# PROPOSED PLAN

## WEST LAKE LANDFILL SITE
## OPERABLE UNITS 1 AND 2

## BRIDGETON, MISSOURI

Site: West Lake Landfill
ID # MOD079900932
Break: 5.6
Other: 6-2006
0714

Prepared by:

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Region VII
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40260858
SUPERFUND RECORDS

## 1.0 INTRODUCTION

This Proposed Plan identifies the Preferred Alternative for each of two operable units (OUs) of the West Lake Landfill site. The Proposed Plan is intended to inform the affected community of the proposed remedy and elicit comments. The U.S. Environmental Protection Agency (EPA) is issuing this Proposed Plan as part of its public participation responsibilities under Section 117 (a) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, (CERCLA), and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Following the comment period, EPA, in consultation with the Missouri Department of Natural Resources (MDNR), will select a final remedy for each OU after reviewing and considering all comments and information submitted during the public comment period. EPA may modify the Preferred Alternatives or select another response action based on new information. Therefore, the public is encouraged to provide review and comment.

This Proposed Plan relies on more detailed information presented in the Remedial Investigation and Feasibility Study (RI/FS) reports and other documents contained in the Administrative Record file for the site. Copies of the Administrative Record files including the RI/FS reports are available at the EPA Regional Office in Kansas City, Kansas or at the document repository located at the Public Library, Bridgton Trail Branch.

**PUBLIC COMMENT PERIOD:**
June 14, - July 14, 2006
EPA will accept written comments on the Proposed Plan during the public comment period

**PUBLIC MEETING:**
June 22, 2006
7:00 PM – 9:00 PM
EPA will hold a public meeting to explain the Proposed Plan. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Bridgeton Community Center, 4201 Fee Fee Road, Bridgeton, MO at 7:30 pm.

**SITE DOCUMENTS AVAILABLE AT THESE LOCATIONS:**

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|---|---|
| Bridgton Trails Branch | U.S. EPA Records Center |
| St. Louis County Library | Region 7 |
| 3455 McKelvey Rd. | 901 North 5th St. |
| Bridgeton, MO 63044 | Kansas City, KS 66101 |
| (314) 291-7570 | (913) 551-7166 |

## 2.0 BACKGROUND

The West Lake Landfill site is on a parcel of approximately 200 acres located in the northwestern portion of the St. Louis metropolitan area (see attached Figure 2-1 from the OU-1 FS). It is situated approximately one mile north of the intersection of I 70 and I 270 within the limits of the City of Bridgeton in northwestern St. Louis County. The Missouri River lies about two miles to the north and west of the Site. The site is bounded on the north by St. Charles Rock Road and on the east by Taussig Road and undeveloped land. Old St. Charles Rock Road borders the southern and western portions of the site. The Earth City Industrial Park is adjacent to the site on the west. The Spanish Village residential subdivision is located less than a mile to the south.

The site consists of the Bridgeton Landfill and several inactive areas with sanitary and demolition fill. The Bridgeton Landfill ceased disposal operations in 2005. Other facilities, which are not subject to this response action are located on the 200-acre parcel, including concrete and asphalt batch plants, a solid waste transfer station, and an automobile repair shop. The site was used agriculturally until 1939 when the limestone quarrying and crushing operation began. Beginning in the early 1950s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes and construction/demolition debris. These early operations were not subject to State permitting. Two areas of the site were radiologically contaminated in 1973 when soils mixed with leached barium sulfate residues were used as daily and intermediate cover in the landfill operations. The barium sulfate residues were some of the uranium ore processing residues initially stored at the St. Louis Airport Site (SLAPS). The quarry pits were used for permitted solid waste landfill operations beginning in 1979.

EPA placed the site on the Superfund National Priorities List (NPL) in 1990.

## 3.0 SITE CHARACTERISTICS

The site is divided into the following areas (see attached Figure 2-4 from the OU-1 FS):

- Radiological Area 1 - This area was part of the landfill operations conducted prior to state regulation. The MDNR was formed in 1974. Approximately 10 acres are impacted by radionuclides at depths ranging up to 15 feet. The radionuclides are in soil material that is intermixed with the overall landfill matrix consisting of municipal refuse. The total volume of radiologically impacted materials is estimated at 24,400 cubic yards.
- Radiological Area 2 – This area was also part of the unregulated landfill operations conducted prior to 1974. Approximately 30 acres are impacted by radionuclides at depths generally ranging to 12 feet, with some localized occurrences that are deeper. The radionuclides are in soil material that is intermixed with the overall landfill matrix consisting mostly of construction and demolition debris. The total volume of radiologically impacted materials is estimated at 118,000 cubic yards.

- Buffer Zone/Crossroad Property – This property, also known as the Ford Property, lies west of Radiological Area 2 and became surficially contaminated when erosion of soil from the landfill berm resulted in transport of radiologically contaminated soils from Area 2 onto the adjacent property
- Closed Demolition Landfill – This area is located on the southeast side of Radiological Area 2. This landfill received demolition debris. It received none of the radiologically contaminated soil. It operated under permit with the State and was closed in 1995.
- Inactive Sanitary Landfill – This landfill is located south of Radiological Area 2 and was part of the unregulated landfill operations conducted prior to 1974. The landfill contains sanitary wastes and a variety of other solid wastes and demolition debris. It received none of the radiologically contaminated soil.
- Former Active Sanitary Landfill – This municipal solid waste landfill, known as the Bridgeton Landfill, is located on the south and east portions of the site. The landfill is subject to a State permit issued in 1974. This landfill received none of the radiologically contaminated soil. Landfill operations ceased in 2005 and closure and post-closure activities are currently in progress.

Field studies show that the radionuclides present in Radiological Areas 1 and 2 are members of the naturally occurring uranium-238 (U-238) and uranium-235 (U-235) series. The radionuclides derive from ore processing residues with an elevated ratio of thorium-230 (Th-230). The high relative concentration of thorium resulted from ore processing designed to separate out uranium and radium, thus "depleting" the ores of uranium and radium, or "enriching" the residues in thorium. Over time, the radionuclides will return to their natural proportions (establish secular equilibrium).

The results of chemical sampling and analysis of the waste materials and the groundwater in the unregulated portions of the landfill (Radiological Areas 1 and 2 and Inactive Sanitary Landfill) are consistent with the disposal of sanitary wastes or municipal refuse and show no evidence of significant industrial hazardous waste disposal.

Based on groundwater monitoring data, several radionulides and chemical contaminants are present in the shallow groundwater beneath the site, including uranium, petroleum hydrocarbons, and several volatile organic compounds (VOCs). The contaminants generally occur at low concentrations and detections are sporadic. The data do not indicate the presence of contaminant plumes or contiguous areas of groundwater contamination associated with the landfill areas. Groundwater transport of contaminants to off-site areas does not appear to be a significant migration pathway under current conditions. Data summaries and detailed evaluations are in the RI reports for OU-1 and OU-2, included in the Administrative Record file.

## 4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The site has been divided into two operable units. Operable Unit 1 (OU-1) consists of Radiological Areas 1 and 2 and the Buffer Zone/Crossroad Property. Operable Unit 2

(OU-2) consists of the other landfill areas that are not impacted by radionuclides, i.e., the Closed Demolition Landfill, the Inactive Sanitary Landfill, and the Former Active Sanitary Landfill.

## 5.0 SUMMARY OF SITE RISKS

A baseline risk assessment (BRA) for each OU was conducted as part of the RI/FS process to examine the current and potential future effects of the contaminants on human health and the environment. The BRA process evaluates a range of current and potential future exposures assuming that no controls are in place to prevent or limit exposure. In the case of OU 1, the BRA presents calculated human health risks based on several potential human exposure scenarios. In the case of OU 2, a more streamlined approach was used consistent with EPA's presumptive remedy guidance for municipal landfill sites. The presumptive remedy guidance is explained in the next section. Based on the results of these assessments, it is EPA's judgment that response actions are necessary to protect public health or welfare from actual or threatened releases of hazardous substances into the environment.

### Human Health Risks

### OU-1

The BRA identified eight radionuclides (U-238, U-235, Th-232 and their associated daughter products U-234, Th-230, Ra-226, Pb-210, and Pa-231) as chemicals of potential concern based on their long half-lives. Based on site data and toxicity screening, three trace metals (arsenic, lead, and uranium as a metal) and one polychlorinated biphenyl (Aroclor 1254) were also selected as contaminants of potential concern for the human health risk assessment.

Potential human receptors would need to be engaged in activities that result in ongoing occupancy of Radiological Areas 1 and 2. Several potential human receptors were identified and evaluated including groundskeepers working on or adjacent to Radiological Areas 1 and 2, and receptors associated with future parking, open storage or other uses of Radiological Areas 1 and 2 consistent with potential future commercial/industrial uses. The pathways by which these receptors could be exposed to contaminants present in Radiological Areas 1 and 2 include exposure to external radiation, inhalation of radon gas or contaminated dust, dermal contact with impacted materials, or incidental ingestion of contaminated soil. Residential use and groundwater consumption were not evaluated because these uses are not consistent with reasonably anticipated land use for Radiological Areas 1 and 2.

For known or suspected carcinogens, EPA has determined that an acceptable level of exposure correlates to an excess lifetime cancer risk to an individual of between 1 in 10,000 and 1 in 1 million. This is known as the acceptable risk range. The calculated risks for certain potential future uses at Radiological Areas 1 and 2, as represented by the

groundskeeper and a worker involved in outdoor storage, exceed the acceptable risk range. Under CERCLA, this provides a sufficient basis for taking action.

**OU-2**

A streamlined BRA was developed using RI data to perform a qualitative risk assessment. The streamlined approach differs from the typical BRA in that quantitative calculations of intakes and risks are not performed. Instead, obvious potential threats are identified by comparing site-specific contaminant concentrations to established standards or risk-based concentrations. In this case, contaminant concentrations in the shallow groundwater were compared to chemical-specific standards. Several groundwater contaminants have been detected at levels exceeding Safe Drinking Water Act maximum contaminant levels (MCLs) or non-zero maximum contaminant level goals (MCLGs), including arsenic, iron, manganese, benzene, and total petroleum hydrocarbons. Under the presumptive approach, this provides sufficient basis for taking action and a standard BRA is not necessary.

**Ecological Risks**

The BRA for OU-1 included a screening level ecological risk assessment. Using highly conservative assumptions, certain ecological receptors such as burrowing mammals, soil invertebrates and plants may be at risk from exposure to site contaminants, especially metals. However, the site currently supports vegetative and animal communities with no observable impacts.

## 6.0 REMEDIAL ACTION OBJECTIVES

**Presumptive Remedy Approach for CERCLA Municipal Landfills**

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides the implementing regulations for CERCLA. Section 300.430(a)(iii)(B) of the NCP contains the expectation that engineering controls, such as capping or other form of containment, will be used for waste that poses a relatively low long-term threat or where treatment is impracticable. The preamble to the NCP identifies municipal landfills as a type of site where treatment of the waste may be impracticable because of the size and heterogeneity of the contents (55 FR 8704). Waste in CERCLA landfills usually is present in large volumes and is a heterogeneous mixture of municipal waste frequently co-disposed with industrial and/or hazardous waste. Because treatment is usually impracticable, EPA generally considers containment to be the appropriate response action, or the "presumptive remedy" for the source areas of municipal landfill sites.

Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA has issued guidance that establishes containment as the presumptive remedy for CERCLA municipal landfills including EPA 540-F-93-035 *Presumptive Remedy for CERCLA Municipal Landfill Sites*;

EPA/540/P-92-001 *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*; EPA/540F-95/009 *Presumptive Remedies: CERCLA Landfill Caps RI/FS Data Collection Guide*; EPA/540/F-96/020 *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills,* including those that contain radioactive wastes; EPA 540/R-94/081 *Feasibility Study Analysis for CERCLA Municipal Landfill Sites;* and EPA 540-F-99-015 *Reuse of CERCLA Landfill and Containment Sites*. These documents are included in the Administrative Record file and some can be found in Appendix A to the OU-1 FS.

The West Lake Landfill site consists of areas used for solid waste landfill disposal consistent with that envisioned for the presumptive remedy approach and a streamlined approach to site evaluation was taken where appropriate. The presumptive remedy is engineered containment composed of technology options that are appropriate to the circumstance. The presence of radiologically contaminated soils at Radiological Areas 1 and 2 present an atypical circumstance that justifies a look at other non-presumptive options that could be used in combination with the presumptive remedy. However, under all practicable alternatives, each of the landfill areas that comprise the West Lake Landfill site will remain landfills and the use of containment technologies consistent with the presumptive remedy approach for municipal landfills is appropriate in each case.

The Remedial Action Objectives (RAOs) for the municipal landfill presumptive remedy are the following:

- Prevent direct contact with landfill contents;
- Minimize infiltration and resulting contaminant leaching to ground water;
- Control surface water runoff and erosion;
- Collect and treat contaminated ground water and leachate to contain any contaminant plume and prevent further migration from the source area; and
- Control and treat landfill gas.

These RAOs, identified by EPA in the presumptive remedy guidance (EPA, 1993), address the potential migration pathways and exposures identified in the BRAs for OU-1 and OU-2. The first objective of preventing direct contact with landfill contents addresses direct exposure to contaminated soil or waste materials and is necessary for both OUs. Under OU-1, this objective will also include prevention of exposure to gamma radiation. The second and third objectives identified in the presumptive remedy guidance are directly applicable to OU-1 and OU-2. The fourth objective is not applicable to this site because a plume of contaminated groundwater is not present beneath or downgradient of the disposal areas. Also, meeting the second objective ensures that the potential for ongoing infiltration or leaching is minimized. However, long-term groundwater monitoring is a necessary component of the remedies. The fifth

objective of controlling and treating landfill gas is applicable to both OUs, and includes radon gas emissions from Radiological Areas 1 and 2 in OU-1.

Based on site-specific data and application of the presumptive remedy guidance to the West Lake Landfill site, the following RAOs are identified:

**RAOs for OU-1:**

- Prevent direct contact with landfill contents, including exposure to radiation;
- Minimize infiltration and any resulting contaminant leaching to ground water;
- Control surface water runoff and erosion; and
- Control and treat landfill gas emissions, including radon.

**RAOs for OU-2:**

- Prevent direct contact with landfill contents;
- Minimize infiltration and any resulting contaminant leaching to ground water;
- Control surface water runoff and erosion; and
- Control and treat landfill gas.

## 7.0 SUMMARY OF REMEDIAL ALTERNATIVES

The following components address the RAOs identified above:

Landfill cap;

Landfill gas collection and treatment;

Long-term monitoring and maintenance; and

Institutional controls to limit land and resource use.

Construction of a proper landfill cap will prevent direct contact with landfill contents, including exposure to gamma radiation in OU-1. The cap will be designed to minimize infiltration, control surface water runoff and erosion, and control landfill gas emissions, including radon. Based on the results of gas monitoring, collection and/or treatment will be undertaken as necessary. Long-term groundwater monitoring plans and operation and maintenance (O&M) plans will be developed and implemented. The specific requirements that these components must meet are established based on an analysis of applicable or relevant and appropriate requirements (ARARs).

The evaluation for OU-1 includes a "hot spot" option involving excavation and off-site disposal of a portion of radiologically impacted materials in Radiological Areas 1 and 2. "Hot spots" are defined in EPA's Presumptive Remedy for CERCLA Municipal Landfills (EPA 540-F-93-035) as discrete, accessible, and more toxic or mobile waste forms within the landfill that might compromise the integrity of the containment remedy. Typical hot spots include drums or trenches containing liquids or concentrated industrial waste. If hot spots are identified, the process provides that they be evaluated for removal and/or treatment. To be considered for excavation and treatment, hot spots should be large enough or toxic enough that remediation would significantly reduce the risk posed by the site, but small enough and accessible enough that it is reasonable to consider removal. The West Lake Landfill site does not have any areas that meet EPA's established hot spot criteria. However, the presence of long-lived radiological contamination makes it reasonable to evaluate excavation and off-site disposal of a portion of the waste material in conjunction with containment of the remaining waste materials.

Under all remedial alternatives, the site will remain a landfill and hazardous substances will remain onsite at levels that do not allow for unlimited use and unrestricted exposure. Therefore, a periodic review of the remedy will need to be conducted at least every five years (Five-Year Review).

**REMEDIAL ALTERNATIVES FOR OU-1:**

**Areas 1 and 2**

**Alternative L1** – No Action

*Estimated capital cost: $0*
*Estimated annual O&M cost: $0*
*Estimated 30-year present worth cost: $47,000*

Alternative L1 (No Action) is included as required by the NCP to serve as a baseline for comparison of the other alternatives. Under this alternative, no engineering measures will be implemented to reduce potential exposures or control potential migration from Areas 1 and 2. Similarly, no additional institutional controls and no additional fencing will be implemented to control land use, access or potential future exposures to Radiological Areas 1 and 2. No monitoring will be conducted to identify or evaluate any potential changes that may occur to conditions at Radiological Areas 1 and 2 or to contaminant levels or occurrences. The estimated present worth cost is for performance of Five-Year Reviews over a 30-year period.

**Alternative L2** – Cover Repair and Maintenance, Additional Access Restrictions, Additional Institutional Controls, and Monitoring

*Estimated capital cost: $890,000*
*Estimated annual O&M cost: $240,000 to $260,000*

*Estimated 30-year present worth cost: $3,900,000*

Under Alternative L2, the existing landfill cover in Radiological Areas 1 and 2 would be inspected and repaired. Maintenance of the landfill cover would include regular inspection and repair, as necessary. Institutional controls must be implemented to limit future uses and to insure that future uses do not impact the effectiveness or integrity of the remedial actions.

**Alternative L3** – Soil Cover to Address Gamma Exposure and Erosion Potential

*Estimated capital cost: $8,400,000*
*Estimated annual O&M cost: $20,000 to $200,000*
*Estimated 30-year present worth cost: $9,800,000*

Alternative L3 would consist of placement of a 30-inch thick soil cover over Radiological Areas 1 and 2 to reduce the potential gamma exposure to workers or others that may enter these areas in the future. Placement of additional soil cover would also reduce the potential for windblown or water erosion of surface soil containing radionuclides. Maintenance of the landfill cover would include regular inspection and repair, as necessary. Institutional controls must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedial actions.

**Alternative L4** –Regrading of Radiological Areas 1 and 2 (minimum slope of 2%) and Installation of a Subtitle D Cover System

Soil fill option to achieve minimum slope of 2%:

| | |
|---|---|
| *Estimated capital costs:* | *$ 21,800,000* |
| *Estimated annual O&M costs:* | *$ 15,000 to 200,000* |
| *Estimated 30-year present worth costs:* | *$ 23,100,000* |

Cut/fill existing materials option to achieve minimum slope of 2%:

| | |
|---|---|
| *Estimated capital costs:* | *$ 20,500,000* |
| *Estimated annual O&M costs:* | *$ 15,000 to 200,000* |
| *Estimated 30-year present worth costs:* | *$ 21,700,000* |

Alternative L4 would consist of placing additional soil or inert fill material (non-putrescible construction and demolition debris such as concrete or asphalt rubble) or soil over Radiological Areas 1 and 2 to increase the final grades to achieve a minimum slope angle of 2%. Alternatively, the existing waste material and soil in these areas could be regraded (cut and filled) to achieve a minimum slope of 2%. Portions of the landfill berm that contain slopes greater than 25% would be regraded through placement of additional material or cutting and filling of existing material to reduce the slope angles to 25% subject to physical constraints associated with the location of the toe of the landfill relative to the property boundary. Upon completion of the landfill regrading, a new

landfill cover would be constructed over these areas. Design and construction of the landfill cover would include a rubble/rock layer to minimize bio-intrusion and erosion potential and increase the longevity of the landfill cover. Surface drainage diversions, controls, and structures would also be designed and constructed as necessary to route storm water runoff off of Radiological Areas 1 and 2 to the permitted storm water drainage systems. The landfill cover would be routinely inspected and maintained to ensure the long-term integrity of the cover. Landfill gas monitoring/management and long-term groundwater monitoring would be required. Institutional controls must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedial actions.

**Alternative L5** – Regrading of Radiological Areas 1 and 2 (minimum slope of 5%) and Installation of a Subtitle D Cover System

Soil fill option to achieve minimum slope of 5%:

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| *Estimated capital costs:* | *$ 24,600,000* |
| *Estimated annual O&M costs:* | *$ 15,000 to 200,000* |
| *Estimated 30-year present worth costs:* | *$ 25,800,000* |

Cut/fill existing materials option to achieve minimum slope of 5%:

| | |
|---|---|
| *Estimated capital costs:* | *$ 19,900,000* |
| *Estimated annual O&M costs:* | *$ 15,000 to 200,000* |
| *Estimated 30-year present worth costs:* | *$ 21,100,000* |

Alternative L5 would consist of placing additional soil or inert fill material (non-putrescible construction and demolition debris such as concrete or asphalt rubble) over Areas 1 and 2 to increase the final grades to achieve a minimum slope angle of 5% specified in the MDNR regulations (10 CSR 80-3.010(17) and 10 CSR 80-4.010(17)) for final cover for operating municipal solid waste or construction and demolition landfills. Alternatively, the existing waste material and soil in these areas could be regraded (cut and filled) to achieve a minimum slope of 5%. Portions of the landfill berm that contain slopes greater than 25% would be regraded through placement of additional material or cutting and filling of existing material to reduce the slope angles to 25% subject to physical constraints associated with the location of the toe of the landfill relative to the property boundary. Upon completion of the landfill regrading, a new landfill cover would be constructed over these areas. Design and construction of the landfill cover would include a rubble/rock layer to minimize bio-intrusion and erosion potential. Surface drainage diversions, controls, and structures would also be designed and constructed as necessary to route storm water runoff off of Radiological Areas 1 and 2 to the permitted storm water drainage systems. The landfill cover would be routinely inspected and maintained to ensure the long-term integrity of the cover. Landfill gas monitoring/management and long-term groundwater monitoring would be required. Institutional controls must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedial actions.

**Alternative L6** – Excavation of Material with Higher Levels of Radioactivity from Radiological Area 2 and Regrading and Installation of a Subtitle D Cover System

With soil fill option to achieve minimum slope:

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|---|---|
| *Estimated capital costs:* | *$ 75,00,000* |
| *Estimated annual O&M costs:* | *$ 15,000 to 200,000* |
| *Estimated 30-year present worth costs:* | *$76,000,000* |

Because the radiologically contaminated soils are distributed widely in the landfill waste material, there are no areas that qualify as "hot spots". However, this alternative was developed to evaluate excavation of some accessible portion(s) of the landfill material containing relatively higher concentrations of radiologically contaminated material.

Alternative L6 consists of excavation of a portion of the radiologically impacted materials in Radiological Area 2 that contain levels of radioactivity that are higher than those found in other portions of Radiological Area 2 along with the installation of an upgraded landfill cover. No specific criteria have been established or defined for identification of radiologically impacted materials containing higher levels of radioactivity. As part of the development of this alternative, excavation of all of the radiologically-impacted material was initially evaluated (OU-1 FS, Appendix B). This assessment indicated that over 250,000 $yd^3$ of material (including 130,000 $yd^3$ of radiologically-impacted materials and approximately 120,000 $yds^3$ of overburden waste materials and soil) would have to be excavated. This amount of excavation is substantially greater than the 100,000 $yd^3$ or less volume identified in EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites guidance as being reasonable to consider for removal. Therefore, this alternative looks at the possibility of removing a smaller volume (a portion) of the radiologically-impacted materials from Area 2 which contains higher levels of radionuclides found at the Site.

For purposes of developing this alternative, the activity levels of individual radionuclides and gamma levels measured in the downhole (borehole) gamma logs were reviewed to identify those materials with levels of radioactivity that were higher than those found in other portions of Area 2. The purpose of this effort was to identify a sub-area(s) within Area 2 that are substantially smaller than the entire extent of Area 2 that could be considered for excavation as part of a possible "hot spot" removal alternative. Under this alternative, materials containing individual radionuclides with activity levels above 1,000 pCi/g or gamma readings above 500,000 cpm would be excavated.

Under one scenario, all of these materials (construction and demolition debris, household and commercial refuse, radiologically impacted soil and unimpacted soil) would be shipped offsite for disposal at a licensed commercial low-level radioactive waste disposal facility. After applying an appropriate bulking factor, the total volume of material (waste plus soil) to be shipped and disposed at a commercial low-level radioactive waste

disposal facility in conjunction with excavation of "hot spot" material under this alternative was estimated to be approximately 85,000 $yds^3$.

As an alternative to shipping all of the excavated material (construction and demolition debris, commercial and household refuse, radiologically impacted soil, and unimpacted soil) for offsite disposal, the excavated material could be sorted and screened to separate out the soil (both impacted and unimpacted) fraction from the debris and refuse. After applying assumptions on soil fraction and bulking factor, the volume of segregated soil for transport and disposal was estimated at 21,250 $yd^3$.

In addition to the selective excavation component described above, Alternative L6 would also include backfilling of the selective excavation with soil or inert fill material, regrading and construction of an upgraded landfill cover as described under Alternative L4 or L5; as well as the additional access restriction and institutional controls.

**Buffer Zone / Crossroad Property (Ford property) Alternatives**

Historic erosion of the landfill berm along the north side of Radiological Area 2 resulted in deposition of radiologically impacted soil on the surface of the Buffer Zone and Crossroad property (also known as the Ford Property). The following remedial alternatives for the soil in this area were evaluated as part of the development of potential remedial alternatives for West Lake Landfill OU-1:

**Alternative F1** – No Action

Alternative F1 (No Action) is included as required by the NCP to serve as a baseline for comparison of the other alternatives. Under this alternative, no engineering measures will be implemented to reduce potential exposures to the radiologically impacted soil in the Buffer Zone and Crossroad property. Similarly, no new institutional controls and no additional fencing will be implemented to control land use, access or potential future exposures to the Buffer Zone and Crossroad properties. No long-term monitoring will be conducted to identify or evaluate any potential changes that may occur to conditions in the Buffer Zone or Crossroad property or to contaminant levels or occurrences in this area.

**Alternative F2** – Institutional and Access Controls

*Estimated capital cost: $210,000*
*Estimated annual O&M cost: $6,000 to $14,000*
*Estimated 30-year present worth cost: $290,000*

Alternative F2 entails the use of institutional and access controls on the Buffer Zone and Crossroad property to prohibit residential and other land uses that could result in human exposure to the contaminated soils. Alternative F2 would include additional soil sampling to assess the current conditions of the surface soil in Lot 2A2 and the Buffer Zone.

**Alternative F3** – Capping and Institutional and Access Controls

*Estimated capital cost: $340,000*
*Estimated annual O&M cost: $6,000 to $14,000*
*Estimated 30-year present worth cost: $420,000*

Alternative F3 includes construction of a cap consisting of a minimum 6-inch thick gravel layer, asphalt or other form of pavement, or another form of surface preparation installed over the Crossroad property to prevent direct contact with the radiologically impacted soil. Installation of gravel or pavement over the surface of the Crossroad property is consistent with the currently intended use of the property for outdoor storage of tractor trailers. Installation of a gravel cover or pavement would prevent direct contact by workers with the radiologically impacted soil. Alternative F3 would include additional soil sampling to assess the current conditions of the surface soil in Lot 2A2 and the Buffer Zone. Alternative F3 would also include access and institutional controls to control land use.

**Alternative F4** – Soil Excavation and Consolidation in Radiological Area 2

*Estimated capital cost: $600,000*
*Estimated annual O&M cost: $0*
*Estimated present worth cost: $600,000*

Alternative F4 entails excavation of the radiologically impacted soil from the Buffer Zone and/or Crossroad property and consolidation of the radiologically impacted soil on the surface of Radiological Area 2. The soil would be excavated to remediation goals that support unlimited use and unrestricted exposure. Upon completion of excavation, verification sampling would be performed followed by backfilling and regrading of the area and replacement of the gravel cover.

**REMEDIAL ALTERNATIVES FOR OU-2:**

**Closed Demolition Landfill and the Former Active Sanitary Landfill**

Missouri is a federally-approved regulator for solid waste landfills and has promulgated laws and requirements for the design and operation of sanitary landfills (10 CSR 80-3.010) and demolition landfills (10 CSR 80-4.010). The Missouri Solid Waste Management Rules also provide requirements for closure and post-closure care (10 CSR 80-2.030). The Closed Demolition Landfill operated under Missouri permit and was closed in 1995. The Former Active Sanitary Landfill (Bridgeton Landfill) operated under Missouri permit and disposal operations ceased in 2005. The Missouri Solid Waste Rules are applicable to these landfills and closure and post-closure care will be carried out in accordance with state and local permits. Application of these rules is consistent with the RAOs identified in Section 6.0 above. Therefore, the terms of these permits will dictate the closure and post-closure requirements and no further evaluation of remedial alternatives or relevant and appropriate requirements is necessary for these areas.

**Inactive Sanitary Landfill**

This landfill was part of the unregulated landfill operations conducted prior to 1974. It contains sanitary wastes and a variety of other solid wastes and demolition debris. This landfill is similar to a sanitary landfill and many of the substantive Missouri requirements for closure and post-closure care are relevant and appropriate. This landfill is also well suited for streamlined evaluation as envisioned under EPA's presumptive approach to municipal solid waste landfills. There is no unusual site condition that might justify evaluation of non-presumptive remedial options.

**Alternative 1** – No Action

Alternative 1 (No Action) is included as required by the NCP to serve as a baseline for comparison of the other alternatives. Under this alternative, no engineering measures will be implemented to reduce potential exposures or control potential migration. Similarly, no additional institutional controls and no additional fencing will be implemented to control land use, access or potential future exposures. No monitoring will be conducted to identify or evaluate any potential changes that may occur. The only costs that would be associated with the No Action Alternative are those associated with performing Five-Year Reviews. The 30-year present worth cost is estimated at $47,000.

**Alternative 2** – Landfill Cover with Long-Term Monitoring and Institutional Controls

*Estimated capital cost: $6,670,000*
*Estimated annual O&M cost: $45,000*
*Estimated 30-year present worth cost: $7,215,000*

Under Alternative 2, a landfill cap would be installed consistent with relevant and appropriate Missouri requirements for sanitary landfill cap construction, including two feet of engineered materials meeting the permeability requirement and vegetated cover. Missouri requirements for landfill gas monitoring/management, groundwater monitoring, and inspection and maintenance would also be met. Institutional controls must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedy.

## 8.0 EVALUATION OF ALTERNATIVES

EPA uses nine criteria to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each remedial alternative against the nine criteria, noting how it compares to the other options under consideration. The first two criteria are considered threshold criteria that all acceptable alternatives must satisfy. The Detailed Analysis of Alternatives can be found in the FS reports available in the Administrative Record file.

**Evaluation for OU-1**

OU-1 is comprised of Radiological Areas 1 and 2 and the Buffer Zone/Crossroads Property (Ford Property).

**1. Overall Protection of Human Health and the Environment**

All of the alternatives for Areas 1 and 2, except Alternative L1 (No Action), will result in increased protection of human health and the environment by limiting potential exposure to site contaminants through land use controls or engineering means. Due to the increased engineering controls and monitoring and maintenance requirements, the solid waste landfill cover alternatives (Alternatives L4, L5, and L6) are considered to offer much more reliable protection over the long-term than Alternatives L2 or L3. Due to the excavation and remote disposal of waste material, Alternative L6 offers additional long-term protection in the event the remedy is compromised at some point in the future. Alternative L6 does not necessarily deliver the greatest overall protection among the alternatives due to the higher potential for human exposures and increased physical hazards during the construction phase.

All of the alternatives for the Buffer Zone/Crossroad Property, except Alternative F1 (No Action), are protective of human health and the environment. By removing the contamination to the landfill, the excavation alternative (Alternative F4) provides the greatest level of protection. The land use control alternative (Alternative F2) depends on institutional and access control and is therefore less reliable than alternatives using engineering measures.

**2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**

Alternatives L4, L5, and L6 will comply with all ARARs. Alternatives L2 and L3 do not meet the basic cover design requirements found in the Missouri Solid Waste Rules for sanitary landfills (10 CSR 80-3.010). Since Alternatives L2 and L3 do not meet the threshold criteria, these alternatives were not evaluated further.

All of the alternatives for the Buffer Zone/Crossroad Property, except Alternative F1 (No Action), will meet ARARs.

**3. Long-Term Effectiveness and Permanence**

Each of the solid waste landfill cover alternatives (Alternatives L4, L5, and L6) provide engineered containment in conjunction with long-term monitoring, maintenance, and land use control designed to be effective over the long-term. Without considering any impact to the other facility that would receive the excavated material, Alternative L6 provides a greater measure of long-term effectiveness and permanence than the other two alternatives through excavation and remote disposal of a portion of the radiologically contaminated material.

By moving the contamination from the Buffer Zone/Crossroad Property to the landfill, the excavation alternative (Alternative F4) provides the greatest level of long-term effectiveness and permanence among the alternatives. The land use control alternative (Alternative F2) depends on institutional and access controls and is therefore less reliable over the long-term than the other action alternatives.

**4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment**

None of the alternatives for Radiological Areas 1 and 2 will result in a reduction of toxicity, mobility, or volume through treatment. Occurrences of radionuclides within Areas 1 and 2 are dispersed within soil material that is further dispersed throughout the overall, heterogeneous matrix of municipal refuse, construction and demolition debris and other, non-impacted soil materials. Consequently, excavation of the radiologically impacted materials for possible ex-situ treatment techniques is considered impracticable. In addition, the heterogeneous nature of the solid waste materials and the dispersed nature of the radionuclide occurrences within the overall solid waste matrix make in-situ treatment techniques impracticable.

None of the alternatives for the Buffer Zone/Crossroad Property will reduce toxicity, mobility, or volatility through treatment.

**5. Short-Term Effectiveness**

Once implemented, all of the alternatives for Radiological Areas 1 and 2 would be effective over the near-term. Alternative L6 is more difficult and time consuming to construct than the other alternatives. Because Alternative L6 requires extensive excavation and handling of landfill waste materials, it presents a greater potential for exposures than Alternatives L4 and L5 over the near-term.

All of the action alternatives for the Buffer Zone/Crossroad property would be effective over the near-term and there is no great difference in effectiveness between the alternatives over the near-term.

**6. Implementability**

All of the cover materials for Alternatives L4, L5, and L6 are readily available and the technologies are generally proven. Alternative L6 involves greater physical hazards and greater construction challenges, e.g., dust and run-off control; waste handling and storage, than the other alternatives. Few administrative difficulties are foreseen for any of the alternatives.

All of the action alternatives for the Buffer Zone/Crossroad property are implementable, although Alternatives F2 and F3 could be more difficult to carry out than F4 because they may require institutional controls involving property owned by a third party.

**7. Cost**

All of the solid waste landfill cover alternatives will have similar construction and annual maintenance costs. The excavation and remote disposal component of Alternative 6 effectively triples the estimated capital cost of the remedy without reducing annual costs.

The engineering alternatives for the Buffer Zone/Crossroad Property (Alternatives F3 and F4) involve modestly greater capital costs than the land use control alternative (Alternative F2). Soil excavation (Alternative F4) costs the most to construct but has the advantage of having no annual costs.

**8. State Acceptance**

The Missouri Department of Natural Resources (MDNR) assists EPA in its oversight role and provides review and comment on site documents. The MDNR has provided a statement on the preferred remedy which is included in the next section.

**9. Community Acceptance**

Community acceptance of the preferred remedy will be evaluated following the public comment period.

**Evaluation for OU-2**

OU-2 is comprised of the Closed Demolition Landfill, the Formerly Active Sanitary Landfill, and the Inactive Sanitary Landfill. As explained in the prior section, an evaluation was not performed for the Closed Demolition Landfill and the Former Active Sanitary Landfill. An evaluation of options for the Inactive Sanitary Landfill is not presented because, consistent with EPA guidance, the remedy is presumed to be a landfill cover with long-term monitoring and institutional controls as described in Alternative 2. This remedy is protective and will be designed to meet ARARs. The MDNR has provided a statement on the preferred remedy which is included in the next section. Community acceptance will be evaluated following the public comment period.

## 9.0 SUMMARY OF THE PREFERRED REMEDIES

**Preferred Remedy for OU-1:**

The preferred remedy for Radiological Areas 1 and 2 is to install a cover system consistent with Alternative L4. Alternative L4 provides the best balance of trade-offs when evaluated against the nine criteria. The landfill cover, gas control, run-off control, long-term groundwater monitoring, and post-closure inspection and maintenance would be done consistent with the relevant and appropriate requirements found in the Missouri Solid Waste Rules for sanitary landfills. The landfill cover would also incorporate a rubble/rock layer to minimize the potential for bio-intrusion and erosion and increase the longevity of the cover. The landfill cover would also be designed to provide protection

from radioactive emissions (i.e., gamma radiation and radon). Surface drainage diversions, controls, and structures would be designed and constructed to route storm water runoff from Radiological Areas 1 and 2 to the permitted storm water drainage systems. The landfill cover would be routinely inspected and maintained to ensure the long-term integrity of the cover. Landfill gas monitoring/management and long-term groundwater monitoring would be required. The gas monitoring and assessment program will evaluate radon as well as decomposition gases. Lateral migration of radon and/or decomposition gases will be evaluated and controlled as necessary. The long-term groundwater monitoring program will meet the substantive requirements for groundwater protection and monitoring at uranium mill tailing sites and the MDNR post-closure regulations for closed solid waste landfill.

With respect to the Buffer Zone/Crossroad Property, the evaluation of alternatives points to consolidation under the landfill cover (Alternative F4) as the most straightforward and effective solution. Further limiting the options, it is anticipated that construction of the cover will require the toe of the landfill berm to be regraded and extended over the impacted area on the Buffer Zone/Crossroad property. There is uncertainty as to whether there would be any contaminated soil outside the natural footprint of the landfill cover. For purposes of defining the proposed remedy, the preferred approach is to identify any contaminated soil located outside the footprint of the landfill and consolidate it under the landfill cover. Soil sampling will be undertaken to support the remedial design, confirm assumptions, and document the final conditions. Any impacted area outside the footprint of the landfill would meet remediation goals that support unlimited use and unrestricted exposure and would be subject to verification sampling.

Land use restrictions must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedial actions. The restrictions must be maintained until the remaining hazardous substances are at levels allowing for unlimited use and unrestricted exposure. These restrictions do not apply to activities related to the implementation, maintenance, or repair of the remedy.

The following use restrictions apply within the boundary of the cover system(s) for Radiological Area 1 and Radiological Area 2:

1. Prevent development and use for residential housing, schools, childcare facilities or playgrounds.
2. Prevent development and use for industrial or commercial purposes, such as manufacturing, offices, storage units, parking lots or other facilities that are incompatible with the function or maintenance of the landfill cover.
3. Prevent construction activities involving drilling, boring, digging, or other use of heavy equipment that could disturb vegetation, disrupt grading or drainage patterns, cause erosion or otherwise compromise the integrity of the landfill cover; or, manage these activities such that any damage to the cover is avoided or repaired.
4. Prevent the use of all groundwater underlying these areas.

5. Retain access necessary for continued maintenance, monitoring, inspections and repair.

For non-disposal areas of the West Lake Landfill site, any new or existing structures for human occupancy should be assessed for methane and/or radon gas accumulation and mitigative engineering measures, such as foundation venting, should be employed as necessary.

Property use restrictions at the West Lake Landfill site will be implemented through the placement of institutional controls. The specific institutional control design and implementation strategy will be a component of the remedial design planning process following release of the OU-1 Record of Decision by EPA. Where appropriate, multiple mechanisms, or a "layered" approach, will be used to enhance the effectiveness of the institutional control strategy.

At the West Lake Landfill site, the affected properties are privately owned and the use restrictions must be maintained for a long period of time. Therefore, proprietary controls will be used because they generally run with the land and are enforceable. The institutional control component (Appendix E) of the MDNR *Cleanup Levels for Missouri* (CALM) draft regulations consists primarily of a restrictive covenant with an easement provision that allows MDNR access to a site for the duration of the restrictive covenant for the purpose of conducting periodic inspections. As grantee, MDNR has the authority to enforce the restrictive covenant. Though not a promulgated regulation, the CALM Appendix E language provides a useful format for implementing proprietary controls.

Also, the West Lake Landfill site has been listed by MDNR on the State's Registry of Confirmed, Abandoned, or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Uncontrolled Sites Registry). The Registry is maintained by the MDNR pursuant to the Missouri Hazardous Waste Management Law, Mo.Rev.Stat. Section 260.440. Sites listed on the Registry appear on a publicly available list. A notice is filed with the County Recorder of Deeds and notice must be provided by the seller to any potential buyers of the property.

The Operation and Maintenance (O&M) Plan will contain procedures for surveillance, monitoring and maintenance of the institutional controls. The O&M Plan will provide for notice to EPA and/or the state of any institutional control violations, planned or actual land use changes, and any planned or actual transfers, sales or leases of property subject to the use restrictions.

**Applicable or Relevant and Appropriate Requirements (ARARs) for OU-1:**

Missouri Solid Waste Rules for Sanitary Landfills:

Under RCRA Subtitle D, a state may promulgate more stringent regulations for landfills in that state, provided that the EPA approves of the state's regulations. Missouri is an approved state for providing regulations for landfills. Missouri promulgated its

regulations in 1997 [22 Mo Reg 1008, (June 2, 1997)] and they became effective July 1, 1997. The Missouri Solid Waste Rules establish closure and post-closure requirements for existing sanitary landfills that close after October 9, 1991. Although not applicable to the closure of Areas 1 and 2, the requirements described below are considered relevant and appropriate.

The MDNR regulations require cover to be applied to minimize fire hazards, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance [10 CSR 80-3.010(17)(A)]. This final cover shall consist of at least two feet (2') of compacted clay with a coefficient of permeability of $1 \times 10^{-5}$ cm/sec or less overlaid by at least one foot (1') of soil capable of sustaining vegetative growth [10 CSR 80-3.010(17)(C)(4)]. Placement of soil cover addresses the requirements for minimization of fire hazards, odors, blowing litter, control of gas venting and scavenging. Placement of clay meeting the permeability requirement addresses the requirement for minimization of infiltration of precipitation. Placement of soil and establishment of a vegetative cover meets the requirement of providing for a pleasing appearance.

The MDNR landfill regulations also contain minimum and maximum slope requirements. Specifically, these regulations require the final slope of the top of the sanitary landfill shall have a minimum slope of five percent (5%) [10 CSR 80-3.010(17)(B)(7)]. MDNR regulations also require that the maximum slopes be less than 25% unless it has been demonstrated in a detailed slope stability analysis that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill. Even with such a demonstration, no active, intermediate or final slope shall exceed $33^1/_3$%. The objective of these requirements is to promote maximum runoff without excessive erosion and to account for potential differential settlement. Because landfilling of Radiological Areas 1 and 2 was completed approximately 30 years ago, most compaction of the refuse has taken place and differential settlement is no longer a significant concern. The 5% minimum sloping requirement is greater than necessary and may not be optimal in this case. Therefore, the 5% minimum sloping requirement is not considered appropriate. Sloping specifications would be designed to promote drainage and reduce infiltration of precipitation while minimizing the potential for erosion. It is anticipated that a 2% slope would be sufficient to meet drainage requirements while resulting in a lower potential for erosion. This approach should increase the life of the cover and overall longevity of the remedy compared to a steeper slope which would be subject to increase erosion potential. The maximum sloping requirements would be met.

The requirements for decomposition gas monitoring and control in 10 CSR 80-3.010 (14) are considered relevant and appropriate. The number and locations of gas monitoring points, and the frequency of measurement will be established in approved remedial design submittals. In the event landfill gas is detected at the landfill boundaries above the regulatory thresholds, gas controls will be implemented.

The requirements for a groundwater monitoring program in 10 CSR 80-3.010 (11) are considered relevant and appropriate. The monitoring program will be capable of

monitoring any ongoing impact of the landfill on underlying groundwater. Over time, the groundwater monitoring program may be modified based on the results of the monitoring program.

The substantive MDNR landfill requirements for post-closure care and corrective action found in 10 CSR 80-2.030 are also considered relevant and appropriate. These provisions provide a useful framework for operation and maintenance and corrective action plans.

Environmental Protection Standards for Uranium and Thorium Mill Tailings:

The Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192 Subpart B) provide standards for land and buildings contaminated with residual radioactive materials from inactive uranium processing sites. The standards were developed pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). Some of the regulations that provide for closure performance standards are considered relevant and appropriate to remedial actions for OU-1. Specifically, to address longevity considerations, 40 CFR 192.02(d) requires that each disposal site "shall be designed and stabilized in a manner that minimizes the need for future maintenance." For UMTRCA tailings piles, the longevity consideration is typically addressed through placement of a rock armoring layer over the upper surface of the tailings pile capping system. Placement of a rock armoring layer over the top of a solid waste landfill cover system is inconsistent with the landfill cover design criteria contained in Subtitle D. Solid waste closure requirements are generally more appropriate than the UMTRCA requirements for the conditions associated with OU-1. To address longevity considerations for OU-1 and long-term hazards relating to disruption of the disposal site by natural phenomena, the cover system will incorporate a concrete debris layer to restrict bio-intrusion and erosion into the underlying landfilled materials.

Three chemical-specific standards of 40 C.F.R. Part 192 are considered relevant and appropriate to potential remedial actions for OU-1. First, the UMTRCA standards state that control of residual radioactive materials and their listed constituents shall be designed to provide reasonable assurance that release of radon-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20 $pCi/m^2s$ [40 C.F.R. § 192.02 (b)(1)]. For inactive sites, this standard can be satisfied alternatively by providing reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocuries per liter [40 C.F.R. § 192.02(b)(2)]. Remedial actions involving placement of additional cover material pursuant to EPA's presumptive remedy guidance will meet the radon emission standard promulgated under UMTRCA.

Secondly, the Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192 Subparts A and B) establishes concentration limits for groundwater protection. Based on the presence of radioactive materials in OU-1 and the potential for leaching to groundwater, the groundwater protection standards (40 CFR

192.02(c)(3) and (4)) and monitoring requirements (40 CFR 192.03) of the UMTRCA regulations are relevant and appropriate.

Third, the soil standards found in the Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192 Subpart B) are relevant and appropriate requirements for the cleanup of any radiologically impacted soil that may be present on the Buffer Zone/Crossroad property outside the footprint of the final landfill cover. These soil standards address the cleanup of soil contaminated with radium. Guidance on the use of these soil standards for CERCLA site cleanups is contained in *Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites* (OSWER Directive 9200.4-25, February 12, 1998).

National Emissions Standards for Hazardous Air Pollutants:

The National Emissions Standards for Hazardous Air Pollutants (NESHAPs) include standards for radon-222 emissions to ambient air from designated uranium mill tailings piles that are no longer operational. Specifically, radon-222 emissions from inactive uranium mill tailings piles should not exceed 20 $pCi/m^2s$ (40 CFR 61 Subpart T). The West Lake Landfill OU-1 is not a designated uranium mill tailings site and this requirement is not applicable. A portion of the waste materials in West Lake Landfill OU-1 do emit radon; therefore, the radon-222 NESHAP is considered to be relevant and appropriate.

Clean Water Act

The CWA sets standards for ambient water quality and incorporates chemical specific standards including federal water quality criteria and state water quality standards. The substantive requirements for storm water run off are relevant and appropriate.

The following are construction-related regulatory requirements:

Missouri Radiation Regulations for Protection Against Ionizing Radiation:

The Missouri Radiation Regulations for Protection Against Ionizing Radiation (19 CSR 20-10.040) contain chemical-specific standards that address radiation protection. These regulations define maximum permissible exposure limits for specific radionuclides in air at levels above background inside and outside of controlled areas. These requirements are considered applicable during implementation of any remedial action. Specifically, these regulations would require perimeter air monitoring during implementation of any remedial action that may be undertaken at OU-1. Site health and safety plans will address worker protection consistent with these requirements.

Missouri Well Construction Code:

The MDNR has promulgated regulations pertaining to the location and construction of water wells. The Well Construction Code (10 C.S.R. 23-3.010) prohibits the placement

of a well within 300 feet of a landfill. These rules should provide protection against the placement of wells on or near the West Lake Landfill.

The regulations on monitoring well construction (10 C.S.R. 23-4) will apply to the construction of new or replacement monitoring wells.

Missouri Storm Water Regulations:

The Missouri regulations governing storm water management at construction sites are set out in 10 C.S.R. 20-6.200. A disturbance of greater than one acre and the creation of a storm water point source during construction of the remedy would trigger these requirements.

**Preferred Remedy for OU-2:**

The preferred remedy for the Inactive Sanitary Landfill is to install a cover system consistent with Alternative 2. As with OU-1, the landfill cover, gas control, run-off control, long-term groundwater monitoring, and post-closure inspection and maintenance will be done consistent with the relevant and appropriate requirements found in the Missouri Solid Waste Rules for sanitary landfills. The landfill cover would be routinely inspected and maintained to ensure the long-term integrity of the cover. Landfill gas monitoring/management and long-term groundwater monitoring would be required. The gas monitoring and assessment program will evaluate decomposition gases and control any lateral migration as necessary. The long-term groundwater monitoring program will meet the substantive requirements in the MDNR post-closure regulations for a closed solid waste landfill.

Land use restrictions must be implemented to limit future uses and to insure future uses do not impact the effectiveness or integrity of the remedial actions. These restrictions must be maintained until the remaining hazardous substances are at levels allowing for unlimited use and unrestricted exposure. The use restrictions for the Inactive Sanitary Landfill apply within the boundary of the cover system and are otherwise the same as those described for OU-1 above.

**Applicable or Relevant and Appropriate Requirements (ARARs) for OU-2:**

Missouri Solid Waste Rules for Sanitary Landfills:

The MDNR regulations require cover to be applied to minimize fire hazards, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance [10 CSR 80-3.010(17)(A)]. This final cover shall consist of at least two feet (2') of compacted clay with a coefficient of permeability of $1 \times 10^{-5}$ cm/sec or less overlaid by at least one foot (1') of soil capable of sustaining vegetative growth [10 CSR 80-3.010(17)(C)(4)]. Placement of soil cover addresses the requirements for minimization of fire hazards, odors, blowing litter, control of gas venting and scavenging. Placement of clay meeting the permeability requirement

addresses the requirement for minimization of infiltration of precipitation. Placement of soil and establishment of a vegetative cover meets the requirement of providing for a pleasing appearance.

The MDNR landfill regulations also contain minimum and maximum slope requirements. Specifically, these regulations require the final slope of the top of the sanitary landfill shall have a minimum slope of five percent (5%) [10 CSR 80-3.010(17)(B)(7)]. MDNR regulations also require that the maximum slopes be less than 25% unless it has been demonstrated in a detailed slope stability analysis that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill. Even with such a demonstration, no active, intermediate or final slope shall exceed $33^1/_3$%. The objective of these requirements is to promote maximum runoff without excessive erosion and to account for potential differential settlement. Because landfilling of the Inactive Sanitary Landfill was completed approximately 30 years ago, most compaction of the refuse has taken place and differential settlement is no longer a significant concern. The 5% minimum sloping requirement is greater than necessary and may not be optimal in this case. Therefore, the 5% minimum sloping requirement is not considered appropriate. Sloping specifications would be designed to promote drainage and reduce infiltration of precipitation while minimizing the potential for erosion. It is anticipated that a 2% slope would be sufficient to meet drainage requirements while resulting in a lower potential for erosion. This approach should increase the life of the cover and overall longevity of the remedy compared to a steeper slope which would be subject to increase erosion potential. The maximum sloping requirements would be met.

The requirements for decomposition gas monitoring and control in 10 CSR 80-3.010 (14) are considered relevant and appropriate. The number and locations of gas monitoring points, and the frequency of measurement will be established in approved remedial design submittals. In the event landfill gas is detected at the landfill boundaries above the regulatory thresholds, gas controls will be implemented.

The requirements for a groundwater monitoring program in 10 CSR 80-3.010 (11) are considered relevant and appropriate. The monitoring program will be capable of monitoring any ongoing impact of the landfill on underlying groundwater. Over time, the groundwater monitoring program may be modified based on the results.

The substantive MDNR landfill requirements for post-closure care and corrective action found in 10 CSR 80-2.030 are also considered relevant and appropriate.

The following are construction-related regulatory requirements:

<u>Missouri Well Construction Code:</u>

The MDNR has promulgated regulations pertaining to the location and construction of water wells. The Well Construction Code (10 C.S.R. 23-3.010) prohibits the placement of a well within 300 feet of a landfill. These rules should provide protection against the placement of wells on or near the West Lake Landfill.

The regulations on monitoring well construction (10 C.S.R. 23-4) will apply to the construction of new or replacement monitoring wells.

Missouri Storm Water Regulations:

The Missouri regulations governing storm water management at construction sites are set out in 10 C.S.R. 20-6.200. A disturbance of greater than one acre and the creation of a storm water point source during construction of the remedy would trigger these requirements.

## 10.0 STATE ACCEPTANCE

The MDNR provided the following statement describing state acceptance:

> "The Missouri Department of Natural Resources is currently reviewing the proposed plan and, in general, supports remediation that will provide containment and isolation from human receptors and the environment, such as that proposed in Alternative L4 for OU1, Alternative F4 for the Buffer Zone and Alternative 2 for OU2. The department also recognizes the need for long-term care and monitoring and insists that a robust and durable stewardship plan be implemented to address this aspect. In order to achieve this, the State has applicable standards which are relevant and appropriate for
> - closure and long-term care of all portions of the site,
> - monitoring and control of gas generated in the waste deposits
> - monitoring of groundwater, and
> - continued removal of leachate from the formerly active sanitary landfill.
>
> The department will formally recommend the State's preferred remedial alternative that will encompass all of these objectives following an evaluation of the public comments generated as part of the public comment period."

## 11.0 COMMUNITY PARTICIPATION

The EPA is providing information on the proposed remedies for the West Lake Landfill site through this Proposed Plan and by holding a public meeting. The Administrative Record files for the site are also available for review. Following the comment period, EPA, in consultation with the Missouri Department of Natural Resources (MDNR), will select a final remedy for each OU after reviewing and considering all comments and information submitted during the public comment period. EPA may modify the Preferred Alternative or select another response action based on new information. Therefore, the public is encouraged to provide review and comment.

The dates for the public comment period, the date and location of the public meeting, and the location of the Administrative Record files are provided in Section 1 of this proposed plan.

Written comments on the Proposed Plan should be submitted to:

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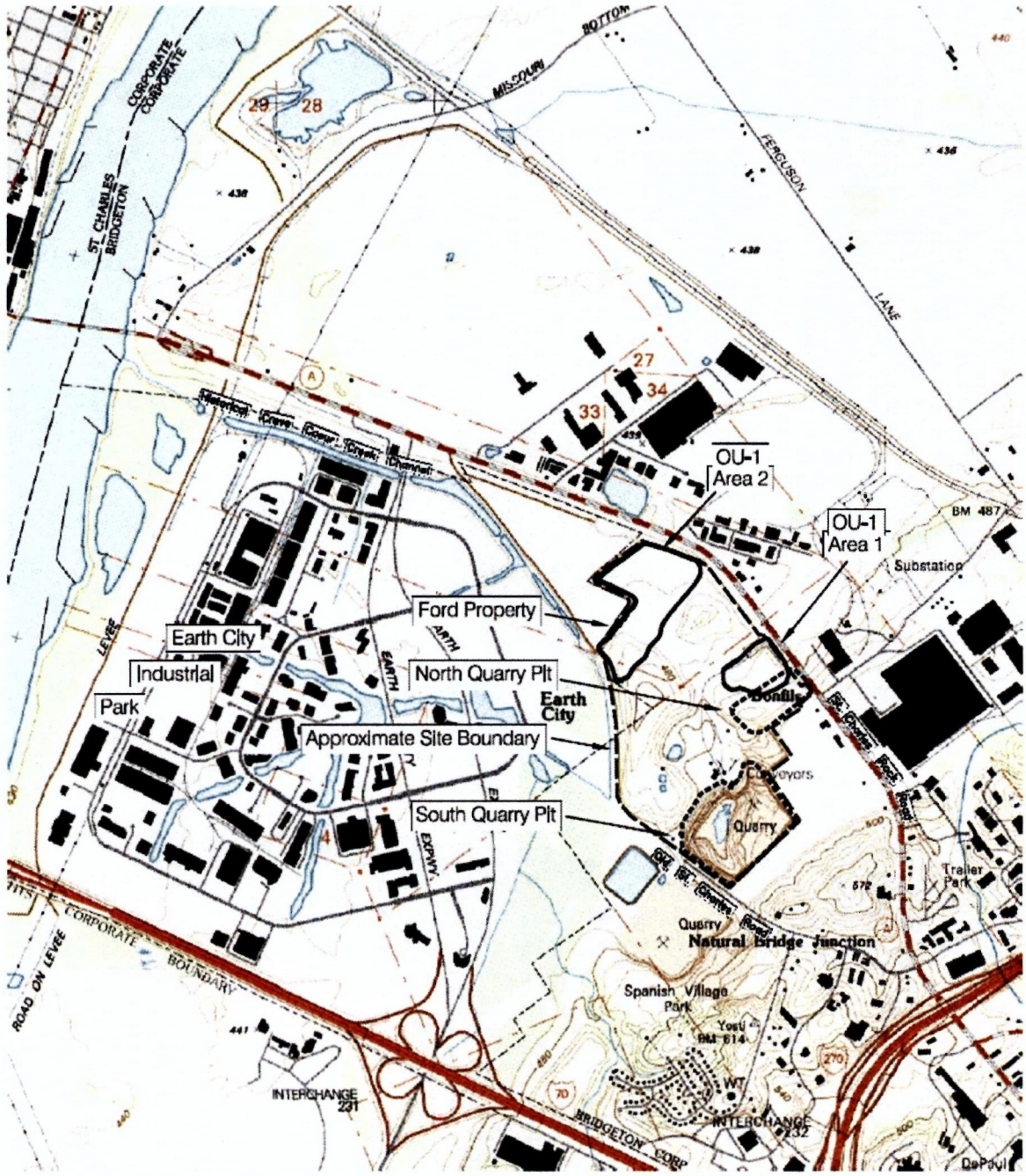


Source: St. Charles, MO USGS
7.5' Quadrangle, 1994

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SCALE IN FEET

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Figure 2-1

Site Location Map

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.

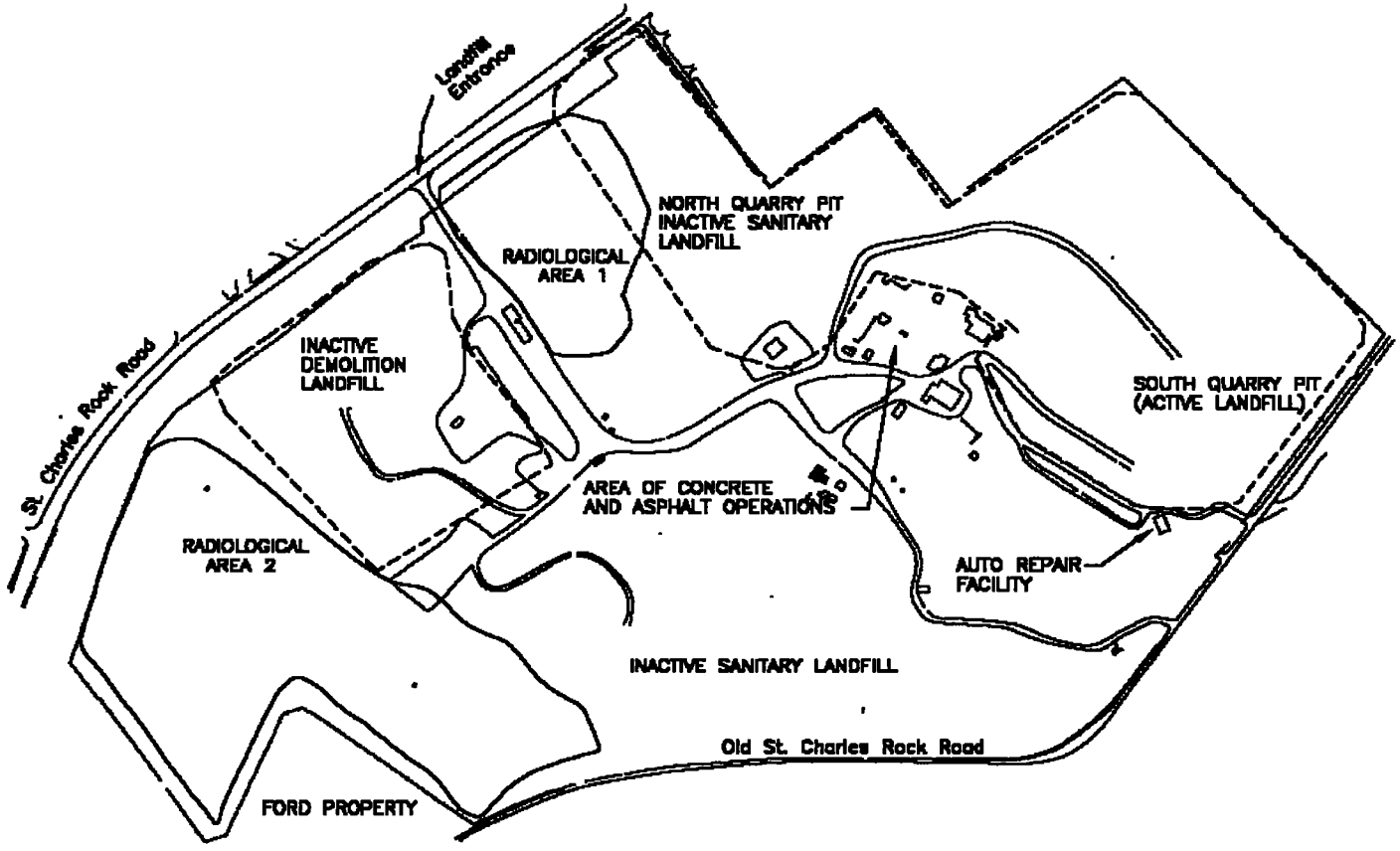

Figure 2-4

Site Layout

West Lake Landfill OU-1 Feasibility Study

EMSI Engineering Management Support, Inc.