UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 7
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

NOV 10 2010

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Paul Rosasco, P.E.
Engineering Management Support, Inc.
7720 West Jefferson Avenue, Suite 406
Lakewood, Colorado 80235

Re: Draft Supplemental Feasibility Study, Radiological-Impacted Material Excavation Alternatives Analysis for West Lake Landfill Operable Unit 1, July 23, 2010

Dear Mr. Rosasco:

The United States Environmental Protection Agency (EPA) has reviewed the subject document and provides the following comments:

General Comments

1. Several components of the engineering evaluations specified in the Superfund Feasibility Study (SFS) work plan were not found in the draft SFS report as follows:

   - SFS work plan section 2.3.5, Material Handling: No material handling plan or discussion of temporary stockpiles, management of leachate, handling of liquid waste, or asbestos-containing material were found in the SFS.

   - SFS work plan section 2.3.8, Surface Water/Leachate Control: No surface water management plan or methods for diverting storm water and removing leachate were found in the SFS.

   - SFS work plan section 2.3.11, Methane Gas Emergency Action Plan: No such plan or discussion of monitors for methane were found in the SFS.

   The draft SFS report must be revised to include these required plans.

2. Section 3.1 of the SFS work plan states that the SFS will include an evaluation of potential occurrences of principal threat wastes. This evaluation was not found in the SFS and must be included.

3. Although mitigation of odors through engineering means is limited, application of a temporary cover (e.g., clean soil or other means) at the end of each workday would help

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to mitigate odors during nonworking periods. This would also reduce radiological exposures to potentially exposed nonradiological workers in the vicinity and would reduce the attractiveness of the exposed waste to birds and vermin. This temporary cover material should be evaluated for each of these issues as part of each remedy.

4. This document should discuss the issues associated with shipping mixed waste and how much it will influence the cost estimates, particularly for the on-site disposal cell which will not be able to accept any mixed waste.

5. The document should explore whether shoring or other methods of stabilizing the excavations within the landfill are a viable and cost-effective alternative to the sidewall slopes proposed for these excavations.

6. Acronyms and abbreviations such as IRIS, PUF, and "dtrs" are not found in the acronym and abbreviation list. The acronym and abbreviation list for the document should be rechecked for completeness. It may be helpful to create separate acronym and abbreviation lists for some of the appendices.

Specific Comments

1. Acronyms: In the acronym definitions for MCL and MCLG, the word "limit" should be "level."

2. Section 2.2.1, third paragraph, page 8: In the last sentence, the maximum depth at of the radiological occurrences should be briefly stated.

3. Section 2.2.2, third paragraph, page 9: In the first sentence, the OSWER directives should be 9200.4-25 and 9200.4-18.

4. Section 2.2.3, page 13: This section should explain what a "bank cubic yard" is and how it differs from a "loose cubic yard." Also, the arithmetic calculating the "Total RIM" figure is incorrect; the value should be 335,500 bcy.

5. Section 2.3, page 13: The 1954 aerial photo and the geologic map used as the basis for the geomorphic flood plain delineation should be included in the document.

6. Section 3.1.1.1.1, second paragraph, page 16: Please note which radionuclides are included in the UMTRCA site surface soil cleanup standard of 5 pCi/g plus background.

7. Section 3.1.1.1.1, page 18: In the second sentence, insert the word "level" after "cleanup."

8. Section 3.1.1.2, page 19: In the second sentence, the words "ROD remedy" are repeated. This should be corrected.

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9. Section 3.1.2.1, page 22: The "mitigative measures" mentioned here should be briefly explained.

10. Section 3.2.1, fourth sentence, page 30: Add the word "facility" after the word "disposal" (the second time it is used).

11. Section 3.2.3.2, page 33: The gamma dose rate of 116 R/hr on contact with the container surface should be 116 μR/hr.

12. Section 3.2.3.3, page 34: This section notes that "… the generator or owner must certify that the waste material does not contain any other radioactive waste or hazardous waste." Energy Solutions therefore will not accept 11e.(2) material that is also hazardous. Although the West Lake Landfill accepted only municipal solid waste (MSW), household trash cans contain materials (solvents, herbicides, pesticides, metals, etc) which would cause isolated portions of the radiologically impacted waste mass to fail the Toxicity Characteristic Leaching Procedure (TCLP) and thus be considered mixed waste. An alternative arrangement for 11e.(2) mixed waste would need to be identified. Disposal of mixed wastes must be evaluated in the detailed analysis of the alternatives to determine its impact on their feasibility and implementability.

    US Ecology's waste acceptance criteria do not explicitly state whether or not they can accept 11e.(2) mixed waste; this should be confirmed as well.

13. Section 3.2.3.4, last sentence, page 35: The "American Ecology's Grandview, Idaho facility" should be the "US Ecology's Grandview, Idaho facility."

14. Section 4.2, page 38: The title of this section is confusing and should be reworded.

15. Section 4.3.1, page 40: The fifth paragraph should discuss waste acceptance monitoring for hazardous constituents and asbestos in addition to scanning the waste for the radiological waste acceptance criteria.

16. Section 4.3.3, page 41: This additional technology is not listed in the table on page 39 and should be added to that table.

17. Section 4.3.3, page 42: The last paragraph of this section should note that a pilot test of these solids separation technologies would be required during the remedial design phase of either of the "complete rad removal" alternatives should one of those remedial alternatives be selected. In addition, in the fourth sentence, the word "exceeded" should be "exceeding."

18. Section 5.2.2.1, page 52: This section should discuss monitoring for volatile hazardous constituents and asbestos in addition to radioactive emissions, particles, and radon.

19. Section 5.2.2.3, page 52: The last sentence of the first paragraph discusses an issue outside the scope of the SFS and should be deleted.

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20. Section 5.2.2.4, page 54: The last sentence of this section discusses an issue outside the scope of the SFS and should be deleted.

21. Section 5.2.4, third paragraph, page 57: The word "insure" should be "ensure."

22. Section 5.3.2.1, first paragraph, page 60: In the last sentence, the word "activity" should be replaced with "radioactivity above cleanup levels."

23. Section 5.3.4.2, page 66: This section notes that the design of the on-site cell would primarily be based on the UMTRCA requirements, while considering the requirements of MDNR solid waste regulations to the extent that they do not compromise the UMTRCA requirements. It is not clear that the multiple synthetic components of the on-site cell's proposed liner and cap design would meet the design life requirements of UMTRCA. In addition, the proposed granular drainage layer in the cap is a potential plane of weakness along which the upper layer of the cap could fail and slump off the landfill at some point during the UMTRCA-specified design life. These issues must be addressed in this section and in the detailed analysis of this alternative in Section 6.

24. Section 6.2.1.3.1, page 92: This section should explicitly state whether the calculated risks are from residual radionuclides below the cleanup level, the nonradiological contaminants in the landfill, or both. It may be appropriate to calculate radiological and nonradiological risks separately if both are contributing to the overall risk. Any remaining noncarcinogenic risks should also be identified.

25. Section 6.2.1.5.5, page 96: The second sentence of this section includes the phrase "2.5f to 4 years" which appears to be a misprint and should be corrected.

26. Section 6.2.1.6.2, page 97: This section is titled "Reliability of the Technology" but it does not actually evaluate its reliability, stating only that this technology is used frequently. A more robust line of evidence demonstrating the reliability of this technology must be included.

27. Section 6.2.1.6.5, page 98: This section should discuss relevant FAA guidance and the negative easement on the property placed by the city of St. Louis. While the city is not an "agency", their approval of a variance for this easement may be required to implement the remedy. These guidance documents, including the 1998 FAA ROD, FAA Advisory Circulars 150/5200-33B, and 150/5200-34A, the 2003 Memorandum of Agreement between FAA, EPA, and other federal agencies, and the September 20, 2010, letter from the St. Louis Airport to EPA should be added to Appendix B.

28. Section 6.2.2, page 101: The actual or assumed location of the truck-to-rail transloading operation and the actual or assumed rail route to the disposal facility discussed here must be specified and shown on the appropriate figures. EPA needs this information to evaluate any potential Environmental Justice issues at the transloading point along the rail route and at the disposal facility.

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29. Section 6.2.2.2, page 102: The level of detail in this section is insufficient, and key ARARs are not mentioned. This section needs to be rewritten with the completeness and level of detail used in Section 6.2.1.2 to evaluate the ROD remedy.

30. Section 6.2.2.3, page 102: This section should mention that even after the radiologically impacted material (RIM) is removed from the site, the site will still be a municipal solid waste landfill requiring a new cap, monitoring system, and institutional controls.

31. Section 6.2.2.3.1, page 102: This section should explicitly state whether the calculated risks are from residual radionuclides below the cleanup level, the nonradiological contaminants in the landfill, or both. It may be appropriate to calculate radiological and nonradiological risks separately if both are contributing to the overall risk. Any remaining noncarcinogenic risks should also be identified.

32. Section 6.2.2.5.1, page 104: This section must include a discussion of the potential for the excavation of RIM to create a contaminant plume of nonradiological contaminants in groundwater beneath and surrounding the landfill. The excavation work will remove the existing cover and create depressions which will collect water and potentially act as preferential pathways for certain volatile contaminants to leach and migrate out of the waste, potentially exposing receptors who are not currently exposed and who would not be expected to be exposed in the future under the ROD remedy.

33. Section 6.2.2.5.1, page 104: This section focuses primarily on risks to workers and traffic accidents and does not adequately discuss risks to the public. These risks include but are not limited to dust and radon migrating off-site and material falling off of or out of trucks and railcars along the transportation route. This section must be rewritten to focus on community protection during the remedial action.

34. Section 6.2.2.5.5, page 106: In the first sentence of the first paragraph, the word "all" should be inserted after the word "nearly." Also, in the first sentence of the second paragraph, the phrase "do not occur" should be deleted.

35. Section 6.2.2.6, page 107: This section needs to specifically mention that the excavation slopes for Areas 1 and 2 will intersect adjacent landfill cells which are not part of OU 1, thereby exposing more waste. A figure illustrating this issue should be included.

36. Section 6.2.2.6.1, second paragraph, page 108: In the second sentence, the phrase "manner the blends RIM" should be "manner that blends RIM."

37. Section 6.2.2.6.6, page 109: This section should discuss relevant FAA guidance and the negative easement on the property placed by the city of St. Louis. While the city is not an "agency", their approval of a variance for this easement may be required to implement the remedy.

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38. Section 6.2.2.6.7, page 109: This section must state whether or not the three disposal facilities meet the criteria under the Off-Site Rule to accept CERCLA waste from this site. EPA Region 7 contacted EPA Regions 8 and 10 to determine the current compliance status of the Energy Solutions and US Ecology facilities and found that both were currently in compliance. These compliance determinations are renewed every 60 days.

39. Section 6.2.3.3.1, page 114: This section should explicitly state whether the calculated risks are from residual radionuclides below the cleanup level, the nonradiological contaminants in the landfill, or both. It may be appropriate to calculate radiological and nonradiological risks separately if both are contributing to the overall risk. Any remaining noncarcinogenic risks should also be identified.

40. Section 6.2.3.5.4, page 116: This section should acknowledge that groundwater monitoring will be necessary around the new on-site cell as well as around Areas 1 and 2.

41. Section 6.2.3.6, page 118: This section needs to specifically mention that the excavation slopes for Areas 1 and 2 will intersect adjacent landfill cells which are not part of OU 1, thereby exposing more waste. A figure illustrating this issue should be included.

42. Section 6.2.3.6.1, page 118: As discussed during our meeting on July 15, 2010, the size of the soil stockpile area being considered for the new on-site cell is "just barely" large enough to accommodate the expected volume of RIM from Areas 1 and 2. This section should evaluate the effect on the implementability of this remedy should the volume of RIM be found to exceed the capacity of the on-site cell during its construction.

43. Section 7.2.3, page 126: This section must include a discussion of the potential for the excavation of RIM to create a contaminant plume of nonradiological contaminants in groundwater beneath and surrounding the landfill. The excavation work will remove the existing cover and create depressions which will collect water and potentially act as preferential pathways for certain volatile contaminants to leach and migrate out of the waste potentially exposing receptors who are not currently exposed and who would not be expected to be exposed in the future under the ROD remedy.

44. Section 7.2.4, page 129: This section does not adequately describe the differences in implementability of the three remedies being compared in the SFS. Many of these implementability issues are identified in previous comments and must be summarized here.

45. Section 7.2.5, page 130: The comparison to the Mound CERCLA site made here should briefly discuss the reasons for the cost overruns that occurred there.

46. Table 1, Missouri Radiation Regulations, Protection Against Ionizing Radiation: The radionuclides present at the site do emit ionizing radiation in the form of alpha and beta particles contrary to the "remarks" provided in the table. While it is true that this weakly penetrating, ionizing radiation is of less concern than the strongly penetrating but

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nonionizing gamma radiation emitted by these radionuclides while they are largely incorporated into and shielded by the overall waste mass, excavating these radionuclides so that receptors can come in contact with them will expose these receptors to ionizing radiation. This exposure should be acknowledged here and considered in the risk assessment.

47. Tables 1, 2 and 3: These tables should be reorganized to separate ARARs from TBCs rather than mixing them together.

48. Table 3, RCRA Subtitle C: It is quite possible that parts of the excavated waste will fail TCLP and constitute hazardous waste so this ARAR is potentially applicable.

49. Table 6, Short-Term Effectiveness: This section should mention the potential for the excavation of RIM to create a contaminant plume of nonradiological contaminants in groundwater beneath and surrounding the landfill. The excavation work will remove the existing cover and create depressions which will collect water and potentially act as preferential pathways for certain volatile contaminants to leach and migrate out of the waste potentially exposing receptors who are not currently exposed and who would not be expected to be exposed in the future under the ROD remedy.

50. Table 6, Implementability: This section does not adequately describe the differences in implementability of the three remedies being compared in the SFS. Many of these implementability issues are identified in previous comments and must be summarized here.

51. Figure 3: The locations of adjacent agricultural land and nearby residential areas must be included on this figure.

52. Figure 12: OU 1 area 1 is mistakenly labeled as OU 2 Area 1 on this figure.

53. Appendix A-1, section 3, second paragraph, page 4: The second sentence should explicitly state that it is discussing RIM occurrences within Area 2.

54. Appendix A-1, Tables 4 and 8: The footnote on these tables beginning with "Depth intervals" is missing information on how the interval extensions were calculated.

55. Appendix A-2, Section 2.2, first paragraph, page 4: The last sentence should explain why this assumption about the waste settlement was made.

56. Appendix C-1, Table C-1: A footnote to this table indicates that US Ecology cannot accept radioactively contaminated liquids. Thus, radioactively contaminated storm water or perched water from within the excavation, and radioactively contaminated leachate collected from the on-site landfill cell (Section 5.3.4.3) would need to be shipped to an alternate disposal facility such as Energy Solutions.

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57. Appendix C-1, Table C-1: Some of the excavated waste from Areas 1 and 2 will almost certainly fail the Paint Filter test due to the presence of free liquids. This waste will either need to be allowed to drain or mixed with a drying agent to remove free liquids prior to loading into trucks and rail cars. This issue must be considered for both of the "complete rad removal" alternatives.

58. Appendix C-2, Section 3.1.4.2: This section notes that 11e.(2) contaminated debris accepted by Energy Solutions has a maximum size of 10 inches in at least one dimension. Waste in Areas 1 and 2 will contain items larger than this, such as appliances, so the off-site disposal alternative should include some mechanism of debris sorting and/or shredding to comply with this restriction if Energy Solutions is to receive the waste. Although the waste acceptance criteria for US Ecology do not explicitly include a size limit, this should be confirmed.

59. Appendix D: The acronym "RAECOM" should be defined and a brief description of how this software was used should be included.

60. Appendix E, Section 1: A fully developed site environmental monitoring plan should include groundwater monitoring and surface water monitoring in addition to the air monitoring. In addition, in the last sentence describing the ROD remedy, the word "context" should be "contact."

61. Appendix E, Section 4: It may be advisable to include a continuous radon daughter monitor in conjunction with any continuous radon monitor to assist in dose assessments (i.e., to assess radon equilibrium level and corresponding dose impacts).

62. Appendix E, Section 5: A background monitoring station needs to be included and discussed.

63. Appendix E, Section 5: It may be advisable to place a monitoring station closer to the Allied Waste offices to represent a (likely) maximally exposed nonradiological worker.

64. Appendix E, Section 6: This section should discuss general differences in the sampling schemes required for the ROD remedy versus the two "complete rad removal" alternatives.

65. Appendix E, Section 6.1: Daily checks of air sampling stations by a technician may be unwarranted. Rather, weekly flow rate checks and filter change-outs should be sufficient for environmental monitoring purposes. This should also allow for sufficient detection capability of gross alpha activity concentrations by an on-site laboratory with an HPGe detector.

66. Appendix E, Conceptual Environmental Monitoring Plan, Section 6.2.1: This section should state that the effluent release limit for the mix of radionuclides in the RIM pertains

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to gross alpha activity. Also, is the 2.0E-14 μCi/ml limit based on an average mix of the radionuclides of interest in the effluent, or does it assume that the mix is 100% of the "worst actor" dosimetrically?

67. Appendix E, Section 6.2.1: EPA could not reproduce the calculated sample volume of 2.88E+14 ml for an 8-hour day; should it be 2.88E+07 ml instead? (60 L/min x 1,000 ml/L x 60 min/hr x 8 hr/d = 2.88E+07 ml). If so, then the release limit activity would result in a collected filter activity of only 1.279 dpm over an 8-hour period. (2.88E+07 ml x 2.0E-14 μCi/ml x 2.22E+06 dpm/μCi). This may be further justification to collect filters only once a week.

68. Appendix E, Section 6.2.2: A continuous radon monitor would record the average radon concentration in air (pCi/L) rather than a flux rate (pCi/m^2-s).

69. Appendix H: This appendix should include generalized schedules for the "complete rad removal" alternatives under a constrained funding scenario of $10 million per year.

70. Appendix I: This appendix should include generalized cost estimates for the "complete rad removal" alternatives under a constrained funding scenario of $10 million per year.

Appendix F – Risk Assessment

1. General: Exponential notation throughout this Appendix uses two different formats (e.g., $1x10^{-6}$ and 1E-06). One common notation format should be used throughout.

2. Section 1: In the last sentence describing the ROD remedy, the word "context" should be "contact."

3. Section 3, second paragraph: In the second sentence, the word "are" should be deleted.

4. Section 4.1, first paragraph: In the last sentence, the parentheses should be removed from the figure of 95 percent.

5. Table 4-2: Footnote "a" states that screening levels used in the risk evaluation are from the EPA Region 9 screening tables. Please note that the Region 9 screening levels were replaced in September 2008 by the EPA Regional Screening Levels. The most recent update of the screening levels took place in May 2010. Consequently, several of the risk-based screening levels presented in this table are no longer appropriate for use and should be replaced with the most current values. The current screening tables can be found online at:

   http://www.epa.gov/reg3hwmd/risk/human/rbconcentration_table/Generic_Tables/index.htm

   Also, EPA is currently conducting a reassessment of hexavalent chromium under the IRIS program (EPA, 2010a). Hexavalent chromium has been considered to be

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carcinogenic by the inhalation route of exposure for a number of years. However, recent studies have shown that hexavalent chromium should be considered to be carcinogenic by the oral route of exposure as well (NIH, 2007). Furthermore, it appears that hexavalent chromium's carcinogenicity is associated with a mutagenic mode of action (McCarroll, et. al., 2009). EPA currently considers the oral cancer slope factor of 0.5 (mg/kg-d)-1 developed by the state of New Jersey to be a Tier 3 value (EPA, 2003 and 2010b). EPA has recently updated its Regional Screening Tables taking this information into account as well as the mutagenic mode of action and is now recommending screening levels for hexavalent chromium of 0.29 mg/kg in residential soil, 5.6 mg/kg in industrial soil, and 0.043 µg/l in tap water. These new screening levels emphasize the need for chromium sampling to report the results for both trivalent and hexavalent chromium rather than simply a value for total chromium. In order to be conservative, in the absence of hexavalent chromium data, EPA Region 7 will consider all total chromium results to represent hexavalent chromium concentrations (EPA, 2010b). Thus, chromium in this table should be identified as another COPC in the initial contaminant screening process.

6. Section 4.3.3: The risk calculator web sites maintained by EPA should be referenced here.

7. Table 4-4: Arsenic has an inhalation unit risk value of 4.3E-03 $(\mu g/m3)^{-1}$. Also, EPA considers the dermal slope factors of carcinogens to be equal to their oral slope factors based on the recommended approach in RAGS Part E (EPA, 2004).

8. Table 4-5: EPA considers the dermal reference doses for arsenic and uranium to have the same values as their oral reference doses based on the recommended approach in RAGS Part E (EPA, 2004).

9. Tables 4-4 and 4-5: Superscript "a" is defined as referring to two toxicity databases. It would be helpful to instead use more than one superscript to denote which value, for which chemical, is derived from IRIS or from HEAST. Is it correct to cite Auxier (2000) as the reference for HEAST as noted in this footnote?

10. Section 4.3.4.1: The text identifies the equation on this page as being applicable to an outdoor worker. However, the subscripts are those for an indoor worker. The actual numerical values which appear in the following equation appear to be correct.

11. Section 5.3.1, third bullet: The "rock and clay layer" described here appears to be referred to as the "biointrusion layer" in Figure 5-1. These names should be made consistent. This inconsistency also occurs in Section 7.2.1 and Figure 7-1.

12. Section 5.3.1.2, second bullet: This bullet refers to footnote 7, but the footnote is missing and must be included.

13. Table 5.1: A comparison of Table 5.1 with Tables A.3-2 and A.3-5 in the BLRA shows that the exposure point concentrations for Area 1 used in the SFS are based on the 95 percent UCL of sample results from "all depths." However, Equation A.3-5, and the text

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in Section A.5.2.1, of the BLRA seem to indicate that "surface soil" was evaluated in the BLRA. Also, the surface soil exposure concentrations in Tables A.3-2, A.3-3, A.3-5, and A.3-6 of the BLRA are higher than those for all depths. Given this, it seems as though an evaluation of the surface soils in the SFS would have been a more conservative approach. The SFS could benefit from some discussion as to how the exposure point concentrations were selected for evaluation.

Also, we noticed that the exposure point concentrations for Area 2 in Tables A.3-3 and A.3-6 of the BLRA are slightly different than the exposure point concentrations which appear in Table 5-1. An explanation of these differences would be helpful to the reader.

14. Section 5.5.1: In its justification on page 11 for the use of RESRAD, the SFS describes the similarities between the results obtained using EPA's methodology and RESRAD when the exposure parameters used "were consistent with the exposure parameters on the EPA website." Yet the text on page 19 notes that, with the exception of the parameters in Table 5-2, "all other RESRAD input variables were left at their default values." The SFS would benefit from some discussion of how EPA's exposure parameters were taken into account in the RESRAD evaluation.

15. Section 5.5.2: The first paragraph on page 20 states that "A more detailed presentation of the long-term risks and doses are presented in Exhibits 5-1 through 5-4." These exhibits appear to be RESRAD printouts, but there is no explanation of how the results are to be read or interpreted. If the public is expected to be able to read and understand these exhibits, then some explanation will be required.

16. Exhibits 5-1, 5-2, and 7-1: In the "detailed dose data" section, the column headings are missing and should be added. Also, in Exhibit 6-6, the area of Area 2 is incorrectly stated.

17. Section 6.1: This section and subsequent sections of the risk assessment refer to "small quantities", "a thin layer of", or "residual" RIM to be left in Areas 1 and 2 as part of the "complete rad removal" alternatives. This characterization is misleading and appears inconsistent with the main text of the report. The radiological cleanup levels set for Areas 1 and 2 are somewhat above background, and excavating all material above these cleanup standards will leave some RIM with concentrations below the cleanup levels in Areas 1 and 2. EPA recommends using the term "RIM below cleanup levels" consistently throughout this risk assessment to refer to this material.

18. Section 6.2.1, third bullet: The rock layer described in this bullet is missing from Figure 6-1. The text and figure must be reconciled.

19. Section 6.2.3: The text here states that "This remedy would place a thick layer of trash and cover material over the residual RIM left in Areas 1 and 2." However, the description in Section 6.2.1 of the "physical configuration of the site after completion of

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the remedy" makes no mention of the use of "trash and cover material." The SFS should more clearly explain the use of "trash" as a cover material for RIM and why this cover material will be protective.

20. Section 6.5.1: See Risk Assessment comment 14 above.

21. Section 6.6, fourth sentence: Insert the word "be" after "might."

22. Exhibits 6-1 through 6-8: See Risk Assessment comment 15 above.

23. Section 7.2.1: The physical configuration of the on-site cell cap in this section does not exactly match the configuration in the text and on Figure 15, in that the geomembrane is not included here. In addition, the proposed sand layer represents a plane of weakness which could compromise the cap's integrity over the design life of the cap. Once the cap configuration is agreed upon, this risk assessment may need to be revised.

24. Section 7.3: In the first bullet of this section, the source term should include the new on-site disposal cell in addition to Areas 1 and 2.

25. Section 7.5.1: See Risk Assessment comment 14 above.

26. Exhibits 7-1 and 7-2: See Risk Assessment comment 15 above.

27. Sections 8, 9 and 10: While Section 4 of this risk assessment describes the methodology for the long-term risk assessments presented in Sections 5, 6, and 7, there is no corresponding section describing the methodology for the short-term risk assessments in Sections 8, 9, and 10. In addition, Section 2.11 of the SFS work plan discusses the use of Microshield for calculating exposure rates for short-term receptors; however, Microshield is not discussed or referenced anywhere in this Appendix. A section discussing short-term risk assessment methodology and incorporating the use of Microshield must be included.

28. Tables 8-2, 8-3 and 8-4: The abbreviation "D" is used for several radionuclides in this table and appears to have the same meaning as the "dtrs" abbreviation used earlier in the document. These abbreviations should be made consistent. "D" is also used in Tables 9-2, 9-3, 9-4, 10-2, 10-3, and 10-4.

29. Section 8.3.2: The list of potential receptors in this section should include an off-site (public) receptor at a nearby workplace as fugitive dusts and radon may migrate off site to these receptors.

30. Section 8.3.5: The last paragraph on this page discusses risks to the remediation worker from inhalation. The SFS should clarify why EPA guidance for inhalation of fugitive dust (EPA, 2000), including the use of the default PEF value, was not used here.

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31. Section 8.3.5: The text here discusses the evaluation of potential risk to a "distant receptor." However, the first sentence below Table 8-4 describes the risks to a remediation worker.

Also, the text in the first paragraph states that the evaluation assumes the off-site receptor is exposed to the same air concentrations as the remediation worker. This is said to be a conservative approach, which it is. EPA wonders if it would be more transparent, however, to also include an evaluation of a true "distant receptor", taking distance from the landfill into account. As it now stands, the SFS contains no such evaluation of potential off-site receptors that are not landfill workers.

32. Section 8.5: The text here notes that the remediation workers were assumed to be classified as radiation workers, and thus any potential risks were evaluated using RESRAD. It might be beneficial to also calculate potential remediation worker risk using EPA exposure parameters as was done for grounds keeping workers, in order for the reader to better understand the potential risks to remediation workers.

33. Section 8.6: In the second paragraph, the excess cancer risk to the radiation surveyor of $2.7 * 10^{-4}$ is stated to be "below the target risk range of 10^{-6} to 10^{-4}" when in fact it is above this target risk range. This should be corrected.

34. Section 9.3: This section needs to better explain and justify the decision made here to ignore nonradiological carcinogenic risks and all noncarcinogenic risks for the off-site disposal remedy. This remedy will involve very different exposure factors and pathways than those currently existing at the site which could result in significantly different risks than those calculated in the baseline risk assessment.

35. Section 9.3.2: See Risk Assessment comment 29 above.

36. Section 9.3.5: See Risk Assessment comments 31 and 34 above. Additional risk pathways for off-site receptors include groundwater (if excavation activities create a contaminant plume) and direct exposure to RIM which may fall from trucks during transport. These risks should be evaluated here.

37. Section 10.3: This section needs to better explain and justify the decision made here to ignore nonradiological carcinogenic risks and all noncarcinogenic risks for the off-site disposal remedy. This remedy will involve very different exposure factors and pathways than those currently existing at the site, which could result in significantly different risks than those calculated in the baseline risk assessment.

38. Section 10.3.2: See Risk Assessment comment 29 above.

39. Section 10.3.5: See Risk Assessment comments 31 and 34 above. Additional risk pathways for off-site receptors include groundwater (if excavation activities create a contaminant plume) and direct exposure to RIM which may fall from trucks during transport. These risks should be evaluated here.

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40. Section 10.5: See Risk Assessment comment 32 above.

Additional Comments

1. The final document should include a full and accurate characterization of the radioactive and other (e.g., RCRA hazardous waste) materials. Among other things, it should address EPA's principal threat determination guidance (OSWER Directive 9380.3-06FS). Based on information and data contained in the remedial investigation (RI) report, as well as two NRC reports (1982 and 1988 described more fully in #2 below), it would be appropriate to conclude that the radioactive materials could pose "a significant risk to human health should exposure occur" because these materials have "high concentrations of toxic compounds." For example, in light of the fact that cleanup level is 5 pCi/g, it is significant that the NRC reports state that subsurface soil contamination concentrations of Ra-226 (radium) are up to 22,000 pCi per gram (1988 report at p. 9). The remedial investigation report indicates radionuclide concentrations as high as those reported by NRC.

   Consistent with the statute, NCP, and program guidance, principal threat waste (PTW), whether radioactive or chemical, triggers the need to evaluate treatment options (which could be added to current Section 4). Thus, the SFS needs to explain how the remedial alternatives for OU 1 at this site satisfy the preference for treatment to significantly reduce toxicity, mobility, and volume. The materials may be considered PTW in accordance with the NCP; therefore, a discussion of the treatment of PTW needs to be included. The draft report does not indicate whether any treatment, including stabilization technologies, was considered.

2. The final document's full and accurate characterization of the radioactive materials should explicitly reconcile the data and findings of the RI with the data, primary findings, and conclusions of a radiological survey conducted by Radiation Management Corporation (RMC) for NRC in 1980-1981 (and published in 1982), and the 1988 NRC Summary Report, including:

   - Radioactive contaminants are in two areas (which were subsequently designated as Radiological Disposal Areas 1 and 2) (at page 20 of RMC report). Almost all of the radioactivity is from uranium (U-238 and U-235) and its decay products (at page 20). Radioactivity is dominated by thorium-230 and radium-226.

   - In addition, " . . . the radioactive decay of the Th-230 will increase the concentration of its decay product Ra-226 until these two radionuclides are again in equilibrium. . . .the Ra-226 activity will increase by a factor of five over the next 100 years, by a factor of nine 200 years from now, and by a factor of thirty-five 1000 years from now. . . Therefore, the long-term Ra-226 concentration will exceed the Option 4 criteria. Under these conditions, onsite disposal, if possible, will likely require moving the material to a carefully designed and constructed 'disposal cell.'" (1988 report at p. 13). And in the Summary section, the 1988

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report (at p. 15) states: "A dominant factor for the future is that the average activity concentration of Th-230 is much larger than that of its decay product Ra-226, indicating a *significant increase in the radiological hazards in the years and centuries to come*." (emphasis added).

- Subsurface deposits extend beyond areas where surface radiation measurements exceed [NRC] action criteria.

- "In general, the subsurface contamination appears to be a continuous single layer, ranging from two to fifteen feet thick, located between the elevations of 455 feet and 480 feet and covering 16 acres total area." (at page 15 and similar language at page 21); "a fairly continuous, thin layer of contamination, as indicated by survey results" (1982 report at p. 16); "The contaminated soil forms a more or less continuous layer from 2 to 15 feet in thickness (1988 report p. 5); "the waste was covered with only about 3 feet of soil." (1988 report at p. 1).

- These data are generally "... consistent with the operating history of the site, which suggests that the contaminated materials was moved onto the Site within a few days time, and spread as cover over fill material." (at page 16 and similar language at page 20)

3. The final document should fully address the technical recommendations made by the Office of Superfund Remediation & Technology Innovation (e.g., about the cap, air, and groundwater monitoring and flood mitigation measures), which were provided in a May 2009 memorandum (see enclosed), but are not cited in Section 8 or mentioned in Section 5.2 of the current draft. The final document should also explain how the containment remedy that is being evaluated and compared to the two additional, excavation-based alternatives would incorporate these recommendations.

4. The final document should eliminate the ambiguity in the draft about the design, performance objectives and expected protectiveness of the landfill cover that is envisioned in the May 2008 ROD and would be constructed under that containment remedy. A casual reader of the draft could come away with the erroneous impression that the ROD-selected remedy would not be protective but would be constructed anyway under this containment alternative.

   The ambiguity in the draft arises from claims in Section 5.2.1 that "the ROD-specified cover design may not be sufficiently thick to control radon emissions," while neglecting to explicitly affirm that, under this remedial alternative, the cover would be designed and constructed to meet whatever specifications are deemed necessary during final remedial design (e.g., a four-foot thick clay layer) to meet all performance standards and ensure protectiveness.

   The final document should clarify that the containment remedy that is being evaluated and compared to the two additional, excavation-based alternatives is a refined version that at a minimum incorporates the technical recommendations by the Office of

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Superfund Remediation & Technology Innovation in May 2009 about the cap, air, and groundwater monitoring, and flood mitigation measures. The final document should be unequivocal about the need to implement a protective remedy, and should acknowledge that this may require changes to the containment remedy described in the ROD depending upon decisions that Region 7 makes upon completion of its review of the final SFS.

5. The final document should also explicitly reconcile the data and findings of the RI with the data, primary findings, and conclusions about hydrology and groundwater in the two NRC reports described more fully in comment 2 above, including:

   - "Studies indicate the landfill is on the alluvial floodplain of the Missouri River." (1982 report at p. 3). "About 75 percent of the landfill site is located on the floodplain of the Missouri River" (1988 report at p. 5) "contamination of water in the bedrock aquifer is possible" and "*The water table of the Missouri River floodplain is generally within 10 feet of the ground surface, but at many points it is even shallower*. At any one time, the water levels and flow directions are influenced by both the river stage and the amount of water entering the floodplain from adjacent upland areas" (emphasis added) and "This represents the likely direction of leachate migration from the landfill." (1988 report, p. 6).

   - "Any possibility of disposal on site will depend on adequate isolation of the waste from the environment, especially for protection of the groundwater. It is unclear whether the area's groundwater can be protected from onsite disposal at a reasonable cost." (1988 report at p. 14).

   The final report needs to address how these statements affect potential leaching within the existing landfills, as well as potential for enhancing the mobility of hazardous substances into groundwater from the landfills. Section 2 would be a logical location for this discussion and a summary of pertinent, site-specific hydrologic and hydrogeologic information.

6. Groundwater conditions should be described in greater detail in Sections 2 and 5.2, respectively.

   - The final document should acknowledge that interpreting flow conditions and contaminant sources is complicated due to the hydrologic/geologic setting (e.g., perched groundwater has been observed), operation of the leachate collection system for the Former Active Sanitary Landfill, and other man-made influences (e.g., Earth City and levee maintenance).

   - The description of groundwater quality conditions should identify all constituents that have been detected in groundwater at concentrations greater than their respective MCLs. In particular, the final report should address the MCL exceedences (e.g., Radium) identified in the ROD (see Table 5-1).

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- The expanded discussion of the groundwater monitoring plan should fully reflect the May 2009 OSRTI technical recommendations (e.g., installation of new sentinel wells, adaptive monitoring approach).

- The groundwater monitoring plan should not rely on filtered samples. Among other considerations: (1) the generally accepted method is to analyze unfiltered samples; (2) there were minimal differences between the results obtained from filtered and unfiltered samples historically, according to the ROD; and (3) release and transport of colloids, if any, may represent a more important migration-to-groundwater mechanism for radionuclides than would dissolution/leaching.

- The objectives of the groundwater monitoring plan should be clearly and definitively stated in the final document, which may lead to some differentiation in the details of the groundwater monitoring plans under the excavation and containment alternatives. The elements of the respective monitoring plans should reflect the stated objectives. Although it has been suggested that the proposed groundwater monitoring program for the containment remedy is intended to demonstrate that the remedy "performs as required over the post-closure period," it does not entail any leachate monitoring even though one of the key remedial objectives is "[m]inimize infiltration and resulting contaminant leaching."

- The objectives of the groundwater monitoring plan should be clearly and definitively stated in the final document. A reasonable goal for the monitoring program would be to complete the characterization of site-wide groundwater conditions.

- In Section 5.2.2.3, the draft SFS states "Statistical evaluation of groundwater data would be used to assess groundwater quality and identify long-term trends." The final report should explain how (and specifically which) data will be collected and analyzed to document this.

7. The final report needs to identify and fully analyze available approaches, which may include movable enclosures, for reducing nuisance attraction to and congregation at the landfill by birds during potential implementation of each of the alternatives. The United States Department of Agriculture, Animal, and Plant Health Inspection Service, Wildlife Services, among other potential authorities, should be consulted to identify appropriate, cost-effective means for ensuring that remedial actions undertaken at the site would not unnecessarily jeopardize public safety with respect to the airport and its operations. At a minimum, potentially effective approaches should be identified and evaluated in the section currently entitled 'Technology Screening,' which should provide a thorough analysis of all aspects of each approach (e.g., movable structures may allow work to proceed during inclement weather which could shorten the duration of the remedial action and provide savings to offset the cost of the structure).

8. The final report needs to identify available approaches, which may include movable enclosures, for preventing pollution of storm water during potential implementation of

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each of the alternatives. At a minimum, potentially effective approaches should be identified and evaluated in the section currently entitled 'Technology Screening,' which should provide a thorough analysis of all aspects of each approach.

9. The descriptions of the three remedial alternatives, which appear in Section 5 of the current draft, should identify the expected useful lifetime (or expected "design life") for each distinct cover. This is especially important because of potential radiological hazards described in the 1988 NRC report, which indicates "a significant increase in the radiological hazards in the years and centuries to come," as documented further in comment 2 above.

   The evaluations (e.g., relating to Long Term Effectiveness and Permanence and Compliance with ARARs), which appear in Sections 6 and 7, should objectively consider and compare the design life relative to the duration over which significant radioactivity is expected to be present under each respective alternative. Among other considerations, the final document needs to address the OSRTI recommendation in May 2009 that the proposed cover meet UMTRCA guidance for a 1,000-year design period. It also needs to address the fact that the typical design life of a RCRA subtitle C or subtitle D cover is substantially shorter than the long-term duration of radiological hazards described by the NRC. The final document needs to explain the reliable financial mechanism for ensuring proper, periodic repairs and how O&M over a period of hundreds of years will be assured.

10. The final document should provide a full, accurate, and up-to-date accounting of evidence, if any, that significant quantities of potentially hazardous wastes and asbestos-containing materials are present in Areas 1 and 2 and should include a coherent, internally consistent evaluation of related (e.g., hazardous waste and mixed waste) issues. In particular, the final document needs to fully characterize and identify RCRA hazardous wastes (e.g., metals; solvents) and discuss the RCRA subtitle C regulations as a potential ARAR for proper disposal of such hazardous wastes. The presence of hazardous waste may pose significant implementation problems, could impose significant costs regarding the excavation alternatives, and would prompt the need for changes in the identification and evaluation of related ARARs (in Section 3).

11. The opening sentence of the Introduction (Section 1) should clarify the purpose of the document, which is reflected by the following sentences: "As a result of its internal deliberations and its further consideration of certain comments provided by interested community members, EPA determined that a Supplemental Feasibility Study (SFS) is warranted. This SFS will be added to the Administrative Record for this Site."

12. Section 1.1 might be more appropriately entitled "Scope" if the relevant discussions about scope are consolidated therein. On that basis, the first sentence of Section 1 should be moved to become the opening sentence in Section 1.1 and the first two complete paragraphs on page 3 (about NCP requirements) should be moved to Section 1.1. In addition, Section 1.1 should note the following: "Among other things, this document

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refines the description and evaluation of the containment remedy that was selected in the ROD. It also addresses in detail various facts and findings contained in two NRC reports that evaluate this Site."

13. If the changes recommended in comment 12 above are made, then Section 1.2 might be more appropriately entitled "Approach." On that basis, the second sentence of Section 1 should be moved to become part of the opening of Section 1.2.

14. It is logically awkward to partially discuss cleanup levels (Section 2.2) in advance of a discussion of ARARs (Section 3.1, which includes additional discussion about cleanup levels) and within a section that otherwise is devoted to site-specific information about land use, operations, and hydrology. A more satisfactory alternative organization would entail a separate discussion of RIM presence, distribution and extent (say new Section 4) that follows the discussion of ARARs (Section 3.1) and precedes the 'Technology Screening' (currently Section 4). If a new Section 4 is created for these purposes, then Section 2 could still retain a general discussion of the nature of the RIM (e.g., origins, amounts disposed over what time period, primary radiological parents, expected longevity, and in-growth of the radioactivity) but would not introduce the volume estimates nor discuss the distribution of RIM within the landfill.

15. EPA recommends a separate section devoted to the characterization of RIM to consolidate the relevant discussions and conclusions that are dispersed in the current draft (e.g., the discussion of uncertainty in the volume estimates is in Section 5.3.1 in the current draft) and provide a full, accurate, and up-to-date characterization of the RIM, one that (among other things) is consistent with the statute, NCP, and EPA guidance (e.g., principal threat waste guidance) and consistent with comments provided on the March 22 draft work plan (see comment 2 above). It also will provide for a transparent discussion about whether the RI data are consistent with or different than the NRC data and/or can be reconciled with various statements and conclusions in those reports (for example, that radioactive soil was disposed during a limited portion at the end of the operating history of the two radiological areas) including all those described in comments 1, 2, and 9 above.

16. To help make this document more self-sufficient, the scope of the remedial investigations of RIM presence should be summarized and consolidated in the final document (e.g., should incorporate information about boring density that is provided in Section 5.3.1 [page 58] of the current draft). Such a summary would provide an opportunity to explain the extent to which the NRC data were considered and evaluated in designing the RI. In light of not finding discrete layers of radioactive soil during the boring investigation and attributing radioactivity at unexpected depth in certain locations to artifacts of the boring investigation, the summary should also address and discuss whether the methods used during the RI to evaluate RIM presence were appropriate and sufficient for purposes of definitively determining the distribution of radioactivity within the landfill. This content could be incorporated into a new Section 4, dedicated to a discussion of RIM occurrences and spatial extent as recommended above.

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17. To help make this document more self-sufficient and "reader-friendly," Section 2 (suggested title: Summary of Key Site Conditions) should include concise, coherent presentations of the full range of site-specific information that potentially bears upon an evaluation of the alternatives. On that basis, the document at a minimum should include in Section 2:

- a readily identifiable subsection that consolidates the dispersed information about surrounding land use (i.e., background information reported in Sections 2.1, 3.1.2.2.1, 5.3.4.1, and elsewhere in the draft). Such a dedicated subsection would provide a good opportunity to identify and illustrate the proximity of the airport and orientation of its runways and the proximity of residential neighborhoods.

- additional information and potentially also clarifications about the nature and location of current on-site operations (e.g., explain why a solid waste transfer station and borrow area are essential to current site operations if wastes are no longer disposed on site; modification of Figure 2 to clarify site boundaries and identify undeveloped area(s) of the site). Such information would provide a foundation for the subsequent discussion of possible candidate locations for a newly constructed on-site disposal unit as envisioned in one of the excavation alternatives.

- existing land use and groundwater use restrictions for the site, including the Negative Easement and Declaration of Restrictive Covenants Agreement mentioned on page 24 of the draft.

- a summary of the design and construction of the two nonactive landfills, known as Radiological Areas 1 and 2, and evidence, if any, about the generation of methane within or underneath these landfills.

- a summary of pertinent, site-specific information about groundwater (see, for example, comments 5 and 6 above).

- available information about seismic areas, Holocene faults, unstable areas, and wetlands (as cited in state landfill siting regulations [10 CSR 80-3.010(4)(b)] which pertain to each of the remedial alternatives being evaluated.

Additional information about transportation routes (e.g., truck routes into and out of the site, location of nearest railroad line) and truck traffic (e.g., number of trips into and out of site under current operations, if available) might also warrant inclusion in Section 2 to provide a basis/context for subsequent discussions and evaluations about community impacts of the excavation alternatives (i.e., "short-term" effectiveness) and infrastructure needs of the excavation alternatives.

18. The draft SFS proposes (in Section 3.3.2) to add a new Remedial Action Objective (RAO), which conceptually may be an appropriate approach to take. The proposed fifth RAO should not be included as written; however, because RAOs generally should not prescribe specific remedial actions (e.g., waste removal) and should apply to all remedial

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alternatives that are being considered and evaluated. In addition, the nature, complexity, and requisite duration of the institutional controls generally are appropriate matters to consider when evaluating the long-term effectiveness and reliability of the remedial alternatives (e.g., as part of the nine criteria analysis), not as specific language in an RAO.

19. The final SFS should include an appropriately worded RAO to justify choosing groundwater monitoring as a component of the three remedial alternatives. By itself, groundwater monitoring does not attain any of the RAOs stated in the May 2008 ROD (i.e., it does not prevent direct contact with landfill contents or radiation, does not minimize infiltration or leachate generation, and does not control surface water runoff or radon and landfill gas emissions).

20. Because the Negative Easement arose from an agreement between the Bridgeton Sanitary Landfill and the airport owner (see page 24), which did not involve MDNR, it should be discussed in a separate section rather than within a section pertaining to MDNR solid waste regulations. EPA recommends including it in the proposed discussion of existing institutional controls in Section 2 (see comment 17 above for further explanation). This discussion should also summarize the outcome of recent discussions with appropriate airport authorities about the easement in the context of alternatives being evaluated in the SFS.

21. The Negative Easement is documented in the SFS (Appendix B) presumably because it potentially bears upon the implementation of the alternatives being evaluated in the SFS. The existing on-site land use restrictions should also be documented in an appendix to the final SFS because the information bears upon evaluations of the long-term effectiveness, reliability, and protectiveness of the alternatives being evaluated in the SFS.

22. The draft report does not provide an objective analysis in its limited consideration of treatment. For example, page 94 (first paragraph) states that treatment will not be used due to large volumes of material with low activity levels, and that radionuclides cannot be destroyed. The term "low activity levels" should be replaced throughout the SFS with the actual range of activities observed at OU 1.

23. The Feasibility Study is generally viewed as occurring in three phases: the assembly/development of alternatives, the screening of the alternatives, and the detailed analysis of alternatives. (In actual practice, the development and screening of alternatives are often discussed together to better reflect the interrelatedness of these efforts and because the point at which the first phase ends and the second begins is not so distinct.) Consistent with guidance for conducting feasibility studies under CERCLA (EPA/540/G-89/004; OSWER Directive 9355.3-01), the final document should contain a distinct and recognizable section that assembles/develops and presents the final set of alternatives, incorporates the results of the evaluation of treatment options (see comment 22 above), integrates information present in Sections 3.3 (Remedial Action Objectives), and 5.1 of the current draft.

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24. The guidance for conducting feasibility studies under CERCLA (EPA/540/G-89/004; OSWER Directive 9355.3-01) calls for a detailed evaluation of alternatives against the NCP's nine criteria evaluation that is to occur in two sequential and separate steps: (1) an assessment of each individual alternative against the evaluation criteria, and (2) a comparative analysis among the alternatives to assess the relative performance of each alternative with respect to each evaluation criterion. The first step is intended to consider only remedial components within each individual alternative; comparisons should not be made to the other alternatives nor to response options that were not included in any of the final set of alternatives. The final SFS should conform to this guidance. The draft document does not. Section 6.2 appears to be intended to provide the Individual Analysis of Alternatives; if so, it should be so labeled. On that basis, Section 6.2.2.4, which pertains to the individual analysis of "full" excavation and off-site disposal alternative, should not and need not advance arguments that compare the alternatives (e.g., "*none of the alternatives* [emphasis added] will reduce the toxicity, mobility, or volume of the waste material through treatment technology" at page 103); appropriate arguments comparing alternatives to the NCP nine criteria belong instead in the Section entitled Comparative Analysis of Alternatives (Section 7 in the current draft). Likewise, the individual analysis should not make statements or arguments about other response actions (e.g., about in situ or ex situ treatment, see page 103); appropriate arguments comparing candidate response options belong instead in the Section on Development and Screening of Alternatives (Section 4 in the current draft, which is entitled Technology Screening).

25. Section 5.1 of the current draft recaps the remedial alternatives that were considered in the Feasibility Study for Radiological Areas 1 and 2, which include a 'partial excavation' alternative (L6). This recap should be amended to restate that alternative F1 (No-action Alternative) for Radiological Areas 1 and 2 does not meet the threshold criteria set forth in the NCP.

26. Because the Statement of Work was primarily conceptual and does not displace or change any statutes, regulations, or guidance, it does not represent a comprehensive, final statement about the scope or approach of the SFS or the scope of EPA's considerations in making remedy selection decisions. The final SFS should not include any statements that compare and contrast the Statement of Work and the final Work Plan, nor should it include any statements that could be construed as criticizing or identifying a shortcoming in the Statement of Work. (For example, the second complete paragraph on page 3 opens with "Although not required by the SOW (EPA, 2010), the NCP requires ..." The phrase "Although not required by the SOW (EPA, 2010)" is unnecessary and could be misleading.)

27. The final SFS should specify which "supplemental evaluations" by TetraTech EMI (TtEMI) were relied upon by Engineering Management Support, Inc. (EMSI) (see page 2 of the current draft SFS, Section 1.2). The final document needs to clarify whether EMSI relied only upon TtEMI's initial list of potentially relevant disposal facilities and which unit costs for off-site disposal were used.

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28. As stated in the 1988 NRC report (*Radioactive Materials in the West Lake Landfill*, NUREG Publication 1308, page 1), the NRC during a site inspection in 1974 determined that approximately "43,000 tons of waste and soil" comprised of leached barium sulfate residues mixed with top soil had been disposed in 1973 at the West Lake Landfill and "covered with only about 3 feet of soil." This same NRC report notes that this landfill "was closed in 1974 by the Missouri Department of Natural Resources (MDNR)." This contemporary reference (and/or other contemporary references), rather than the 2009 report by TtEMI, needs to be cited as the basis for information summarized in the SFS about the operating history of the non-active landfills known as Radiological Areas 1 and 2.

29. The draft SFS needs to accurately describe the extent and time frame for solid waste disposal activities (including nonradioactive solid wastes) in the nonactive landfills known as Radiological Areas 1 and 2; as written, the draft SFS suggests they were limited to the early 1970s. The subsection about operational history needs to clarify (1) the overall operating period; and (2) the design and construction of these two nonactive landfills and whether they satisfy the current, primary design criteria for a RCRA Subtitle C or D landfill.

30. The main text of the document should:

- summarize the volume estimates, including a definition of the volume being estimated (i.e., estimated lateral and vertical extent of RIM occurrences)
- clearly describe the need/purpose of those estimates (e.g., is the goal to obtain an upper-bound or a lower-bound estimate of the volume?)
- discuss the primary sources of uncertainty in the volume estimates, which is in Section 5.3.1 of the current draft

This content could be incorporated into a new Section 4 dedicated to a discussion of RIM occurrences and spatial extent as recommended above. Here and throughout the text, the volumes should be described accurately and referenced consistently.

31. The final document needs to clarify the purpose of Section 4.2 (in the current draft) and how it relates to existing language in the Feasibility Study. The original Feasibility Study evaluates "selective excavation of radiologically impacted materials containing higher levels of radionuclides as a potential remedial technology" and a "partial excavation" alternative with off-site disposal (L6), short-term monitoring, physical treatment, transportation, and off-site disposal was, in fact, considered in the original Feasibility Study. In the current draft, however, Section 4.2 suggests that short-term monitoring, physical treatment, transportation, and off-site disposal, as identified and described on pages 39 to 44, are "additional" response actions that were not considered in the Feasibility Study and only now warrant consideration. If there is any significant new

information about short-term monitoring, physical treatment, transportation, or off-site disposal that would alter the findings of the previous evaluation, the final SFS should clearly identify and explain it.

32. The discussion about means, methods, implementability, and other aspects of transportation, and off-site disposal should reflect a consideration of the experiences during the remedial actions at the St. Louis Airport properties (SLAPS) nearby.

33. Additional explanation or clarification may be warranted to provide assurance that shredding is a suitable pretreatment step to facilitate size separation of waste materials. The current draft states that "shredders would be employed as a pretreatment step prior to a solids separation process" (see Section 4.1.2, page 41). Because such a pretreatment would tend to reduce the size of municipal solid waste materials, it could be counter-productive as a treatment step in advance of solids separation processes that primarily rely upon differences between small soil particles and larger pieces of solid waste such as are cited in Section 4.3.3 (see pages 41-42).

34. Although the ROD does not explicitly mention (in the Description of Selected Remedy at page 43) that substantial volume of waste materials will be excavated, handled, or moved to create stable side slopes under the containment remedy, the final SFS should explicitly acknowledge same and accurately state relevant facts (e.g., estimated waste volume to be moved) as a part of the definitive description of this alternative (which is in Section 5.2 of the current draft).

35. The final document should reach a conclusion about whether a new engineered disposal cell is feasible on the site. The discussion of an on-site cell (Section 5.3.4.1) should include a summary or refer to documentation of recent discussions with the airport authority about waiving the Negative Easement which the current draft implies is possible (see second bullet on page 65).

36. The final document needs to provide "fair and balanced" evaluations of the remedial alternatives. For example, as currently written, the evaluation of environmental impacts in the draft report is not fair and balanced. The draft appropriately states for both the excavation remedy (Section 6.2.2.5.3) and the containment remedy (Section 6.2.1.5.3) that "disturbance of the landfill surface would destroy those portions of the habitats that currently exist on the surface of Area 2, forcing wildlife to migrate to other areas." But only in the case of the containment remedy (see Section 6.2.1.5.3) does the draft SFS state that "this disruption would be temporary" and "[n]o measurable long-term impacts to plants and animals in surrounding ecosystems are expected."

37. The final SFS needs to contain specific factual statements that are supported by data, rather than general characterizations. So, for example, the final report needs to report the activity concentrations of uranium and thorium in barium-sulfate residues (see page 7, Section 2.2.1), rather than to claim without further documentation that barium-sulfate residues contained only "traces" of uranium and thorium. Likewise, statements that the radioactivity levels in the waste materials are "low" (see page 94), if true, needs to be

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backed up with specific, credible sampling data compared to specific benchmarks of safety. Similarly, given the specific language in the NRC reports to the contrary, the final report needs to provide a readily recognizable, verifiable, scientific basis for the characterizations (see page 8) that "radionuclides are present in a dispersed manner *throughout* the landfill deposits" and "the soil containing radionuclides is intermixed and *interspersed within the overall matrix* of landfill refuse, demolition and construction debris, fill materials, and unimpacted soil" or for the claim (see page 92) that "Long-term site management plans and institutional controls would be *robust and durable*." (Emphasis added.) Among other considerations, the statement that "radionuclides are present in a dispersed manner throughout the landfill deposits" appears to be inconsistent with certain conclusions reached in the NRC reports (e.g., see quotes above in comment 2 and the RI report which suggest a more limited but well-defined vertical distribution (e.g., "In the northwestern part of Area 1, radiologically impacted materials were identified at depths generally ranging between 0 and approximately 6 feet" (at page 92 of the April 2000 RI report). Radiologically impacted materials were generally found at depths ranging between 0 to approximately six feet in the northern and southern parts of Area 2 (at page 97 of the RI report).

38. The final report should minimize unnecessary, duplicative information. For example, the history of this document's development (i.e., letters and work plans) is repeated throughout the draft (see, for example, introduction to Sections 2.3 and 4.2, in addition to opening paragraph of Section 1) as are statements that the "complete rad removal" alternative would not really remove the radioactive materials completely (see, for example, page 1, second paragraph of Section 2.2.2, and fourth paragraph of Section 3.1.1.1.1) and that EPA required two additional alternatives to be evaluated (see, for example, last sentence in Section 1.1 and introduction to Section 4.2, in addition to third paragraph of Section 1.1). As a general matter of style and readability, noncritical information of this kind need not be restated repeatedly throughout a document.

39. As a result of addressing the foregoing comments, related portions of the document (e.g., analysis of alternatives per the nine NCP criteria) may also warrant amending.

40. Page 9: The risk-based cleanup level for uranium should not be above background. This is inconsistent with EPA's Role of Background policy. The risk-based cleanup level should be expressed as a single concentration which includes background.

41. Page 9: To comply with EPA policy, cleanup levels for uranium should be expressed both in terms of mass for total uranium noncancer risk and activity per uranium isotopes for cancer risk. The noncancer risk-based level of total uranium should be stated along with a concise comparison to the cancer-based level and a declaration of which is lower and governs the cleanup.

42. Page 28, third paragraph: See comment 22 above. The basis of calling radioactive contamination "low activity" is not apparent, particularly since most of the owners and operators of licensed disposal facilities consider it too radioactive to accept. The radium-226 concentrations at UMTRCA sites generally are not above 1,000 pCi/g, but West

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Lake has multiple hits over 10,000 pCi/g. For these and other reasons set forth herein, the term "low activity" should not be used to characterize the radioactive waste in the landfill.

43. Page 57, third paragraph: This section states that the design-phase survey will be conducted using 40 CFR 192 and MARSSIM. Since the approach in 40 CFR 192 uses an average, while MARSSIM uses statistical tests, the current draft is ambiguous about how this would be accomplished. When discussing the 5 pCi/g standard in the document to define the RIM, the final report needs to clearly indicate which approach is being used: 40 CFR 192 area averaging, MARSSIM statistical test, or a not-to-exceed approach. See also page 60, third paragraph, first bullet. The final document should be clear about whether a statistical test, MARSSIM (40 CFR 192), a not-to-exceed approach, or another approach will be used.

44. Page 105, second and third paragraphs: See comment 22 above. The waste should not be characterized as "low activity." Among other considerations, characterizing the waste as "low activity" is undermined where the draft report states that a remediation worker will get 499 mrem/yr exposure for off-site disposal option, and that OSHA equipment and practices may not provide adequate protection for workers. For these and other reasons set forth herein, the term "low activity" should not be used to characterize the radioactive waste in the landfill.

45. Page 108, third paragraph: Blending to change waste characteristics for disposal is generally inconsistent with EPA practices. Was consideration given to sending most waste to U.S. Ecology with higher containers going to another facility (e.g., Energy Solutions)?

46. Page 114, last paragraph: The draft report does not describe what consideration was given to separating the trash from the radioactive material to have less volume of waste to dispose. The final report needs to fully and accurately address this issue. The final document should consider various techniques to reduce waste volume.

47. Table 5, PVC-21, depth 18 feet: The result of 4.4 billion pCi/g for this sample appears to be in error and must be corrected.

48. Appendix F, page 6, footnote a: This footnote states that Region 9 soil screening levels were used for chemical risk assessment. The final report should use the Regions 3, 6, and 9 regional screening level calculator in order to provide a more accurate, up-to-date evaluation.

49. Appendix F, page 11, last paragraph: The report needs to either provide the rationale for using RESRAD, rather than the PRG calculator, in that situation or rerun the assessment using the PRG calculator.

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50. Appendix F, page 54, first paragraph, and Table 8-4, second column: The PRG calculator does include external as well as inhalation for the ambient air scenario as does the indoor scenario in the BPRG calculator. The risk assessment should be corrected to include this pathway of exposure.

51. Appendix F, page 71, Table 10-3, column 5: The source of these concentrations should be explained in the final document. These concentrations appear to be much lower than the survey results.

As agreed during our meeting on September 22, please provide a revised document incorporating these changes within sixty (60) days of your receipt of this letter. EPA anticipates that several conference calls and transmittals of proposed changes will be necessary during this 60-day period; please contact me within seven (7) days of your receipt of this letter to schedule our first conference call. If you have any questions, you may contact me at (913) 551-7324.

Sincerely,

Daniel R. Gravatt
Remedial Project Manager
Missouri/Kansas Remedial Branch
Superfund Division

Enclosure

cc: Shawn Muenks, MDNR
Rich Kapuscinski, EPA HQ (e-mail only)
Charlotte Neitzel, Holme Roberts & Owen (e-mail only)
Christina Richmond, US DOJ for US DOE (e-mail only)
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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Superfund

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

May 21, 2009

MEMORANDUM

SUBJECT: West Lake Landfill Site: Recommendations

FROM: Elizabeth Southerland, Acting Deputy Director Elizabeth Southerland
Office of Superfund Remediation and Technology Innovation

TO: Cecilia Tapia, Director
Superfund Division, Region 7

In response to your request for an evaluation of the remedy at the West Lake Landfill site, I had several Superfund and radiation experts (proficient in landfill remedies, radioactive waste remediation, and hydrogeology) from the Assessment and Remediation Division and the Office of Radiation and Indoor Air review the site remedial studies and May 2008 Record of Decision.

As a result of this review, and following our discussions about the site with you and your staff on May 12, 2009, we believe the region should include several measures to the selected remedy if not already included in the remedy. First, the proposed cap should meet UMTRCA guidance for a 1,000-year design period including an additional thickness to prevent radiation emissions. Second, air monitoring stations for radioactive materials should be installed at both on-site and off-site locations. Third, groundwater monitoring should be implemented at the waste management unit boundary and also at off-site locations. The groundwater monitoring program needs to be designed so that it can be determine whether contaminants from the landfill have migrated across the waste management unit boundary in concentrations that exceed drinking water MCLs. The groundwater monitoring program needs to measure for both contaminants that have historically been detected in concentrations above MCLs (e.g., benzene, chlorobenzene, dissolved lead, total lead, dissolved arsenic, total lead, dissolved radium, and total radium) and broader indicators of contamination (e.g., redox potential, alkalinity, carbonates, pH, and sulfates/sulfides). If the results of the groundwater monitoring program provide evidence that a plume of contaminants at concentrations above the MCLs has or is currently migrating beyond the waste management unit boundary, then the region should do further evaluations and take appropriate response actions. Fourth, flood control measures at the site should meet or exceed design standards for a 500-year storm event under the assumption that existing levee system is breached.

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