



**Missouri Department of Health and Senior Services**

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**Gail Vasterling**  
Director



**Jeremiah W. (Jay) Nixon**  
Governor

April 24, 2014

Shawn Muenks, Program Manager  
Federal Facilities Section, RRA Unit  
Hazardous Waste Program  
Missouri Department of Natural Resources  
P.O. Box 176  
Jefferson City, MO. 65102-0176

Re: The Missouri Department of Health and Senior Services' comments for the document *Evaluation of Possible Impacts of a Potential Subsurface Smoldering Event on the Record of Decision – Selected Remedy for Operable Unit-1 at the West Lake Landfill*; January 14, 2014;

Dear Mr. Muenks:

The Missouri Department of Health and Senior Services (DHSS) has reviewed the referenced document, and provides the following comments.

**Executive Summary**

1. Bullet point items that address radon assume rapid dilution. However, an applicable or relevant and appropriate requirement (ARAR) has been established for flux rates of radon for this site under the Uranium Mill Tailings Radiation Control Act (UMTRCA). Therefore, identify the potential for exceedance of the ARAR based upon flux rates of radon.
2. Bullet point 2 appears to contradict the findings within Section 6.2, Thermal Impacts, regarding dust generation. Bullet point 2 identifies no excess offsite exposure to radiologically-impacted material (RIM) contaminated dust as a result of a subsurface smoldering event (SSE). Section 6.2 identifies the potential for destruction of vegetative cover resulting from an SSE, with adverse effects to include accelerated dust generation. The difference between the Executive Summary and Section 6.2 statement appears to be that the impacts discussed in the Executive Summary assumes that the remedy is in place; whereas impacts discussed in Section 6.2 are pre-remedy. Unfortunately, the Executive Summary does not make the distinction as to whether the impacts assume remedy-in-place or not.

To eliminate confusion as to whether this bullet point references a pre-or post-remedy condition, clarify specifically whether the conclusions reached within the Executive Summary, and as necessary for other applicable sections of the report, are based upon pre-or post-remedial conditions.

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For this statement specifically, if these conclusions are based upon pre-remedial conditions, the statement should be revised to identify a potential for redistribution of RIM due to wind, precipitation, or mechanical disturbances if cover is lost.

3. For the Executive Summary bullet point 3, clearly identify how the remedy design would address an increase in radon flux. The document clearly identifies radon flux rate is a function soil moisture, temperature, and porosity. Two of the soil conditions, moisture and temperature, are expected to increase as a result of an SSE. As a result, increased exhalation is expected from the landfill. An ARAR has been established for flux rates of radon for this site under the UMTRCA. Therefore, address the potential for exceedance of the UMTRCA ARAR.

Not discussed in this report, and relevant to bullet point 3, is the potential to require a barrier placed over the surface of the landfill to control ambient flux of gases, similar to Bridgeton Landfill. If installed, a soil vapor extraction system (SVES) would be required. Include in the report potential impacts associated with installation of a cover and SVES for Westlake. Revise appropriate sections of this report as necessary.

4. The Executive Summary bullet point 4 cannot be stated given the potential for increased leaching, and potential increase flux of radon for exposure scenarios to include remedial workers onsite involved with a SSE. Also, please discuss the potential for redistribution of radon and radon progeny, nor are modeling results (i.e. RESRAD Offsite) provided in this report to support the theory that potential long-term risks will not occur. This support should be provided and based upon conditions contingent on the cap being in place. Potential impacts to the 2011 Supplemental Feasibility Study (SFS 2011) assuming use of a cover and SVES should be discussed within applicable sections of this document.

### **Section 1, Introduction**

5. Section 1, page 2, paragraph 2 identifies conditions that have changed within the Bridgeton Landfill resulting from the SSE. Include in the list a decrease in the leachate quality (higher organic loading, chemical oxygen demand, volatile organic chemicals, etc.)

### **Section 3, ROD-Selected Remedy**

6. Section 3, page 7, bullet point 3 recognizes a layer of cobble to be placed over the landfill. Discuss the potential for preferential migration through the cobble, and redistribution of radon and progeny within applicable sections of the document.

### **Section 4, Potential ARARs Relative to an SSE**

7. Relative to Section 4, ARARs already established have been provided with a conditional, interpretive statement outlining how each ARAR will be applied to Westlake Landfill. DHSS recommends each ARAR-specific statement be revisited, further defining how the ARAR will apply in the event a SSE occurs.



Lacking chemical specific data resulting from a hypothetical SSE, applicability statements for chemical-specific ARARs should include provisions to modify their scope of coverage in the event a SSE occurs. See Table 5: Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria, of the 2011 Supplemental Feasibility Study (SFS 2011) for the listing and applicability statement for each of the ARARs.

8. Discuss any impacts to the estimates of the magnitude of residual risks, as discussed in Section 6.2.1.3.1 of the SFS 2011, and the referenced Appendix H of the Record of Decision (ROD). Specifically, address potential impacts to short-term and long-term effectiveness criteria for both community and workers that may result from preparation for an SSE and in the event an SSE occurs. Both assessments should include risk from increased flux of radon and chemicals to ambient air and groundwater, for both community and workers. Discuss the potential need to reduce emissions through covering and landfill gas extraction, and potential impacts for both community and workers, including any exposures that cannot be controlled.
9. In addition to ARARs, cleanup levels based upon site-specific risk-related factors have been developed for this site. Section 3.4, Cleanup Levels, of the SFS 2011 provides discussion regarding these factors. In the event a contaminant is detected in a specified media, and no ARAR exists or the ARAR is not deemed adequately protective of human health, then a site-specific risk assessment may be required to identify cleanup goals. Alternatively, generic cleanup goals may also be utilized, including but not limited to, EPA Regional Screening Levels for chemical contaminants, or EPA preliminary remediation goals for radionuclides. The potential for use of these alternative factors should be recognized in this document.
10. Provide within Section 4 the list of ARARs that currently are anticipated to apply to a SSE if this document is to be a stand-alone addendum to the SFS. Bridgeton landfill emission data may be referenced for potential chemical-specific ARARs.

Section 4 should include ambient air standards for radionuclide Nuclear Regulatory Commission 10 CFR 2, titled "Standards for Protection against Radiation, Appendix B to Part 20 - Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage". DACs are being used for thorium, and can be applied to all site-related radionuclides. Also, given the list of chemicals of concern could include contaminants resulting from an SSE, sources of acute screening levels for ambient air, and National Ambient Air Quality Standards (NAAQS), where applicable, should be declared as to-be-considered (TBC) requirements. Although screening levels are not *de facto* cleanup standards, their use would be interim until further baseline investigation via risk assessment would be available.

Similarly, ARARs relating to leachate will need to be addressed. Given a leachate recovery system does not exist beneath RIM-impacted fill, groundwater impacts from an SSE are possible. Therefore, condition of applicability of each water quality standards already chosen for each groundwater ARAR for this site should be modified to include the potential for additional chemicals resulting from leachate if an SSE should occur. Because the ROD list of chemicals of concern (COC) does not address an SSE, and COCs from an SSE cannot be predicted, note the



need for additional investigation being required within the conditional statement of applicability of groundwater ARARs for this site. If necessary, a baseline risk assessment to develop potential remediation goals and listing of additional ARARs may be required.

### **Section 5 Potential Impacts of an SSE on the RIM**

11. For Section 5, potential impacts listed on page 10, redistribution of radionuclide from migration of radon and leaching of radionuclides to groundwater, or similar language, should be considered as a fifth potential impact.
12. Corresponding to an SSE under existing conditions, please discuss potential increased exposure by workers to RIM due to increased worker activity within Westlake Landfill to assess and address the SSE. This includes incidental ingestion of soil, inhalation of dust generated during their activity, and external exposures. As the baseline risk assessment does not assess exposures to the extent an SSE would involve, calculation of potential risks to workers may be warranted as part of short-term effectiveness. Discussion in this section regarding update of the baseline risk assessment and implications that apply to use of additional alternative criteria or guidance (i.e. acute screening levels for ambient air) that may apply to the SFS itself is warranted.
13. Not noted in section 5 is that leachate load would increase in groundwater. This has been demonstrated at Bridgeton, where organic and inorganic loads have increased significantly in the leachate collection system. Enhanced radionuclide concentrations would be expected due to disassociation of the radionuclide with organic constituents within the landfill matrix, and increased soil moisture due to exothermic reactions. Resettling of vapor generated by vaporization of entrained liquids in waste or condensation of a vapor front will generate increased leachate volumes. Further discussion on leachate volumes and potential groundwater impacts within this document is therefore warranted.
14. The potential for fissures within the surface soil to occur due to landfill volume reduction, and "settling" of the surface (as currently demonstrated at Bridgeton) should be evaluated. Emissions of radon should increase, as fissures allow for increased flux of soil gas to ambient air. The potential for uptake of surface water into a fissure would also be expected. Pooling and infiltration of surface water in depressions caused by settling is also anticipated. Further discussion of these potential occurrences is warranted.
15. Section 5.2, Increase in Subsurface Temperature, notes ... "the heat that has been observed and/or could be generated within the landfill materials within West Lake Areas 1 and 2 could not approach the amount of heat necessary to melt (barium sulfate) or otherwise disrupt the stability of the RIM." Noting that the chemical compounds (form) of the radionuclides have not been determined for Westlake Landfill, the stability of the barium compound may have little or no impact on transport of radionuclides. Barium sulfate was more or less the name of a process waste, mixed with radionuclides and other metals. Whether this compound remains as the matrix for which radionuclide are affixed, or has degraded into or exists as other compounds has not been demonstrated. This comment should be substantiated with radionuclide-specific compound data, or qualified as discussed above. This is further discussed in Section 5.2, Increase in

Subsurface Temperature, emphasizing barium sulfate and its degradation. Amend all relevant sections of this document as necessary.

The long-term impacts associated with organic conversions due to exothermic degradation of landfilled materials and chemistry of the oxidation by-product materials both may have a significant impact on the transport characteristics of radionuclides through the landfill profile. Two pathways of concern include emanation of radon to ambient air and leaching of radionuclides to groundwater.

An assessment of trends with leachate sample results for metals at Bridgeton would also be an additional line of evidence that would provide fate and transport information for radionuclides. Results of investigations for other landfills post-SSE may also be valuable in determining potential long term transport issues. If significant, these findings should be presented in this document.

16. Section 5, Potential Impacts of an SSE on the RIM, page 10 lists four potential impacts to the subsurface in the event an SSE occurs. Lacking is a discussion of potential impacts due to oxidation of organic matter by a SSE, and corresponding fate and transport characteristics of the by-product. Providing this discussion will aid in further assessment of the potential for migration and redistribution of radionuclides.
17. This report, or the SFS, would benefit from a revised conceptual site models (CSM) assuming an SSE with and without the remedy in place. The CSMs would help visually define potential exposure pathway, identify fate and transport issues, and potential routes for redistribution of radon and its progeny. The potential for transport of radon within the course aggregate defined as the bio-intrusion marker should be addressed.

#### **Section 6, Potential Impacts of an SSE on the Rod-Selected Remedy**

18. Section 6 lacks discussion of potential consequences of radon redistribution, with respect to radon progeny, to the remedy. Of concern is accumulation of radon progeny within the cap. Discussion of potential increases of progeny in the cap is warranted. Potential controls including a synthetic vapor barrier may be considered.

If you have questions or comments, please contact Andrew McKinney at (573) 751-6102.

Sincerely,



Jonathan Garoutte, Chief  
Bureau of Environmental Epidemiology

JF/DW/AM/vmp