UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

December 20, 2013

4WD-FFB

Rachel Blumenfeld
United States Department of Energy
Portsmouth/Paducah Project Site Office
P.O. Box 1410
Paducah, Kentucky 42002

RE: **EPA comments on the Five-Year Review for Remedial Actions as the Paducah Gaseous Diffusion Plant, Paducah, KY (DOE/LX/07-1289&D1)**

Dear Ms. Blumenfeld,

The Environmental Protection Agency (EPA) has received the *Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-1289&D1).* EPA has reviewed the document and our comments are attached.

If you have any questions or require additional information, please contact me at (404) 562-8513.

Sincerely,

Jennifer Tufts

Digitally signed by Jennifer Tufts
DN: cn=Jennifer Tufts, o=US EPA Region 4, ou=Federal Facilities Branch, email=tufts.jennifer@epa.gov, c=US
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Jennifer Tufts
Remedial Project Manager
Federal Facilities Branch

Five-Year Review for Remedial Actions as the Paducah Gaseous Diffusion Plant, Paducah, KY (DOE/LX/07-1289&D1)

GENERAL COMMENTS

1. The PGDP FYR does not follow the format of the FYR Guidance and this results in protectiveness statements that are not clearly supported. The contents of the FYR should follow Exhibit 3-3 and Appendix E of the FYR Guidance to enable a clear and concise presentation of all information relevant to each site.

2. Although the established land use control assurance plan (LUCAP) plan is referenced in Section 1, details regarding what ICs are currently in place and how they relate to protectiveness are not included in each site chapter or site technical assessment Question A sections. LUC details and discussion need to be added to each site chapter in order to support protectiveness determinations. In addition, information regarding the Excavation Penetration Permit Program (EPPP) should be provided to show that it is a long-term protective institutional control (IC).

3. The protectiveness determination for the Northwest Plume project is that it is protective (page xx). EPA does not agree with the protectiveness determination. The Northwest Plume interim remedial action is to initiate control of the source and mitigate spread of contamination from the source areas. The optimization of the Northwest Plume IRA is intended to increase VOC mass removal and enhance the contaminant capture immediately north of the plant. However, as stated on page 5-1 as part of the 2008 Five-Year Review protectiveness statement, ". . .additional actions, as part of the dissolved-phase plume, need to be evaluated for long-term protection." The dissolved-phase plume will not be addressed until 2026. Therefore, the protectiveness determination should be "protective in the short-term".

4. The protectiveness determination for the Northeast Plume project is that it is protective (page xxi). EPA does not agree with the protectiveness determination. The Northeast Plume remedial action is an interim remedial action to initiate hydraulic control of the high concentration area within the Northeast plume that extends outside the security fence. As stated on page 6-1 as part of the 2008 Five-Year Review protectiveness statement, "The remedy for the Northeast Plume is protective of human health and the environment in the short-term." The dissolved-phase plume will not be addressed until 2026. Therefore, the protectiveness determination should be "protective in the short-term".

5. The protectiveness determination for the Cylinder Drop Test Area (SWMU 91) is that it is protective (page xxi). EPA does not agree with the protectiveness determination. By implementing the Lasagna technology at SWMU 91, DOE met their RAO to mitigate migration of TCE from soils to groundwater. DOE achieved the RAO of 5.6 mg/kg average TCE soil concentration with an average soil concentration of 0.38 mg/kg and a maximum soil concentration of 4 mg/kg. Although the RAOs were met, the approach of establishing the point of exposure (POE) at the fence line is inconsistent with the current EPA approach of establishing the POE at the SWMU boundary. Also, the only receptor evaluated in the baseline human health risk assessment for potential soil exposure was a

future excavation worker. Without a risk evaluation for future industrial uses or unrestricted uses, ICs are warranted. According to pages 7-4 and 7-5, DOE remains in control of the property, and therefore, the effectiveness of the remedy remains protective. However, in the event that DOE is no longer in control of the property, the remedy would no longer be protective. Until LUCs are a component of a decision document or a LUCIP is in place, the protectiveness determination should be "protective in the short-term".

6. The protectiveness determination for the Water Policy is that it is protective (page xxi). EPA does not agree with the protectiveness determination. As stated on page xviii, "Not all landowners have signed license agreements on file for their properties; therefore, potential risk exists that residents would use their groundwater." Page 8-3 indicates 60% of the residents have signed the agreement which is not enforceable. As stated on page 8-1 as part of the 2008 Five-Year Review protectiveness statement, "The remedy for the Water Policy Box currently protects human health and the environment by institutional controls; however, additional actions under the dissolved-phase plume need to be evaluated for long-term protection." The dissolved-phase plume will not be addressed until 2026. Therefore, the protectiveness determination should be "protective in the short-term".

7. The protectiveness determination for C-400 Electrical Resistance Heating (ERH) is that it will be protective (page xxii). EPA does not agree with the protectiveness determination. As stated on page 9-7, ERH was not successful in remediating the lower RGA, and the FFA parties are currently evaluating alternative remedies for the lower RGA. Also, the source not been fully characterized, in particular in the area beneath the C-400 building. In addition, the dissolved-phase plume will not be addressed until 2026. Given that significant contaminant sources will remain post the ERH remedy completion, the lower RGA remedy has not been implemented, and contamination has not been fully characterized, the protectiveness determination should be "will be protective in the short term".

8. The protectiveness determination for Southwest Plume is that it will be protective (page xxii). EPA does not agree with the protectiveness determination. Implementation of the Large Diameter Soil mixing with steam and ZVI will treat VOC contaminated soils at SWMU 1, and Long-term Monitoring/LUCs will be implemented at SWMU 211. However, sources below the C-720 building at SWMU 211have not been characterized. Given that soil contamination has not been fully characterized, the protectiveness determination for Southwest Plume Sources should be "will be protective in the short-term".

9. Additional information should be provided to clarify the scope and role of the remedies for the North-South Diversion Ditch (NSDD) Source Control project and the NSDD Section 1&2 project. The NSDD Section 1&2 ROD appears to supersede the NSDD Source Control ROD based on text provided in Chapters 11 and 12. Also, information regarding the implementation and monitoring of LUCs should be provided, including a discussion of the fly ash lagoons to indicate whether the lagoons are managed as part of the NSDD projects or through a separate SWMU. Information regarding the scope and role of the RODs and LUCs is needed to support the protectiveness determination.

10. The protectiveness determination for the C-746-K Landfill is that it is protective (page xxiii). EPA does not agree with the protectiveness determination. The LUCs associated

with the C-746-K Landfill ROD including maintenance of the landfill cap, placement of riprap over seeps, posted warning signs, and a deed notice and restrictions to inform buyers of the leachate seeps and bind buyers to follow the institutional controls. Without additional and more robust LUCs that are a component of a decision document, the protectiveness determination should be "protective in the short term".

11. The protectiveness determination for the Fire Training Area is that it is protective (page xxiii). EPA does not agree with the protectiveness determination. Page 14-1 states the selected remedy was "no further action (outside of maintaining institutional controls)". It is unclear how the ICs which include security fencing, prevention of unauthorized entry, and worker exposure are currently implemented and monitored. On page 14-3, the text states that "DOE remains in control of the property. . .therefore, the exposure assumptions used in the ROD remain valid". However, in the event that DOE is no longer in control of the property, the remedy would no longer be protective. Without additional and more robust LUCs that are a component of a decision document, the protectiveness determination should be "protective in the short term".

12. The protectiveness determination for the On-site Sediment Removal is that it is protective (page xxiv). EPA does not agree with the protectiveness determination. The RAOs were met which were to ensure that direct contact risk for the current industrial worker at the on-site ditches falls within the EPA risk range, and the direct contact risk for the current industrial worker and recreational user at the NSDD falls within EPA risk range. The risk to a future industrial worker has not been calculated and presented. Without a risk evaluation for future industrial uses or unrestricted uses, ICs are warranted. According to page 16-5, engineering and temporary access controls were evaluated and discontinued, so long-term LUCs are not embodied in the decision document. Until LUCs are a component of a decision document or a LUCIP is in place, the protectiveness determination should be "protective in the short-term".

13. The protectiveness determination for the C-749 Uranium Burial Ground, SWMU 2, is that it is protective (page xxiv). EPA does not agree with the protectiveness determination. The RAOs for the interim action were to mitigate migration of uranium and TCE and prevent disturbance or contact with buried waste which would be accomplished with a multilayered cap. The cap was not installed because it was determined that the buried waste was saturated in groundwater. Institutional controls that prevent inappropriate use of the property, and intrusive activities that could expose buried waste are being implemented through DOE ownership of the property. However, in the event that DOE is no longer in control of the property, the remedy would no longer be protective. No deed restriction has been filed. As stated on page 17-3, there is no LUCIP associated with a decision document. Until a final remedy is implemented and LUCs are embodied in the decision document, the protectiveness determination should be "protective in the short term".

14. An evaluation of the implementation and performance of the removal action for the Inactive Facilities as part of the Soils OU should be included in the Five Year Review.

15. The Five-Year Review process presented in Section 22 does not follow the FYR Guidance. Information regarding data review and evaluation specific to each site should be presented as part of the earlier sections devoted to each site so that the answers to the technical assessment questions can be supported. Currently Section 22 provides general statements

as to where the data are located, but the FYR Guidance requires that data collected since the last Five-Year Review be summarized and interpreted in support of the answers to the technical assessment questions. The data review is currently inconsistently presented in site chapters within the remedy selection section and the technical assessment. The FYR should be revised to ensure each site chapter includes a subsection devoted to data review.

16. A section titled "Progress Since the Last Five-Year Review" is missing from the FYR, though information pertaining to the content of that section (such as previous protectiveness statements, status of recommendations and follow-up actions from the previous review) is found in various locations throughout the document. Refer to page E-25 of the FYR Guidance for suggested content for consistency with EPA FYR guidance and to promote overall clarity in the PGDP FYR.

17. Throughout the PGDP FYR the technical assessment sections lack the specificity needed to clearly support the protectiveness statements. According to the FYR Guidance, the technical assessment should present key information from previous sections such as data review, operation and maintenance (O&M), applicable or relevant and appropriate requirements (ARARs) evaluation, in order to support the development of protectiveness statements. However, the PGDP FYR presents this information scattered through the OU chapters rather than within the sections devoted to answering the three questions. For example, in Section 5.4, Technical Assessment (page 5-7) information that supports the three questions is located in the opening section rather than distributed to the appropriate subsections answering the three key questions. The discussion of the system O&M and cleanup levels should be moved to Section 5.4.1. See page E-27 of the FYR Guidance for a checklist of information that should be in each subsection. The technical assessments throughout the PGDP FYR should be revised to follow the FYR Guidance to ensure that the protectiveness statements are clearly supported.

18. For several of the OUs, conclusions are not supported with documentation when responding to Question B (Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of the Remedy Selection Still Valid?). For example, in Sections 7.4.2, 8.4.2, 12.4.2, 13.4.2 and 16.4.2, a conclusion is made that the protectiveness of the remedy was not affected by changes in risk assessment methodology; however, the changes in risk assessment methodology are not provided. These sections should be revised to explain what changes have occurred in risk assessment methodology and why these changes would not affect protectiveness of the remedy. For example, if a residual risk analysis was performed in 2001, then a comparison of the toxicity values used at that time to current toxicity values is warranted to determine if target risk and hazard index values still have been met.

    In addition, these sections state that there are no changes in standards identified as ARARs in the decision documents and that there are no newly promulgated standards that might apply or be relevant and appropriate to the site that affect the protectiveness of the remedy. Further, these sections state there are no changes in to-be-considered (TBCs) values identified in the decision documents that impact the protectiveness of the remedy. These statements are not supported because tabulations of ARARs and TBCs addressed in the decision documents have not been compared to current values. The FYR should follow the FYR Guidance by providing evidence to support the conclusion that there are no changes

in TBCs or standards identified as ARARs in the decision documents that impact the protectiveness of the remedy.

Specific Comments

1. **Table ES.1: Five-Year Review Summary Form, page xvi:** The review period should be the timeframe that the FYR was actually performed, e.g., 1/17/2013-8/1/2013, not the five years prior to the FYR.

2. **Table ES.1: Five-Year Review Summary Form, page xvii:** Consider removing extraneous text (in italics) in the summary form at the top of page xvii that directs how to fill out the form.

3. **Table ES.1: Five-Year Review Summary Form, page xvii:** The row "OUs without Issues and Recommendations" does not include all OUs without issues. Be sure to include all OUs (or areas) with no issues in this row.

4. **Table ES.1: Five-Year Review Summary Form, page xviii through xx**: The second, fourth, fifth and sixth Recommendations do not have a corresponding Issue. All Recommendations should also have corresponding Issues. This comment also applies to the Issue sections throughout the individual sections, as well as Sections 18 and 19.

5. **Table ES.1: Five-Year Review Summary Form, page xvii**: Only issues that affect current and/or future protectiveness should be included as Issues and Recommendations; currently issues that do not affect current or future protectiveness are listed. Many of the issues identified could affect future protectiveness, but are listed as protective currently and in the future. For example, the Remedy Performance issue at the C-400 ERH OU could affect future protectiveness if it is not addressed. The "Affect Future Protectiveness" box should be changed from "No" to "Yes" and the protectiveness statement changed from "will be protective" to "will be short-term protective" and rewritten accordingly. Any additional issues that affect current or future protectiveness will require the corresponding protectiveness statement to be updated accordingly in all locations that the protectiveness statement is repeated.

6. **Table ES.1: Five-Year Review Summary Form, page xx:** Consider removing extraneous text (in italics) in the summary form that directs how to fill out the form.

7. **Table ES.1: Five-Year Review Summary Form, page xxv:** Because the site has not met construction completion, per the 2012 FYR Memo and FYR Guidance, a site wide protectiveness statement is not appropriate. Delete the Sitewide Protectiveness Statement box.

8. **Section 2, Site Chronology, page 2-1:** The opening paragraph of this section is discussing the history of contamination and should be moved to the History of Contamination section 3.3. It is recommended that this section introduce the table and just state that a summary of the remedial response activities is provided below in Table 2.1. Further, the table should also include the remedial investigation and feasibility study completion dates and remedial design start and completion dates as per the FYR Guidance.

9. **Section 3.2, Land and Resource Use, page 3-4:** Physical characteristics of the site, such as groundwater-bearing zones and geological formations below the site, should be moved to Section 3.1 Physical Characteristics. It is recommended that Section 3.2 be limited to discussions on land and resource use to promote clarity and consistency with the FYR Guidance.

10. **Section 3.4, Initial Response, page 3-7:** The NPL proposal and listing dates are not included in Section 3.4. It is recommended this information be included since they represent initial response actions for the site.

11. **Section 3.5, Basis for Taking Action, page 3-9:** This section does not include the contaminants and associated impacted media identified at the Site. To promote clarity in the FYR and to ensure consistency with the FYR Guidance, describe the contaminants found at the site by appropriate media type.

12. **Section 3.5, Basis for Taking Action, page 3-9:** According to the FYR Guidance, results of site investigations are included in Section 3.5; however, because the results of site investigations are included in some of the individual OU-specific sections, consider noting that in this section.

13. **Section 5 Northwest Plume, Page 5-1, and 5.2, Remedy Implementation, page 5-5:** Section 5 lists the protectiveness statement prepared in the 2008 FYR while Section 5.2 discusses progress from the previous FYR; however, as per the FYR Guidance, information pertaining to the protectiveness statement and issues from the previous FYR should be devoted to a new section titled "Progress Since the Last Five-Year Review." It is recommended that the progress since the last FYR be addressed as a separate section to promote clarity in the FYR and consistency with the FYR Guidance.

14. **Section 5.2, Remedy Implementation, page 5-5:** This section includes information pertaining to O&M plans which is more appropriately discussed in Section 5.3, Systems Operations/Operations and Maintenance. It is recommended that the O&M discussions included in Section 5.2 be moved to Section 5.3.

15. **Section 5.3, Systems Operations/Operations and Maintenance, page 5-6:** This section does not compare the summary of the O&M costs over the last five years with the originally estimated annual O&M costs. Per the FYR Guidance, include originally estimated annual O&M costs and discuss whether the costs incurred over the last five years are consistent with, higher, or lower than originally estimated; also provide the rationale for any significant cost deviations from the original estimate. Note this comment also applies to Section 6.3

16. **Section 5.3, Systems Operations/Operations and Maintenance, page 5-7:** This section includes information on the site inspection. As per the FYR guidance, the site inspection information should be discussed in its own section titled "Site Inspection." The Site Inspection section should also include who participated in the inspection. Revise the FYR to include a separate site inspection section to include all required information consistent

with the FYR Guidance. Note this comment also applies to Sections 6.3, 12.3, 13.3, 14.3 and 16.3.

17. **Section 6, Northeast Plume, page 6-1:** This section includes information relating to the protectiveness statements presented in the previous FYR. Per the FYR Guidance, the protectiveness statement from the previous FYR should be moved to a new section titled "Progress Since the Last Five-Year Review." Revise the FYR to include a new section that discusses the progress since the last FYR. Note this comment also applies to Section 7, Cylinder Drop Test Area or Lasagna™ Technology Demonstration, Section 8, Water Policy, and Section 9, C-400 Electrical Resistance Heating, Section 11, NSDD Source Control, Section 12, NSDD Sections 1 and 2; Section 13, C-746-K Landfill, Section 14, Fire Training Area, Section 15, Surface Water Interim Corrective Measures, and Section 17, C-749 Uranium Burial Ground.

18. **Section 6.1, Remedy Selection, page 6-1:** This section does not identify the stated objectives of the interim remedial action (IRA) at the Northeast Plume as Remedial Action Objectives (RAOs). The FYR should indicate why the document does not specifically address RAOs for this site (i.e., none were identified in the ROD). Please revise Section 6.1 to address the lack of stated RAOs for the site.

19. **Section 6.1, Remedy Selection, page 6-1:** An evaluation of cleanup levels is necessary for a protectiveness determination. Since the ROD did not establish cleanup levels, the FYR should state this information in the report to eliminate any uncertainties.

20. **Section 6.1, Remedy Selection, page 6-1:** The first paragraph of this section identifies two objectives of the RA established in the ROD, yet the second to last paragraph of Section 6.1, on page 6-3 only addresses one objective of the RA. Additionally, Section 6.4.2, fourth paragraph, indicates that the Northeast Plume ROD identified only a single goal for the RA. The FYR should consistently document all objectives and/or goals of the RA throughout Section 6.1, 6.4.2 and the remainder of the report. Please revise the FYR to consistently document the objectives of the RA established in the ROD for the Northeast Plume.

21. **Section 7.1, Remedy Selection, page 7-3:** The last paragraph of Section 7.1 states, "The ROD also included a contingency action to use soil mixing to enhance the remedial technology in the event that the Lasagna™ technology by itself was incapable of achieving cleanup objectives." The description of the contingency action is not entirely consistent with the description presented in the ROD for this site because it is not soil mixing alone, but enhanced soil mixing. The Cylinder Drop Test Area ROD (July 1998) states that if the Lasagna™ technology was not successful, "the DOE, in agreement with EPA and the KDEP, may proceed to remediate the unit with Alternative 3, In Situ Enhanced Soil Mixing." This alternative includes a crane or other mechanical mixing unit, an agent delivery system (e.g., hot air, steam or hydrogen peroxide), and an off-gas collection/treatment system. Please revise the FYR to more accurately describe the contingency action for the Cylinder Drop Text area as presented in the ROD for this site.

22. **Section 7.2, Remedy Implementation, page 7-4:** This section includes information on the site inspection. As per the FYR guidance, the site inspection information should be discussed in its own section titled "Site Inspection." The Site Inspection section should also

include who participated in the inspection. Revise the FYR to include a separate site inspection section to include all required information consistent with the FYR Guidance.

23. **Section 7.4.1, Question A: Is the Remedy Functioning as Intended by the Decision Documents? page 7-4:** This section indicates that although toxicity values changed for TCE, the effectiveness of the remedy for soil remains protective for future use at the site based on a comparison to risk-based screening values that are protective of an excavation worker. According to the ROD for this site, the only receptor evaluated in the baseline human health risk assessment for potential soil exposure is a future excavation worker. The ROD concludes that the concentration of TCE in the soil at SWMU 91 is not at levels that are associated with unacceptable risk. It is unclear how the remedy is deemed protective for future uses such as non-intrusive industrial uses or unrestricted uses if these land uses were not evaluated in the risk assessment and ICs are not included in the selected remedy. Although Section 7.4.2 states that DOE remains in control of the property, a demonstration that the site is acceptable for standard industrial use or residential use has not been provided to support that ICs are not needed in the event that DOE no longer controls the property. Please revise Sections 7.4.1 and 7.4.2 to demonstrate whether the site supports standard industrial or unrestricted use based on direct contact with soil otherwise, ICs are warranted as part of the remedy. ICs may be added to a decision document, per the 2011 *Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance.*

24. **Section 7.4.2, Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of the Remedy Selection Still Valid?, page 7-4:** The section states that the answer to Question B is yes; however, there is no discussion why ICs are not needed for a future standard default industrial worker or residential exposures to soil once DOE no longer controls the property. Please revise Section 7.4.2 to demonstrate whether the site supports standard industrial or unrestricted use based on direct contact with soil. Otherwise, ICs are warranted as part of the remedy.

25. **Section 8.1, Remedy Selection, page 8-1:** The FYR does not clearly define the RAO for the Water Policy even though it states in Section 8.4.2 that the RAO used at the time of remedy selection still is valid. The *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, dated December 1994 (Water Policy Action Memorandum), includes the following statement on the purpose of the Water Policy, which could be considered the RAO of the remedy:

    > "The purpose of long-term remedial action is to eliminate, reduce, or control risks to human health and the environment. Implementation of this removal action is consistent with that purpose. Potential threats to public health require attention prior to initiation of long term remediation. This action prohibits exposure to contaminated water from residential wells until a permanent remedy has been successfully completed, or other actions have formally been deemed appropriate."

    The term 'prohibits' should be modified since residents sign the agreement on a voluntary basis. To allow for an evaluation of the validity of RAOs as part of the technical assessment in this FYR, please revise Section 8.1 to clearly define the objective of the remedy consistent with that presented in the Water Policy Action Memorandum.

26. **Section 8.2, Remedy Implementation, page 8-2:** This section states that DOE has obtained Water Policy agreements with 60 percent of residents located within the Water Policy Boundary and that all residents have chosen to use municipal water; however, some landowners have chosen not to sign the agreements. According to Section 8.1, the agreements specify that the property owner will not drill new water supply wells or use existing water wells, and that PGDP personnel are permitted access to the property for sampling purposes. If the remaining 40 percent have not signed an agreement, this raises the concern that the remedy is not protective for some receptors because the Water Policy does not describe how future homeowners will be informed of the agreement in the event the former homeowner did not sign the agreement. This concern is raised as an issue in Section 8.5, and states that a potential risk exists that residents would use their groundwater. However, this is not discussed in Section 8.4, Technical Assessment. Because Section 8.5 indicates that a potential risk exists for those residents that choose not to sign an agreement, this issue should be raised in Section 8.4 (specifically Section 8.4.3).

27. **Section 9, C-400 Electrical Resistance Heating, page 9-1:** This section indicates that although TCE is present at elevated concentrations in soil and groundwater and as DNAPL, the vapor intrusion pathway was addressed by measuring concentrations of vinyl chloride at various locations (underground cable tunnels, the approximate location of the old millwright shop, and the C-400 basement) in 2000. This section states that the sampling results of vinyl chloride were not detected at any location (detection limit of 0.85 ppm); however, this is not sufficient information to support that vapor intrusion is not an issue at this site based on current toxicity values and risk assessment guidance. First, the FYR does not specify the medium that was sampled for vinyl chloride. Second, assuming the medium sampled was air, the sampling method is not specified and the detection limit of 0.85 ppm, which is equivalent to 2,210 micrograms per square meter ($\mu g/m^3$) is a concentration that is well above the EPA's Vapor Intrusion Screening Levels (VISL) for industrial indoor air of 2.8 $\mu g/m^3$. This concentration is also above the industrial subslab soil vapor screening level of 28 $\mu g/m^3$ (http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item4). In addition, at the bottom of page 9-1 it is also stated that TCE and vinyl chloride were sampled in air samples from the C-400 basement and the C-300 tunnel in April 2003 using Draeger tubes as part of the treatability study. Both VOCs were below detection with a TCE detection limit of 2 ppm (approximately 10,750 $\mu g/m^3$) and the detection limit of vinyl chloride unknown. The detection limit for TCE is well above the VISL for industrial indoor air of 3 $\mu g/m^3$ as well as the industrial subslab soil VISL of 30 $\mu g/m^3$. Further, due to the elevated concentrations of TCE in soil and groundwater and the likely presence of DNAPL, it is unclear why only vinyl chloride was analyzed in 2000 to discount the vapor intrusion pathway. Toxicity values of TCE have changed since 2000 and 2003 and the TCE concentrations may be high enough to support that vapor intrusion could be an issue at this area. Risk assessment methods for vapor intrusion have evolved from EPA's 2002 guidance *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor.htm) and vapor intrusion screening levels for soil vapor and groundwater are also available for screening this pathway (http://www.epa.gov/oswer/vaporintrusion/guidance.html#Item6). To ensure that the remedy is protective for vapor intrusion, it is recommended that a vapor intrusion study be conducted based on current toxicity values and risk assessment methodology.

28. **Section 9.1, Remedy Selection, page 9-1:** According to the 2005 ROD, the VOC contamination at this site is considered principal threat waste; however, this is not discussed in Section 9.1. This section should identify the VOC contamination at this site as principal threat waste.

29. **Section 9.1, Remedy Selection, page 9-3:** Section 9.1 lists the major components of the selected remedy for the C-400 Cleaning Building area, which include "Removal and treatment of TCE and other VOCs from the contaminant source zone in the UCRS and RGA at the C-400 Cleaning Building area using ERH. The C-400 ROD (July 2005) provides additional information on the components of the remedy, including a requirement for when the ERH could cease operation. Section 2.12.2 of the C-400 Cleaning Building Area ROD states, "The operation of Electrical Resistance Heating would cease when monitoring indicates that heating has stabilized in the subsurface and when recovery diminishes to a point at which the rate of removal of TCE, as measured in the recovered vapor, becomes asymptotic." Please revise Section 9.1 to include this component of the selected remedy.

30. **Section 9.1, Remedy Selection, page 9-3:** Section 9.1 lists the major components of the selected remedy for the C-400 Cleaning Building area, which include "Implementation, maintenance, enforcing, and reporting of LUCs on the C-400 Cleaning Building area." The C-400 Cleaning Building Area ROD presents further details on the LUCs at this site but these additional details do not appear to be described in the FYR. Specifically, the C-400 Cleaning Building Area ROD states that LUCs will consist of the following:

    - Placement of Property Record Notices to alert anyone searching property records to the information about contamination and the interim response action for the C-400 Cleaning Building area. The language comprising the Property Record Notice will be filed at the McCracken County Clerk's Office, in accordance with state law, within 120 days of regulatory approval of the LUCIP.
    - Deed Restrictions to limit use of the property to industrial activities, to prevent exposure of groundwater to industrial workers, and to restrict drinking or other interest(s) being created in the DOE property that is the subject of this interim action, including but not limited to, liens, mortgages, leases, easements, licenses, profits, servitudes, covenants or life estates; or before any actual transfer of such property. Deed restrictions are to be recorded at the McCracken County Clerk's office in accordance with applicable state and federal law.
    - Administrative Controls in the form of an "excavation/penetration permit program" that would require a worker to obtain formal authorization prior to excavating or performing other intrusive activities in the C-400 Cleaning Building area.
    - Access controls, as necessary to ensure protectiveness following the remedial action.

    Please revise Section 9.1 to describe the specific LUC components of the selected remedy for the C-400 Cleaning Building area. Additionally, revise Section 9.2, Remedy Implementation, to describe the current status of implementing these LUCs at the C-400 Cleaning Building area.

31. **Section 9.2, Remedy Implementation, page 9-4:** Groundwater monitoring is a major component of the selected remedy for the C-400 Cleaning Building area but the status of

implementation of this component of the remedy is not described. Please revise Section 9.2 to discuss the status of groundwater monitoring at the C-400 Cleaning Building area. Provide the results of recent groundwater sampling in support of the technical assessment of the remedy at this site.

32. **Section 9.4, Preliminary Technical Assessment, page 9-8:** This section is not consistent with the FYR Guidance. Per the FYR Guidance, this section should be renamed "Technical Assessment" and include the four subsections (Questions A-C and the Technical Assessment Summary) and appropriate content for each to match other OU chapters. This comment also applies to Section 10.3.

33. **Section 10.1, Remedy Selection, page 10-1:** The first paragraph of Section 10.1 summarizes the selected remedies for SWMU 1 and SWMUs 211-A and 211-B, but it does not note that the selected remedies for the SWMUs also include interim LUCs. The Southwest Plume Sources ROD (March 2012) specifies that the selected remedy for the SWMU 1 is *In Situ* Source Treatment Using Deep Soil Mixing with Interim LUCs. The selected remedy for SWMUs 211-A and 211-B will be either *In Situ* Source Treatment Using Enhanced *In Situ* Bioremediation with Interim LUCs or Long-term Monitoring with Interim LUCs, pending the results of further investigation to determine contamination extent and magnitude. Please revise Section 10.1 of the FYR so that the description of the selected remedies is consistent with the remedies presented in the Southwest Plume Sources ROD.

34. **Section 10.1, Remedy Selection, page 10-1:** The third paragraph of Section 10.1 does not present all major components of the selected remedy for SWMUs 211-A and 211-B. As noted, the selected remedy for SWMUs 211-A and 211-B will be either In Situ Source Treatment Using Enhanced In Situ Bioremediation with Interim LUCs or Long-term Monitoring with Interim LUCs, pending the results of further investigation to determine contamination extent and magnitude. Section 1.4.2 of the Southwest Groundwater Plume ROD presents the following major components for the selected remedy for SWMUs 211-A and 211-B:

    a) In Situ Source Treatment Using Enhanced In Situ Bioremediation with Interim LUCs
        - RDSI
        - Enhanced In Situ Bioremediation System.
        - Groundwater monitoring.
        - Confirmatory sampling for VOCs.
        - Secondary waste management.
        - Site restoration.
        - Interim LUCs.

    b) Long-term Monitoring with Interim LUCs
        - Groundwater monitoring.
        - Interim LUCs.

    To ensure consistency with the requirements of the ROD, please revise Section 10.1 to summarize the major components of the selected remedy for SWMUs 211-A and 211-B which are identified above.

35. **Section 10.1, Remedy Selection, page 10-1:** This section does not identify remedial goals for all constituents of concern (COC) identified in the Southwest Groundwater Plume ROD. Tables 17 and 18 of the Southwest Groundwater Plume ROD identify Upper Continental Recharge System Soil Cleanup Levels for TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and vinyl chloride but only the TCE soil cleanup level is presented in the FYR. Please revise the FYR to document all of the UCRS Soil Cleanup Levels for all COCs identified in the ROD.

36. **Section 10.3, Preliminary Technical Assessment, page 10-6:** This section states that vapor inhalation is likely not a significant concern associated with the source zones at the site due to the confined space air characterization summarized in the introduction to Section 9. As stated in a previous comment on Section 9, the relative significance of the vapor intrusion pathway cannot be supported with the data presented. A vapor intrusion evaluation consistent with EPA risk assessment guidance using multiple lines of evidence is warranted to support whether the remedy will be protective of human receptors from the vapor intrusion pathway especially because the high-concentration-TCE soils and residual TCE DNAPL are identified as principal threat waste and the site has occupiable buildings.

37. **Section 10.4, Issues, page 10-6:** This section indicates that there are no issues at the site; however, based on the presence of high-concentration-TCE soils, a vapor intrusion evaluation using current EPA risk assessment guidance is warranted to ensure that the remedy is protective of the vapor intrusion pathway for on-site buildings.

38. **Section 11.1, Remedy Selection, page 11-1:** This section does not identify the selected remedy for the site; instead, the FYR presents this information in Section 11.2, Remedy Implementation. Please use the Remedy Selection subsection to first introduce the selected remedial action, consistent with the approach utilized for other sites evaluated in this FYR document (e.g., Sections 5.1, 6.1, 7.1, etc.).

39. **Section 11.1, Remedy Selection, page 11-3:** This section presents three RAOs for the site, but these objectives were not presented as formal RAOs in NSSD Source Control ROD (March 1994). Instead, the ROD refers to the stated objectives as principal goals. For consistency with the ROD, please clarify that no formal RAOs were presented in the ROD; however, the principal goals presented in the ROD may serve as RAOs for the site.

40. **Section 11.2, Remedy Implementation, page 11-3:** Section 11.2 indicates that a component of the selected remedy for source control at the NSDD included rerouting effluent from the C-400 Building from the NSDD to Outfall 008. This component of the remedy was not specifically identified in the NSSD Source Control ROD. The ROD states, "The effluent discharged from the C-400 Cleaning Building shall be treated to reduce radionuclide concentrations…before it is discharged into the ditch." Please identify the decision document that specified rerouting of effluent from the C-400 Building from the NSDD to Outfall 008 as a component of the selected remedy for this site.

41. **Section 11.4.2, Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of the Remedy Selection Still Valid?, page 11-6:** This section states that "changes in risk assessment methodology subsequent to approval of the ROD have been significant; however, successful implementation of the second IRA

for the NSDD (discussed in Chapter 12) has eliminated exposure pathways, thereby eliminating the risk to human health and the environment." It is unclear why Section 12 is being referenced to answer Question B as this question pertains to the remedy for the NSDD Source Control OU and not the remedy for the OU that addresses NSDD Sections 1 and 2 OU in Section 12. To promote clarity in the FYR, it is recommended that Question B address only the NSDD source area in support of developing the protectiveness statement for this OU.

42. **Section 11.4.4, Technical Assessment Summary, page 11-6:** This section summarizes the technical assessment of the NSDD Sections 1 and 2 OU which does not pertain to the summary of the technical assessment of the NSDD Source Control OU. To promote clarity and consistency with FYR Guidance, it is recommended that the technical assessment summary be limited to the information that pertains to the evaluation of the protectiveness of the remedy for the NSDD source control because the NSDD Section 1 and 2 OU is addressed in a separate section.

43. **Section 12.1, Remedy Selection, page 12-1:** This section does not identify the selected remedy for the site; instead, the FYR presents this information in Section 12.2, Remedy Implementation. Please use the Remedy Selection subsection to first introduce the selected remedial action, consistent with the approach utilized for other sites evaluated in this FYR document.

44. **Section 12.1, Remedy Selection, page 12-1:** The FYR does not specify the cleanup levels for the selected remedy. Table 2.14 of NSDD Section 1 &2 ROD (August 2002) presents the selected cleanup levels for COCs in soil and sediment in the NSDD. Please revise the FYR to state the cleanup levels established in the ROD. The FYR should evaluate the validity of these cleanup levels in support of the technical assessment of the selected remedy.

45. **Section 12.2, Remedy Implementation, page 12-3:** Section 12.2 does not describe all components of the remedy selected in the NSDD Section 1&2 ROD. The ROD indicates that a component of the selected remedy, which was to be conducted in two phases, includes installation of piping to route process discharges, which currently go to the NSDD, directly to the C-616 Water Treatment Facility. The selected remedy also includes installation of stormwater runoff controls in the NSDD downstream of Section 2 prior to excavation of a surge basin during Phase I. Existing culverts at the downgradient end of Section 2 were to be plugged and filled with controlled low strength material as an initial step in surge basin construction; existing sediment controls inside the security fence were to remain in place to control runoff. The FYR discusses construction of the basin but it does not address any of the pre-construction components of the selected remedy (e.g., rerouting of process discharges and installation of stormwater runoff controls prior to construction of the basin.) Additionally, although the FYR indicates that drainage culverts were plugged so that neither water nor sediment can leave the PGDP through the ditch, it does not specify the number of culverts plugged. The ROD states that a component of the selected remedy includes "installation of a plug in the NSDD at the PGDP security fence and in three other ditches within the watershed to prevent discharge of stormwater runoff to sections of the NSDD outside the PGDP security fence." Please revise the FYR to document all components of the selected remedy for the site as they were presented initially in the ROD.

This will help ensure that all components of the remedy have been implemented as proposed and the remedy is functioning as intended.

46. **Section 12.4.2, Remedy Implementation, page 12-4:** This section refers to a residual risk evaluation to determine if the remedy for Sections 1 and 2 of the NSDD can be optimized. The risk assessment evaluation should be submitted to EPA separately rather than as part of the Five Year Review document. Any modification to the monitoring frequency and/or cessation of LUCs must be document in the appropriate decision document and/or LUCIP.

47. **Section 12.4, Technical Assessment, page 12-6:** This section states that the cleanup levels for the excavation were met or exceeded at each measurement section; however, there is no presentation that supports this conclusion. According to the FYR Guidance, a summary of the cleanup goals as presented in the ROD should be included and then the validity of the cleanup goals based on changes in toxicity values, exposure assumptions, ARARs or RAOs should be evaluated. Include the list of cleanup goals from the ROD and demonstrate why the cleanup goals remain valid.

48. **Section 14.2, Remedy Implementation, page 14-1:** It is unclear how the selected remedy for Fire Training area is currently being implemented. The *Record of Decision for Waste Area Groups 1 and 7 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, dated February 1998 (WAGs 1 and 7 ROD) states that the selected remedy for the unit is "the continuation of plant institutional controls" which includes "security fencing and patrols to prevent unknowing and unauthorized entry to the plant and risk management procedures to prevent worker exposure to contaminated media." Please clarify how these measures are currently implemented and monitored at the Fire Training area.

49. **Section 15.4.1, Question A: Is the Remedy Functioning as Intended by the Decision Documents?, page 15-5:** This section states that the remedy is functioning as intended by the decision documents; however, this statement is not supported with monitoring data that was collected as part of the selected remedy (Section 15.1). The FYR refers the reader to the *Annual Site Environmental Report*; however, there is no mention of the specific results from the last five years of monitoring to support the conclusion that the remedy is functioning as intended. Section 15.4.1 should be revised to provide a summary of the last five years of monitoring data and a discussion on how this data supports the conclusion that the remedy is functioning as intended.

50. **Section 15.4.2, Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of the Remedy Selection Still Valid?, page 15-6:** This section states that exposure assumptions are still valid even though spite-specific exposure parameters were not described in the decision document. It is unclear how this determination can be made if the exposure parameters are not known. Please address this discrepancy and explain how it was concluded that exposure parameters remain valid.

    Further, this section states that toxicity information or specific cleanup criteria were not discussed in the work plan because the selected remedy did not include excavation and removal of impacted soils/sediments. Yet according to Section 15.4.3, a residual risk assessment had been performed. To demonstrate that changes in toxicity information since the residual risk evaluation was performed have not impacted cleanup levels, this section

should include an evaluation of toxicity value changes to demonstrate that toxicity data and exposure assumptions remain valid.

51. **Figure 16-1, Location of Surface Water On-Site Sediment Removal, page 16-2:** Figure 16-1 does not clearly define multiple site features. These deficiencies are summarized below:

    a) Yellow and red outlines are used to designate different areas of the site, but the figure does not include a legend that defines the meaning of the outlines.

    b) The figure does not define the PGDP property boundary.

    c) The numbered circles are assumed to be the outfall designations, but again, the figure does not include a legend that confirms this assumption.

    d) The figure does not clearly mark the stretches of the NSDD that are defined as Sections 3, 4 and 5; it is unclear where one section ends and the next begins.

    e) The figure does not clearly mark the direction of flow within the ditches.

    f) The figure includes "Outfall 002" which is not described in Section 16, so it is unclear if this outfall was included in the sediment removal action.

    Please revise Figure 16-1 to incorporate the features.

52. **Section 16.2, Remedy Implementation, page 16-3:** NSDD Section 4 is part of SWMU 58, to which the sediment removal action applied; however, the first paragraph of Section 16.2 does not indicate that the remedy was implemented at NSDD Section 4. The FYR does not include an explanation for this omission. To facilitate an understanding of the implemented remedy, please revise the FYR to clarify why contaminated sediment was not excavated at NSDD Section 4 as part of the sediment removal action.

53. **Section 16.2, Remedy Implementation, page 16-3:** The Action Memorandum (April 2009), includes cleanup levels for multiple COCs, but the FYR does not specify the cleanup levels for the selected remedy. Please revise the FYR to state the cleanup levels established in the Action Memorandum. The FYR should evaluate the validity of these cleanup levels in support of the technical assessment of the selected remedy.

54. **Section 17.1, Remedy Selection, page 17-3:** Information pertaining to the ROD is presented in Section 17, however it not discussed in Section 17.1. To promote clarity and also consistency with the FYR Guidance, information pertaining to the ROD should be moved from the opening section to Section 17.1.

55. **Section 17.3, Systems Operations/Operations and Maintenance, page 17-4:** The site inspection information in this section should be moved to its own section titled "Site Inspection." The Site Inspection section should also include who participated in the inspection. Also, include reference to an O&M plan, if one exists, and discussion of O&M activities to date. See page E-24 of the FYR Guidance for additional information that should be included in this section.

56. **Section 22.5., Site Inspections, page 22-1:** The FYR should include more detail of the site inspection, including references to completed site inspection checklists. Refer to page E-26 of the FYR Guidance for suggested content. As individual OU-specific sections are referenced in this section, consider adding a sub header title "Site Inspection" in each OU chapter.

57. **Section 22.6., Interviews, page 22-2:** The FYR should include more detail of the interviews, e.g., summaries of interviews completed. Refer to page E-26 of the FYR Guidance for suggested content.

58. **Appendix A: Issues and Recommendations Table with Completion Dates, page A-4:** This table should be moved to the Recommendations and Follow-Up Actions section, per the FYR Guidance, page E-30.

59. **Appendix A: Issues and Recommendations Table with Completion Dates, page A-4:** This table indicates that the issue associated with the Water Policy OU does not affect current or future protectiveness. This does not agree with Section 8.5 which states that not all landowners have signed license agreements for their properties; therefore, potential risk exists that residents would use their groundwater. Correct Appendix A to be consistent with Section 8.5 which indicates that the issue may impact future protectiveness.

60. **Appendix B: 2008 Issues, Recommendations, and Results, page B-3:** This table should be moved to a new section in the FYR titled, "Progress Since the Last FYR". Per the FYR Guidance, page E-25, the following columns should be added to the table:

    - Party Responsible.
    - Milestone Date.
    - Date of Action.

61. **Appendix D Residual Risk Evaluation Report for North-South Diversion Ditch Sections 1 and 2, Appendix B, page B-3, Executive Summary, page xix:** This section states that the industrial worker, under unrestricted use, was the receptor considered when calculating cleanup levels. Further, this section states that the residual risk evaluation shows that the residual risk to the industrial worker falls within the EPA risk range and concludes that LUCs should no longer be considered necessary, provided that the current and expected future use of the area is industrial, as specified in the ROD. The conclusion that the site should only be used for industrial purposes supports the need for LUCs to ensure no unrestricted activities occur at the site. Address this discrepancy throughout Appendix D to remove this conflicting information. Also, the recommendation to reduce the monitoring of LUCs to once every five years is provided in the document, and at the same time the recommendation is made to drop them completely in other areas of the document. A consistent recommendation should provided in the document.