduced maternal weight gain, but had no fetal effects.

Several studies reported testicular degeneration and atrophy in rats treated with cobalt chloride in the diet or drinking water at concentrations equivalent to doses of 5.7 to 30.2 mg cobalt/kg-day (U.S. EPA, 1992a).

Cobalt is nutritionally essential as a cofactor in cyanocobalamin (vitamin B12) (U.S. EPA, 1992a). The element is ubiquitous and universally present in the diet. Average daily adult dietary intakes of cobalt range from 0.16 to 0.58 mg/day (0.002 to 0.008 mg/kg-day, assuming adults weigh 70 kg) (Tipton et al., 1966; Schroeder et al., 1967). In 9- to 12-year-old children, dietary intakes of cobalt range from 0.3 to 1.77 mg/day (Murthy et al., 1971; NRC, 1989). Assuming an average weight for children in this age range of 28 kg (NRC, 1989), the dietary intakes are equivalent to 0.01 to 0.06 mg/kg-day.

The U.S. EPA (1992a) concluded that the oral toxicity data were insufficient for derivation of an oral RfD for cobalt. The relatively well characterized dietary intake data, however, can provide useful guidance. U.S. EPA (1992a) noted that the upper range of dietary intake for children, 0.06 mg/kg-day, was below the level associated with enhanced erythropoiesis in anephric patients. Therefore, the upper range of dietary intake, 0.06 mg cobalt/kg-day, can be considered a guidance level for the oral intake of cobalt and can be used in place of an oral RfD in CERCLA and RCRA risk assessments.

U.S. EPA (1990) derived an interim inhalation RfC from the LOAEL of 0.003 mg cobalt/m^3 associated with hard metal disease in occupationally exposed humans. Correcting for intermittent occupational exposure (10 m^3 of air inhaled per work day/20 m^3 of air inhaled per day x 5 work days per week/7 days per week) yields an adjusted LOAEL of 0.001 mg/m^3. Application of an uncertainty factor of 1000 [10 for use of a LOAEL, 10 to protect sensitive individuals and 10 to account for disparity between latency period and exposure duration (not further explained)] results in an interim chronic RfC of 1×10^{-6} mg/m^3. Assuming humans inhale 20 m^3 of air/day and weigh 70 kg, the RfC is equivalent to 2.9×10^{-7} mg/kg-day, rounded to 3×10^{-7} mg/kg/day.

Important target organs in orally exposed humans are the heart, erythrocyte and thyroid. Target organs for occupational exposure are the skin, lungs and heart.

Carcinogenicity

The carcinogenicity of cobalt has not yet been evaluated by the U.S. EPA (1992b, c).

References for Cobalt

ACGIH (American Conference of Governmental Industrial Hygienists). 1991. Documentation of the Threshold Limit Values and Biological Exposure Indices. Sixth Edition. Cincinnati, OH. pp. 330-332.

Bucher, J.R., M.R. Elwell, M.B. Thompson, et al. 1990. Inhalation toxicity studies of cobalt sulfate in F344/N rats and B6C3F1 mice. Fundamental and Applied Toxicology 15: 357-372.

Elinder, C.-G and L. Friberg. 1986. Cobalt. In: L. Friberg, G.F. Nordberg and V.B. Vouk, eds. Handbook on the Toxicology of Metals. Volume II. New York: Elsevier Science Publishers B.V. pp. 211-232.

Murthy, G.K., U. Rhea and J.T. Peeler. 1971. Levels of antimony, cadmium, chromium, cobalt, manganese, and zinc in institutional total diets. Environ. Sci. Technol. 5: 436-442. (Cited in U.S. EPA, 1992a).

NRC (National Research Council). 1989. Recommended Daily Allowances. Tenth edition. Subcommittee on the Tenth Edition of the RDAs. Food and Nutrition Board. (Cited in U.S. EPA, 1992a).

Schroeder, H.A., A.P. Nason and I.H. Tipton. 1967. Essential trace elements in man: Cobalt. Journal of Chronic Diseases 20: 869-890. (Cited in U.S. EPA, 1992a).

Sprince, N.L., L.C. Oliver, E.A. Eisen, et al. 1988. Cobalt exposure and lung disease in tungsten carbide production: A cross-sectional study of current workers. Am. Rev. Respir. Dis. 138: 1220-1226. (Cited in U.S. EPA, 1990).

Tipton, I.H., P.L. Stewart and P.G. Martin. 1966. Trace elements in diets and excreta. Health Phys. 12: 1683-1689. (Cited in U.S. EPA, 1992a).

U.S. EPA. 1990. Memorandum from Pei-Fung Hurst, ECAO, Cincinnati, OH to R. Riccio, EPA Region III, Philadelphia, PA. Subject: Toxicity of Cobalt (Halby Chemical/Wilmington, Delaware). Dated October 9, 1990.

U.S. EPA. 1992a. Memorandum from D.L. Forman, U.S. EPA Region III, Philadelphia, PA. Subject: Cobalt Toxicity. Dated March 12, 1992.

U.S. EPA. 1992b. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

U.S. EPA. 1992c. Health Effects Assessment Summary Tables. Annual Update FY 1992, including Supplement A, July, 1992. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

CYANIDE

Noncancer Toxicity

Acute exposure to cyanide induces histotoxic hypoxia (inability of the tissues to use oxygen); death is due to central respiratory arrest (Smith, 1991). Chronic dietary exposure to cyanide induces reduced body weight gain, decreased thyroid activity, myelin degeneration and reduced

fertility in rats (U.S. EPA, 1992). U.S. EPA (1991) presented a verified RfD of 0.02 mg/kg-day for oral exposure to cyanide, based on a NOAEL in a two-year study in rats that consumed food fumigated with hydrogen cyanide, and an uncertainty factor of 500. The target organs for chronic oral exposure to cyanide appear to be the thyroid and nervous system.

Carcinogenicity

U.S. EPA (1991) classified cyanide as a cancer weight-of-evidence Group D substance (not classifiable as to carcinogenicity to humans).

References for Cyanide

Smith, R.P. 1991. Toxic Responses of the Blood. In: M.O. Amdur, J. Doull and C.D. Klaassen, eds. Casarett and Doull's Toxicology, The Basic Science of Poisons. Fourth Edition. New York: Pergamon Press. p. 257-281.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

DIBENZOFURAN

Noncancer Toxicity

Although data associate the polychlorinated dibenzofurans in mixtures with PCBs and polychlorinated dibenzo-p-dioxins with chloracne and other effects in humans (ATSDR, 1992), data were not located regarding the oral or inhalation toxicity of unsubstituted dibenzofuran. Neither provisional nor verified oral RfD values nor inhalation RfC or RfD values were located (U.S. EPA, 1991). Target organs for dibenzofuran have not been identified.

Carcinogenicity

Although data associate the polychlorinated dibenzofurans in mixtures with PCBs and polychlorinated dibenzo-p-dioxins with cancer in humans (ATSDR, 1992), data were not located regarding the carcinogenicity of unsubstituted dibenzofuran. U.S. EPA (1991) classified dibenzofuran a cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans) because of the lack of data.

References for Dibenzofuran

ATSDR (Agency for Toxic Substances and Disease Registry). 1992. Toxicological Profile for Selected PCBs (Aroclor-1360, -1254, -1248, -1242, -1232, -1221, and -1016). Draft for Public Comment. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991.

Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

LEAD

Noncancer Toxicity

The noncancer toxicity of lead has been well characterized through decades of medical observation and scientific research (U.S. EPA, 1992). The primary effects of long-term exposure to levels expected to be encountered in the environment are neurological and hematological. Some of the effects on the blood, particularly changes in levels of certain blood enzymes, and subtle neurobehavioral changes in children, appear to occur at levels so low as to be considered non-threshold effects. In part for this reason the RfD/RfC Work Group considered inappropriate the derivation of an RfC or RfD for inhalation exposure, or an RfD for oral exposure (U.S. EPA, 1991). The principal target organs of lead are the CNS and the hematopoietic system.

Carcinogenicity

Lead is assigned to cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence in humans and sufficient animal evidence (U.S. EPA, 1991). Rat and mouse bioassays have shown statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. The EPA declined to quantitatively estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk (U.S. EPA, 1992).

References for Lead

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

MANGANESE

Noncancer Toxicity

U.S. EPA (1991) presented a verified chronic oral RfD of 0.1 mg/kg-day based on a NOEL for humans in chronic dietary intake studies and an uncertainty factor of 1. U.S. EPA (1991) also presented a provisional chronic inhalation RfC of 0.0004 mg/m^3 based on a LOAEL for respiratory symptoms and psychomotor disturbances in occupationally exposed humans and an uncertainty factor of 900. The inhalation RfC is equivalent to 0.00011 mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg. The CNS and respiratory tract are target organs of inhalation exposure to manganese.

Carcinogenicity

U.S. EPA (1991) classified manganese in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans).

References for Manganese

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

MERCURY

Noncancer Toxicity

Acute oral exposure to high doses of inorganic mercury causes severe damage to the GI mucosa, which may lead to bloody diarrhea, shock, circulatory collapse and death (Berlin, 1986). Acute sublethal poisoning induces severe kidney damage. Chronic exposure induces an autoimmune glomerular disease and renal tubular injury. U.S. EPA (1991) presented a verified RfD of 0.0003 mg/mg-day for chronic oral exposure to inorganic mercury, based on kidney effects in rats and an uncertainty factor of 1000. The form of mercury used in these experiments was not described. Occupational exposure induces neurotoxicity (Berlin, 1986). U.S. EPA (1991) also presented a verified chronic inhalation RfC of 0.0003 mg/m^3, based on occupational data and an uncertainty factor of 30. The RfC is equivalent to 8.6×10^{-5} mg/kg/day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg. Target organs for inorganic mercury include the GI tract, the CNS and kidney.

Carcinogenicity

U.S. EPA (1991) classified mercury in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans).

References for Mercury

Berlin, M. 1986. Mercury. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 387-445.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

METHYLENE CHLORIDE

Noncancer Toxicity

Occupational exposure to high concentrations of methylene chloride may induce liver damage (ACGIH, 1986). U.S. EPA (1991) presented a verified chronic oral RfD for methylene chloride of 0.06 mg/kg-day based on a NOAEL for liver toxicity in male and female rats in chronic drinking water studies and an uncertainty factor of 100. A verified chronic inhalation RfC of 3

mg/m^3, derived from a NOAEL for liver toxicity in a two-year intermittent exposure inhalation study in rats and an uncertainty factor of 100, is also presented. The inhalation RfC is equivalent to 0.86 mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg. The principal target organ for methylene chloride is the liver.

Carcinogenicity

Methylene chloride is classified in EPA cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate human data and sufficient evidence of carcinogenicity in animals (U.S. EPA, 1992). Animal inhalation studies showed increased incidence of hepatocellular neoplasms and alveolar/bronchiolar neoplasms in male and female mice, mammary tumors in rats of either sex, salivary gland sarcomas in male rats and leukemia in female rats. Oral studies were inconclusive. An oral slope factor of 0.0075 per mg/kg-day was based on the incidence of liver tumors in two inhalation studies in mice (U.S. EPA, 1991). An inhalation unit risk of 4.7×10^{-7} per ug/m^3 was based on the incidence of liver and lung tumors in one inhalation study. The equivalent inhalation slope factor is 0.0016 per mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg.

References for Methylene Chloride

ACGIH (American Conference of Governmental Industrial Hygienists). 1986. Documentation of the Threshold Limit Values and Biological Exposure Indices. Fifth Edition. Cincinnati, OH. p. 391-392.4.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

METHYL PARATHION

Noncancer Toxicity

Methyl parathion inhibits cholinesterase activity in animals and humans, reduces erythrocyte count, hematocrit and blood hemoglobin concentration, and may induce degeneration in the peripheral nerves of laboratory animals (U.S. EPA, 1992). U.S. EPA (1991) presented a verified RfD of 0.00025 mg/kg-day for chronic oral exposure based on a NOEL for cholinesterase inhibition and effects on the erythrocytes in a two-year dietary study in rats. An uncertainty factor of 100 was used. Target organs of methyl parathion are the erythrocyte and nervous system.

Carcinogenicity

U.S. EPA (1991) has not evaluated the carcinogenicity of methyl parathion.

References for Methyl Parathion

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

NICKEL

Noncancer Toxicity

U.S. EPA (1991) presented a verified RfD of 0.02 for chronic oral exposure to nickel, based on a NOAEL for decreased organ and body weights in a two-year dietary study with nickel sulfate in rats. An uncertainty factor of 300 was used. In a subchronic study with nickel chloride in water, clinical signs of toxicity included lethargy, ataxia, irregular breathing, reduced body temperature, salivation and discolored extremities (U.S. EPA, 1992). These clinical signs suggest the CNS may be a target for the toxicity of nickel.

Carcinogenicity

Occupational exposure to nickel was associated with increased risk of nasal, laryngeal and lung cancer (ATSDR, 1988). Inhalation exposure of rats to nickel subsulfide increased the incidence of lung tumors. U.S. EPA (1991) presented a cancer weight-of-evidence Group A classification (human carcinogen) for nickel, and presented an inhalation slope factor of 0.84 per mg/kg-day and an inhalation unit risk of 0.00024 per $\mu g/m^3$ for nickel refinery dust. The quantitative estimates were derived from the human occupational studies.

References for Nickel

ATSDR (Agency for Toxic Substances and Disease Registry). 1988. Toxicological Profile for Nickel. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

SELENIUM

Noncancer Toxicity

Selenium is a nutritionally essential trace element that is an integral part of the enzyme glutathione peroxidase and other proteins (Högberg and Alexander, 1986). NRC (1989) recommended dietary allowances (RDAs) for humans range from 10-75 µg/day. Chronic ingestion of 5 mg/day (0.071 mg/kg-day, assuming humans weigh 70 kg) induces selenosis in humans, characterized by abnormal hair and nail formation (Högberg and Alexander, 1986). Effects in

domestic grazing animals exposed to high levels of selenium include emaciation, lameness, and loss of hair and hooves. U.S. EPA (1991) presented a verified RfD of 0.005 mg/kg-day for chronic oral exposure to selenourea, based on effects in humans exposed to selenium in high selenium areas. An uncertainty factor of 15 was used. The principal target organs for selenium are the skin, including the nails and hair, and, in animals, the hooves and joints.

Carcinogenicity

An impressive body of data indicates that selenium exerts an anticarcinogenic effect (Högberg and Alexander, 1986). In laboratory animals, selenium supplementation decreased the incidence of chemical-induced cancers. In humans, the incidence of lymphomas and cancers of the breast, digestive tract and lung were lower in geographic areas with high soil selenium levels. Occupational data suggest that selenium may protect against lung cancer. Several animal tests with various deficiencies in design and conduct equivocally associated exposure to selenium with cancer induction. In a well controlled oral experiment, selenium sulfide was associated with an increase in the incidence of liver tumors in rats, and with liver and lung tumors in mice. On the basis of this study, U.S. EPA (1991) classified selenium sulfide a cancer weight-of-evidence Group B2 compound (probable human carcinogen). Quantitative risk estimates were not derived.

References for Selenium

Högberg, J. and J. Alexander. 1986. Selenium. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 482-520.

NRC (National Research Council). 1989. Recommended Dietary Allowances., 10th Edition. Washington, DC: National Academy Press.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

SILVER

Noncancer Toxicity

The classical effect in humans of repeated oral or inhalation exposure to silver is argyria, a blue-gray discoloration of the skin or viscera from the presence of microscopic granules of colloidal silver (Fowler and Nordberg, 1986). Anemia and cardiovascular damage were reported in laboratory animals treated with various silver compounds. U.S. EPA (1991) presented a verified chronic oral RfD of 0.003 mg/kg-day based on a LOAEL for argyria in humans exposed via chronic ingestion or intravenous exposure and an uncertainty factor of 2. Target organs for silver are the skin, blood and cardiovascular system.

Carcinogenicity

Silver is classified as an EPA cancer weight-of-evidence Group D substance (not classifiable as to carcinogenicity in humans) (U.S. EPA, 1992). Local sarcomas have been induced in animals after

implantation of foils and discs of silver, although the biological significance of these findings is not clear. No evidence of cancer was reported in humans in spite of frequent therapeutic use of silver.

References for Silver

Fowler, B.A. and G.F. Nordberg. 1986. Silver. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. p. 521-531.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1992. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

TETRACHLOROETHENE (TETRACHLOROETHYLENE)

Noncancer Toxicity

Occupational (inhalation and dermal) exposure to tetrachloroethene is associated with neurologic effects, beginning with incoordination and progressing to dizziness, headache, vertigo and unconsciousness (ACGIH, 1986). U.S. EPA (1991) presented a verified chronic oral RfD for tetrachloroethene of 0.001 mg/kg-day based on a NOAEL for liver toxicity in mice in a subchronic gavage study, and on a NOEL for depressed body weight gain in rats in a subchronic drinking water study. An uncertainty factor of 1000 was used. The CNS is the principal target organ for inhalation exposure and the liver is the principal target organ for oral exposure to tetrachloroethene.

Carcinogenicity

Tetrachloroethene is assigned to cancer weight-of-evidence Group B2 (probable human carcinogen) (U.S. EPA, 1991). A provisional oral slope factor of 0.051 per mg/kg-day was based on liver tumors in a gavage study in mice. An inhalation unit risk of 5.2×10^{-7} per $\mu g/m^3$ was based on liver tumors and leukemia in rats and mice. The inhalation slope factor is equivalent to a risk of 0.0018 per mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg.

References for Tetrachloroethene

ACGIH (American Conference of Governmental Industrial Hygienists). 1986. Documentation of the Threshold Limit Values and Biological Exposure Indices. Fifth Edition. Cincinnati, OH. p. 464-465.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

THALLIUM, SOLUBLE SALTS

Noncancer Toxicity

Thallium is highly toxic; acute ingestion in humans or laboratory animals induces gastroenteritis, neurological dysfunction, and renal and liver damage (Kazantzis, 1986). Chronic ingestion of more moderate doses characteristically causes alopecia. Thallium was once used medicinally to induce alopecia in cases of ringworm of the scalp, sometimes with disasterous results. In industrial (inhalation, oral, dermal) exposure, neurologic signs precede alopecia, suggesting that the nervous system is more sensitive than the hair follicle. U.S. EPA (1991) presented a provisional RfD of 0.00007 mg/kg-day for chronic oral exposure, based on increased incidence of alopecia and increased serum levels of liver enzymes indicative of hepatocellular damage in rats treated with thallium sulfate for 90 days. An uncertainty factor of 3000 was used. Target organs for thallium include the GI tract (acute exposure), nervous system, skin, kidney and liver.

Carcinogenicity

Several thallium compounds (thallium acetate, thallium carbonate, thallium chloride, thallium nitrate, thallium sulfate) were classified as cancer weight-of-evidence Group D substances (not classifiable as to carcinogenicity to humans) (U.S. EPA, 1991).

References for Thallium

Kazantzis, G. 1986. Thallium. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 549-567.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

URANIUM

Noncancer Toxicity

The only chemical toxicity effect in humans unequivocally attributed to soluble uranium salts is kidney damage, involving the proximal convoluted tubule, and manifested initially as albumenuria and increased urinary catalase (Berlin and Rudell, 1986). Treatment of rabbits and dogs with soluble uranium salts also induced neurologic signs and pathological changes. U.S. EPA (1991) presented a verified RfD of 0.003 mg/kg-day for chronic oral exposure to soluble uranium salts. The basis was a LOAEL for kidney damage in rabbits treated with uranyl nitrate hexahydrate in the diet for 30 days, and an uncertainty factor of 1000. Rabbits were more sensitive than dogs or rats. The principal target organ for the chemical toxicity of soluble salts of uranium is the kidney; the CNS may be an additional target organ.

Carcinogenicity

Data regarding the chemical carcinogenicity of uranium were not located. Radiologically induced

carcinogenicity of uranium is discussed elsewhere in this document.

References for Uranium

Berlin, M. and B. Rudell. 1986. Uranium. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. pp. 623-637.

U.S. EPA. 1991. IRIS (Integrated Risk Information System). On line. Environmental Criteria and Assessment Office, Cincinnati, OH.

VANADIUM

Noncancer Toxicity

The oral toxicity of vanadium and compounds to humans is very low (Lagerkvist et al., 1986), probably because little vanadium is absorbed from the GI tract. Effects in humans exposed by inhalation include upper and lower respiratory tract irritation. A provisional chronic oral RfD of 0.007 mg/kg-day was derived from a NOEL in rats in a lifetime drinking water study with vanadyl sulfate and an uncertainty factor of 100 (U.S. EPA, 1991). A target organ could not be identified for oral exposure. The respiratory tract is the target organ for inhalation exposure.

Carcinogenicity

No information was located regarding the carcinogenicity of vanadium.

References for Vanadium

Lagerkvist, B., G.F. Nordberg and V. Vouk. 1986. Vanadium. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. p. 638-663.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

VINYL CHLORIDE

Noncancer Toxicity

Data were not located regarding oral exposure of humans to vinyl chloride (ATSDR, 1989). In rats, lifetime dietary consumption of vinyl chloride slightly but significantly increased mortality and induced mild histopathologic effects in the liver. Several early occupational studies associated vinyl chloride exposure with a syndrome known as vinyl chloride disease, which includes acroosteolysis (dissolution of the ends of the distal phalanges of the hands), circulatory disturbances in the extremities, Raynaud syndrome (sudden, recurrent bilateral cyanosis of the digits), scleroderma, hematologic effects, effects on the lungs, and impaired liver function and liver damage. Mild neurologic effects were also associated with occupational exposure. Long-term

inhalation studies in rats and mice identified elevated relative liver weight as a sensitive indicator of liver effects. The principal target organs for vinyl chloride appear to be the CNS and the liver.

Carcinogenicity

U.S. EPA (1991) listed vinyl chloride as an EPA cancer weight-of-evidence Group A compound (human carcinogen) and presented a verified oral slope factor of 1.9 per mg/kg-day, based on the increased incidence of liver and lung tumors in a lifetime dietary study in rats. An inhalation unit risk of 8.4 x $10^{-5}/\mu g/m^3$, equivalent to 0.29 per mg/kg-day, assuming humans inhale 20 m^3 of air/day and weigh 70 kg, was based on liver tumors in rats intermittently exposed by inhalation for 12 months.

References for Vinyl Chloride

ATSDR (Agency for Toxic Substance Disease Registry) 1989. Toxicological Profile for Vinyl Chloride. U.S. Public Health Service, Atlanta, GA.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

ZINC

Noncancer Toxicity

Zinc is a nutritionally essential trace element required for the proper function of many metalloenzymes and DNA polymerase, which is required for cell division (Elinder, 1986). Acute oral exposure to high doses induces GI irritation. Chronic oral toxicity may be manifested as anemia, resulting from impaired GI absorption of copper. Inhalation exposure to dusts or vapors in occupationally exposed humans induces pneumonitis and metal fume fever. A provisional chronic oral RfD for zinc of 0.2 mg/kg-day was based on a LOAEL for anemia in humans in a chronic ingestion study and an uncertainty factor of 10 (U.S. EPA, 1991). Primary target organs for zinc include the GI tract for oral exposure and the lungs for inhalation exposure.

Carcinogenicity

The U.S. EPA (1991) classified zinc as a cancer weight-of-evidence Group D (not classifiable as to human carcinogenicity) substance.

References for Zinc

Elinder, C.-G. 1986. Zinc. In: Friberg, L., G.F. Nordberg and V.B. Vouk, Eds. Handbook on the Toxicology of Metals. Volume II. Second Edition. New York: Elsevier Science Publishers B.V. p. 664-679.

U.S. EPA. 1991. Health Effects Assessment Summary Tables. Annual Update FY 1991. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

ATTACHMENT II

PERMEABILITY CONSTANTS AND ABSORPTION COEFFICIENTS USED IN DERMAL EXPOSURE MODELS

Chemical	Water Permeability Coefficient [a] (cm/hr)	Soil Absorption Coefficient [b] (unitless)
INORGANICS		
Aluminum	ND	0.01
Antimony	ND	0.01
Arsenic	0.000857	0.01
Barium	ND	0.01
Beryllium	0.00216	0.01
Boron	ND	0.01
Cadmium	0.000506	0.01
Calcium	ND	0.01
Chromium	0.00118	0.01
Cobalt	0.00055	0.01
Cyanide	0.0017	0.01
Copper	0.00101	0.01
Iron	ND	0.01
Lead	0.000134	0.01
Magnesium	ND	0.01
Manganese	ND	0.01
Mercury	0.000286	0.01
Molybdenum	ND	0.01
Nickel	0.00108	0.01
Potassium	ND	0.01
Selenium	0.00081	0.01

Chemical	Water Permeability Coefficient a (cm/hr)	Soil Absorption Coefficient b (unitless)
Silver	0.000539	0.01
Sodium	ND	0.01
Thallium	0.000139	0.01
Vanadium	ND	0.01
Zinc	0.00098	0.01
VOLATILE ORGANICS		
1,1,1-Trichloroethane	0.0977	1
1,1,2,2-Tetrachloroethane	0.0118	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1
1,1-Dichloroethane	0.0457	1
1,1-Dichloroethene	0.00955	1
2-Butanone	0.005	1
2-Hexanone	ND	1
4-Methyl-2-pentanone	ND	1
Acetone	ND	1
Benzene	0.111	1
Bromodichloromethane	0.00633	1
Carbon disulfide	0.000843	1
Chlorobenzene	0.219	1
Chloroform	0.0295	1
Cis-1,2-Dichloroethene	0.0203	1
Trans-1,2-Dichloroethene	0.0203	1
Ethylbenzene	0.447	1
Methylene chloride	0.00562	1
Tetrachloroethene	0.125	1

Chemical	Water Permeability Coefficient a (cm/hr)	Soil Absorption Coefficient b (unitless)
Toluene	1.01	1
Total Xylenes	0.000552	1
Trichloroethene	0.0832	1
Vinyl chloride	0.00832	1
SEMIVOLATILE ORGANICS		
1,4-Dioxane	0.0027	1
2,4-Dimethylphenol	0.00036	1
2-Chlorophenol	0.0457	1
2-Methylnapthalene	ND	1
2-Methylphenol	ND	1
2-Propanol	ND	1
4-Chloro-3-methylphenol	ND	1
4-Methyl-2-pentanone	ND	1
4-Methylphenol	ND	1
Acenapthene	ND	1
Anthracene	ND	1
Benzo(a)anthracene	0.0234	1
Benzo(a)pyrene	16.6	1
Benzo(b)fluoranthene	8.46	1
Benzo(g,h,i)perylene	ND	1
Benzo(k)fluoranthene	ND	1
Benzoic acid	11.7	1
Bis(2-ethylhexyl) phthalate	0.00724	1
Butyl benzyl phthalate	ND	1
Chrysene	8.46	1

Chemical	Water Permeability Coefficient a (cm/hr)	Soil Absorption Coefficient b (unitless)
Di-n-butyl phthalate	ND	1
Di-n-octyl phthalate	ND	1
Dibenzo(a,h)anthracene	ND	1
Dibenzofuran	ND	1
Ethyl parathion	ND	1
Fluoranthene	2.48	1
Fluorene	ND	1
Indeno(1,2,3-cd)pyrene	32.6	1
N-nitrosodiphenylamine	ND	1
Napthalene	0.631	1
Pentachlorophenol	7.22	1
Phenanthrene	1.52	1
Phenol	0.00822	1
Pyrene	ND	1
PESTICIDES/PCBs		
Aroclor-1242	ND	1
Aroclor-1248	ND	1
Aroclor-1254	ND	1
Aroclor-1260	ND	1
Methyl parathion	ND	1
DDT	7.24	1
Chlordane	0.933	1

a - US EPA, 1991, Interim Guidance for Dermal Exposure Assessment; Office of Health and Environmental Assessment-EPA/600/8-91/011a March 1991 Workshop Draft.
b - value for metals from Wester et al, 1991; organics assumed to be 1.