



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

11201 Renner Boulevard
Lenexa, Kansas 66219

FEB 05 2018

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations for the West Lake Landfill Superfund Site

FROM: Mary Peterson, Director
Superfund Division

Mary P. Peterson

TO: Douglas C. Ammon, Chair
National Remedy Review Board

The U.S. Environmental Protection Agency, Region 7 would like to thank the members of the National Remedy Review Board for their time and efforts in reviewing the material presented on the West Lake Landfill Superfund Site. Region 7 will use the comments and recommendations offered by the Board in moving forward with the remedy process and establishing a final remedy for the Site that is protective of human health and the environment. Below you will find a summary of the information provided to the Board regarding the Site followed by the Region's responses to the January 26, 2018, Board recommendations.

Overview of the Proposed Action

The West Lake Landfill Superfund Site is a 200-acre, inactive solid waste disposal facility located in Bridgeton, Missouri. Areas of the West Lake Landfill were radiologically contaminated in 1973 when soil mixed with leached barium sulfate was used as cover for landfilling operations at West Lake Landfill.

The site is composed of three operable units, or OUs. OU-1 consists of areas at the site where radiologically impacted material, or RIM, has been identified within surface soil and subsurface solid waste. The remaining surface area of the site is designated as OU-2, which consists of several inactive fill areas that contain sanitary waste or demolition debris. The EPA has specifically designated OU-3 to address potential groundwater contamination at the site. This Board review is focused on the remedial alternatives under consideration for the radiologically impacted areas that constitute OU-1.

In May 2008, the EPA issued a Record of Decision, or ROD, for OU-1 of the Site. The major components of the ROD-selected remedy included the installation of a landfill cover meeting the Missouri closure and post-closure care requirements for sanitary landfills, including enhancements such as an armoring layer and radon barrier consistent with standards for uranium mill tailing sites, consolidation within the landfill, institutional controls (ICs), and groundwater monitoring. In 2010, the EPA determined that further evaluation of remedial alternatives was warranted. After completion of a Supplemental Feasibility Study in 2011, Region 7 consulted with the Board in February 2012. In response to the Board's consultation memo dated February 28, 2013, Region 7 conducted additional investigation activities. The Board would like to acknowledge the thoroughness of these activities and



related findings that address the items and suggestions from the Board's consultation. RIM is located in two landfill disposal areas known as Radiological Areas 1 and 2, as well as in two adjacent parcels of industrial property referred to as the Buffer Zone and Lot 2A2 of the Crossroads Industrial Park. The RIM within Areas 1 and 2 consist of soils containing radium and thorium isotopes within municipal solid waste, industrial waste, and construction and demolition debris, which may contain other non-radionuclide constituents such as trace metals and volatile organic compounds. The areal extent of RIM in Area 1 is approximately 8.4 acres immediately to the southeast of the main access road to the Site. The areal extent of RIM in Area 2 is approximately 26.8 acres along the northern boundary of the Site. The RIM in Areas 1 and 2 does not consist of a continuous layer but rather several discontinuous lenses consisting of varying volumes at depths ranging from 0 to 89.4 feet below ground surface in Area 1 and from 0 to 42.5 feet below ground surface in Area 2. The estimate of the volumes of RIM within Areas 1 and 2 are 58,700 and 251,000 cubic yards, respectively.

The Board noted that in response to the Board's consultation memo dated February 28 2013, the Region had conducted additional investigation activities. The Board acknowledged the thoroughness of those activities and related findings that addressed the items and suggestions from the Board's consultation.

Information provided to the Board by the Region for the January 9, 2018 review included the following:

- NRRB Consultation Considerations
- West Lake Landfill Extent & Distribution of RIM PowerPoint
- Site Background Summary
- NRRB Report
- NRRB PowerPoint

Although a preferred alternative was not provided to the Board, the Region presented the range of remedial alternatives under consideration for OU-1. The remedial alternatives include cap in place (with either a modified 2008 ROD selected engineered cover or an Uranium Mill Tailings Radiation Control Act (UMTRCA) engineered cover), full excavation (with either on-site or off-site disposal), and three partial excavation options based on different criteria. The Board reviewed all alternatives.

The Board reviewed the informational package describing the remedial alternatives and discussed related issues with Region 7 management and staff on January 9, 2018. The Board noted that the range of alternatives had been developed considering the Board's prior consultation. In typical circumstances, the Board is presented with a preferred alternative. In this case, the Site was included on the December 8, 2017, Administrator's List of Superfund Sites Targeted for Immediate, Intense Action and a preferred alternative had yet to be identified. As a result, the applicability of a recommendation may depend upon which alternative is proposed.

Waste Characterization

1. *The Board noted that there remains some uncertainty with the presence and volume of RIM especially in the deeper locations. The Board recommended that the Region describe the impact of this uncertainty on the comparison of alternatives in its decision documents and provide a detailed clarification in the Administrative Record.*

Region 7 Response: The Region recognizes there remains some uncertainty with the limited set of soil borings that indicate deeper occurrences of Radiologically Impacted Material (RIM), particularly in Area 2. To better understand the potential impact of these deep borings on the cost

estimates provided in the FFS, the Region completed an exercise to approximate the costs associated with these deeper occurrences of RIM for these two borings (WL-210 and WL-234) and two other nearby borings (AC-24 and AC-25) in Area 2 and to determine the proportion of those costs compared to the cost of Full Excavation of RIM from Areas 1 and 2.

The EPA utilized volume estimates provided by the Respondents for the RIM, overburden, and setbacks necessary to access this deep RIM and costs presented in Appendix K of the FFS to generate these estimates. The results of these calculations indicate that approximately 5% of the total estimated costs related to the Full Excavation of RIM with off-site disposal is associated with the deep RIM in borings WL-210 and WL-235. The details for these calculations are provided in the EPA's letter approving the FFS with comments, which will be placed in the final Administrative Record.

The Region determined that sufficient information exists from the multiple investigations implemented at the Site (over 500 soil samples and over 100 borings) such that the presence and volume of the RIM is known sufficiently to select the appropriate remedy for the Site. As in any remedial investigation, some uncertainty remains regarding the final delineation of all contamination. This uncertainty can be further reduced as a part of the remedial design of the final selected remedy.

This uncertainty regarding the deeper occurrences of RIM in Area 2 has been documented in the final RIA Report and the comment letter approving with modifications the January 26, 2018 Final FFS Report and is discussed in the Proposed Plan.

- 2. The Board recommends that if the proposed remedy includes excavation that the Region include additional characterization of RIM location as a part of pre-design investigation.*

Region 7 Response:

The Region has added a discussion to the Proposed Plan indicating that additional characterization of RIM is anticipated for excavation remedies that may include deep RIM. Additional post-ROD delineation efforts are common for excavation remedies in the Superfund program and are envisioned during a Pre-Design Investigation or during the initial phase of the Remedial Design for the West Lake Superfund Site.

- 3. The Board recommends that the decision documents clearly explain the different roles associated with each type of measurement used, including when they are used for gamma readings (downhole and core) and the analytical results (radium/uranium/thorium levels).*

Region 7 Response:

Two primary types of data have been used during investigation of the West Lake Site; field screening data such as gamma and alpha scanning, and analytical data from samples analyzed at an off-site laboratory. Field screening data is reported in relative terms related to the instrument response to a specific type of radioactivity, such as gamma radiation, and is often expressed in counts per minutes or counts per second. The type of equipment utilized during the various remedial investigations performed at the Site provide measurement for gross gamma or gross alpha radiation. Analytical data provides concentrations of specific radionuclides at a level of precision specified in a quality assurance project plan or sampling and analysis plan. Analytical data associated with the Site along with field screening data was used to develop the extent of RIM presented in the Remedial Investigation Addendum (RIA) and the volume estimates of RIM presented for each of the remedy

alternatives presented in the Final Feasibility Study (FFS). These estimates are developed and described in the final Estimated Three-Dimensional Extent of Radiologically Impacted Material (December 22, 2017, S.S. Papadopoulos). All the risk evaluations presented in the updated Baseline Risk Assessment (BRA) and the FFS utilized analytical data only.

Additional information related to this recommendation is provided in the Administrative Record and summarized in relevant portions of the RIA, the FFS, and the Estimated Three-Dimensional Extent of Radiologically Impacted Material Report.

Human Health Risk

- 4. The Board recommended that the Region include a nearer-term future time frame consistent with Superfund risk assessment practices in the baseline human health risk assessment. The Board recommended that the Region clarify the current and future risks that support the basis for action at the site. In particular, the Board recommended that the Region clarify that the risks evaluated in the Baseline Human Health Risk Assessment are those posed prior to any remedial action, without existing fences and ICs, in accordance with the NCP Preamble (55 FR 8711, March 8, 1990). Additionally, the Board recommended the Region clearly define in site documents the other risks, and the time frames these risks represent.*

Region 7 Response:

The Baseline Risk Assessment (BRA) adhered to existing and appropriate the EPA guidance in the calculation of risk for current and potential future receptors. In response to the previous Board consultation comments, the EPA ensured that ingrowth of radium from the parent thorium was fully considered in the BRA and that the risks were calculated based on 1000 years of in-growth as is the practice for UMTRCA sites. Risks were also calculated after 9000 years of in-growth to evaluate the maximum concentrations possible. As a result, the presentation to the Board focused on this aspect of the BRA. A risk calculation based on the current concentration and ratio of radionuclides at the Site using the future scenario exposure assumptions (i.e. a storage yard worker) would result in risks that exceed the CERCLA risk range of (1×10^{-4} to 1×10^{-6}); however, current risks based on the present activities and uses at the Site calculated in accordance with RAGs, do not exceed the CERCLA risk range.

The Region added additional clarification and explanation regarding timeframes associated with risk evaluations for near time and future risks in its February 2, 2018 letter approving the Updated Baseline Risk Assessment. Site risks and associated timeframes are clearly defined and presented in the Proposed Plan, Updated Baseline Risk Assessment, and FFS.

Applicable or Relevant and Appropriate Requirements (ARARs)

- 5. The Board recommended that the Region specifically evaluate 10 CFR 61.41, 61.42, and 61.50 in its analysis.*

Region 7 Response:

The region required the Respondents to specifically evaluate in the FFS whether the requirements set forth in 10 CFR Part 61, including 10 CFR 61.41, 61.42, and 61.50, are ARARs for the OU-1 remedial action. Region 7 has concluded that 10 CFR 61.50(7) and 61.52(2) are potentially relevant and appropriate for the on-site disposal cell alternative. Region 7 has concluded that 10 CFR 61.41 is not relevant or appropriate because the dose based requirements in these regulations are greater than

the ARAR protectiveness criteria evaluation recommendation of 15 mrem/yr provided in OSWER Directive 9200.4-40 (May, 2014). Region 7 has also concluded that 10 CFR 61.42 is not relevant and appropriate because the requirements in 10 CFR 61.50(7) provide a more appropriate standard related to intruder barriers. In addition, all alternatives where RIM will remain in place will include institutional controls over the lifetime of the remedial action.

6. *The Board recommended that the Region consider whether the underlying regulation which is being interpreted by the RCRA Subtitle C technical guidance should be considered as a potential ARAR for the onsite disposal cell and engineered cover.*

Region 7 Response:

The region considered whether the underlying regulation for the RCRA Subtitle C technical guidance should be an ARAR for the on-site disposal cell and engineered cover. While Region 7 has determined that the UMTRCA regulations are the primary ARAR for the on-site disposal cell, to ensure the UMTRCA performance standards are met RCRA Subtitle C Subpart N (40 CFR 264.301) is considered relevant and appropriate for the on-site disposal cell liner and leachate collection system. The evaluations of the remedial alternatives presented in the FFS are predicated on the presumption that any hazardous or mixed waste that may be encountered would be transported off-site for treatment and/or disposal. Therefore, the hazardous waste regulations related to design, operation, closure or post-closure of a hazardous waste landfill are not expected to be applicable for the on-site disposal cell. Similarly, the EPA has also carefully reviewed the underlying RCRA Subtitle C regulations at 40 CFR 264.310 for the engineered cover system. While these closure regulations would not be both relevant and appropriate to remedial actions for Areas 1 and 2, Region 7 has determined that in light of the West Lake Landfill contaminant's toxicity, longevity, potential to leach, and location (in certain instances) at depth near the water table, a cap meeting the more specific standards described in the Subtitle C guidance would achieve the groundwater protectiveness standard of the UMTRCA regulations (40 C.F.R. 192.02(c)(3)). The RCRA Subtitle C technical guidance RCRA/CERCLA Final covers, 1989 and Final Covers on Hazardous Waste Landfills and Surface Impoundments, 2004 are TBCs for the UMTRCA cover proposed for all alternatives leaving RIM on-site. RCRA Subtitle C landfill covers are less permeable than Subtitle D covers (10⁻⁷ cm/sec and 10⁻⁵ cm/sec, respectively). These guidance documents provide the technical design basis and evaluation techniques needed in order to meet the UMTRCA requirements for covers over radioactive materials that prevent infiltration of precipitation and thereby provide the protection of groundwater.

Remedy Performance

7. *The Board recommended that the uncertainties of accomplishing deeper excavation be acknowledged in its decision documents. The Board also recommended the decision documents explain that excavation alternatives may still leave radionuclide residues in the landfill to be managed in perpetuity.*

Region 7 Response:

A discussion regarding the implementation issues associated with deeper excavation of RIM is included in the FFS as well as in the Proposed Plan. Region 7's letter approving the January 26, 2018 FFS as well as the Proposed Plan include explicit language stating that after removal of RIM (above 7.9 pCi/g of combined radium or combined thorium) some residual radioactive material will remain at the Site.

8. *The Board also suggested that the Region's decision documents contain a more in-depth analysis of the five balancing criteria than was presented to the Board to highlight the differences among alternatives.*

Region 7 Response:

It should be noted that the Board Report provided a more in-depth analysis of the five balancing criteria. Due to the time constraints of presenting the very technical information about the Site and the eight alternatives considered by Region 7, and the technical questions and responses from the Board, the presentation of the five balancing criteria was not as fully discussed during the Board Review. The FFS and the Proposed Plan contain an in-depth analysis of the five balancing criteria.

9. *The Board recommended that the Region address in its analysis of the remedial alternatives the potential for RIM to act as an ongoing source of groundwater contamination. The Board also suggested that as the groundwater study moves forward, the information gathered during that study be used wherever possible to support the design of OU-1.*

Response: Testing of RIM for leaching was performed as a part of the additional investigations and studies at the Site since the last Board consultation. Recent data has demonstrated that RIM does have the potential to leach under certain conditions; however, the remedial alternatives that leave RIM on-site include an engineered cover that relies upon UMTRCA standards and RCRA guidance, discussed above in the response to comment 6, for limiting infiltration and protection of groundwater.

The region will use information gathered by the investigation of groundwater in OU-3 to inform the design of the remedy for OU-1, as appropriate. Engineered covers over all alternatives except full excavation with off-site disposal are designed to prevent infiltration and thus reduce potential leaching regardless of the depth of the RIM.

10. *The Board recommended the Region clarify in its decision documents the unique nature of the RIM within a municipal landfill and how guidance on capping and "hot spot" removal is addressed depending on the alternative selected.*

Region 7 Response:

Based upon the additional data collected since the 2008 ROD, the region determined that the West Lake Landfill is not a typical municipal landfill due to the presence of PTW, the toxicity of the RIM and the increasing risks due to radioactive decay. Some of the RIM identified within OU-1 is located in discrete and accessible portions of the Site. The volume of the RIM that could be potentially excavated for some of the alternatives is significant and its remediation will reduce Site risks. Therefore, the region no longer considers the presumptive remedy of containment alone to be appropriate for the Site. These facts and determinations are described in the Proposed Plan.

11. *The Board recommended the Region consider the option of selecting tailored remedial alternatives for Area 1 and Area 2 from the range of alternatives presented.*

Response:

RIM is currently estimated to be present at approximately 50 feet below the ground surface in Area 2 and approximately 90 feet below the ground surface in Area 1. Excavation of all RIM within Area 1, including deep RIM, would impact the existing infrastructure in the North Quarry of the Bridgeton Landfill. This deeper excavation creates concerns with causing a new or exacerbating an existing

subsurface heating event, making removal of deeper RIM in Area 1 more challenging than in Area 2. In the Proposed Plan, the region acknowledged that while the general nature of the radiological contamination is comparable between Areas 1 and 2, the spatial and volumetric distribution of RIM in these areas is distinct. Also in the Proposed Plan, the region is seeking input from the public regarding the selection of different depths and concentrations between Areas 1 and 2.

12. *The Board recommended that the Region consider any recent advances in Thorium-230 field measures and “optimization” techniques during design and implementation including best management practices.*

Region 7 Response:

During the remedial design and remedial action phases of the project, the region will ensure that up to date field measurement and techniques are used. The FFS includes a cost estimate for an on-site analytical laboratory to ensure timely and accurate measurements of Thorium-230 in confirmation samples that will be collected during remedial action. Some confirmation samples will be sent to an off-site laboratory in accordance with a quality assurance project plan (QAPP) to validate data determined from the on-site laboratory.

13. *The Board recommended that the decision documents address the consideration of the impacts from natural disasters.*

Region 7 Response:

As noted in the presentation to the Board and in the full Board Report, evaluation of possible impacts from natural disasters, such as tornados or flooding were conducted for the alternatives in the FFS. Flooding is not expected to impact the long-term performance of the alternatives because the Site is currently located more than 1.3 miles from the Missouri River. Even if the 500-year levee ceases to exist, a 500-year flood event is not expected to include high-energy water flows due to the landfill’s distance to from the river and is only anticipated to cause approximately two feet of flood waters to contact the toes of the landfill. Due to the length of time this remedy must remain protective, geologic and anthropogenic uncertainties will be considered during design of any necessary armoring of the toes of the landfill. The vertical height of any flood protection features such as armoring are subject to design phase evaluations but are expected to include a margin of safety over the 500-year floodplain.

14. *The Board recommended that the Region work with the Airport Authority and Federal Aviation Administration to identify other potential mitigation measures.*

Region 7 Response:

Once a remedy has been selected, Region 7 will work with the PRPs, the City of St. Louis and airport officials to identify potential mitigation measures and ensure they are implemented correctly in the Remedial Action phase of the process. In addition, Region 7 will continue to coordinate with the FAA, as appropriate.

cc: J. Woolford, OSRTI
D. Stalcup, OSRTI
C. Mackey, OSRE
P. Leonard, FFRRO
E. Adams, OSRTI
J. Hovis, OSRTI
NRRB Members