VII. TECHNICAL ASSESSMENT

SLDS

Question A: Is the response action functioning as intended by the decision documents?

Answer A: Yes, the response action is functioning as intended by the decision documents.

The SLDS ROD (USACE 1998c) states:

"The main components of the selected remedial action include:

- Excavation and off-site disposal of approximately 65,000 cubic meters (85,000 cubic yards) (in-situ) contaminated soil; and

- No remedial action is required for ground water beneath the site. Perimeter monitoring of the ground water in the Mississippi River alluvial aquifer, designated as the HU-B, will be performed and the need for ground-water remediation will be evaluated as part of the periodic reviews performed for the site."

Response Action Performance

Response actions were completed at some properties of the SLDS (such as Plant 2, Archer Daniels Midland (DT-1), City Property (DT-2), and the MSD Lift Station (DT-15). Response actions are being conducted in some properties, such as Plant 1, Midwest Waste (DT-7), Plant 7E, Plant 6E, and Heintz Steel (DT-6). Response actions will be performed for Mallinckrodt and the remaining VPs. The past and present excavation and off-site disposal of accessible soil above the Remediation Goal (RG) at the SLDS are being performed as prescribed in the SLDS ROD. Completed activities have met the remediation goals [*Final Post-Remedial Action Report for the St. Louis Downtown Site City-Owned Vicinity Property, St. Louis, Missouri*, September 1999 (USACE1999b); *Post-Remedial Action Report for the Accessible Soils Within the Downtown Site Plant 2 Property*, January 2002 (USACE 2002a)]. However, in order to achieve the RGs, the volume of material excavated was greater than the volumes estimated in the ROD for the following reasons: indiscriminate dumping, air dispersion, unknown and abandoned utilities acting as preferred pathways, and surface and subsurface waterborne transport of particles all may have played a greater role in contaminant distribution than originally thought. The change in volumes did not affect the protectiveness of the response action.

The goal of the ground-water portion of the remedy was to monitor the usable aquifer (HU-B) to assure it was protected through the source removal; however, arsenic and uranium were detected in HU-B wells at levels exceeding MCLs or the ILs established in the SLDS ROD. A GRAAA was initiated as required by the ROD and is now in the second phase. The results of this assessment will be presented in the next five-year review.

Systems Operations/O&M

The past and current operating procedures maintain the effectiveness of the response actions. The only significant variance to costs is due to increased volumes of soil to be excavated and sent to off-site disposal.

Opportunities for Optimization

Optimization has occurred in three primary areas: pre-design investigations, system operations, and the environmental monitoring program. Rather than limiting investigations to a specific plant or VP, a study area approach using historical, geological, and gamma walkover survey data, and other existing information, has been implemented. The previous approach of limiting pre-design investigations to particular plants or VPs created difficulties when contamination extended beyond the study boundaries. The new approach results in a more efficient and effective investigation, design, and remedial action.

Systems operations have been optimized through construction of a second soil load out facility. This construction has facilitated efficient transport of contaminated soil and has resulted in a cost savings of approximately $1,000 per railcar.

The environmental monitoring system is optimized through an annual evaluation. Sampling locations, frequencies, and target constituents are modified on the basis of historical data, trends, and the evolving nature of the remedial action. Some monitoring locations have been deleted and sampling frequencies reduced as a result of these evaluations.

Early Indicators of Potential Issues

As discussed above, the only early indicators of potential issues were the larger volume of soil containing contaminants and the exceedance of ILs in the HU-B aquifer.

Implementation of Institutional Controls and Other Measures

To date, no institutional controls have been implemented at the SLDS. For accessible soil, areas remaining after remediation have been released without radiological restrictions. For inaccessible soil, access control and an excavation permit process are sufficient to prevent or minimize exposure.

Mallinckrodt provides the primary access controls on its property through badging and perimeter fencing. Prior to remedial activities at any property, temporary fences, gates, and/or barriers are installed around the work zone, warning signs are posted at designated intervals, and specific points are established for ingress and egress. Anyone not involved in the remediation is restricted from entry into the construction zone. As conditions change, controls are modified to restrict access. When it is necessary to close a road or sidewalk due to construction, alternate routes are provided. In addition, USACE is currently in the process of developing the CERCLA documentation necessary to address inaccessible soil at the SLDS. A long-term stewardship plan will be prepared to document processes and procedures with respect to requirements under CERCLA.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of response selection still valid?

Answer B: Yes, the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of response selection are still valid and any changes in these values have no impact on the protectiveness of the remedy.

40 CFR 141

The change in this proposed standard (shown on Table VII-1) has had no impact on the protectiveness of the remedy. A GRAAA was initiated for the HU-B aquifer because the ROD standard was exceeded as it would have been for the new limits. The revised MCLs will be considered as part of the GRAAA evaluation. If a determination is made that further action is required, the revised MCLs will be considered during the ARARs evaluation.

Table VII-1. Changes in Standards and Investigative Limits

Citation	Contaminant	Medium	ROD IL	New Standard (MCL)
40 CFR 141	Arsenic	Ground water	50 µg/L	10 µg/L
	Uranium	Ground water	20 µg/L	30 µg/L
10 CFR 40; Appendix A, Criterion 6(6)	Non-Ra radionuclides	Soil	None	5/15 pCi/g, Ra-226 Benchmark dose

10 CFR 40 Appendix A: Criterion 6(6)

Title 10, Code of Federal Regulations, Part 40 (10 CFR 40), implements relevant standards for mill tailings. In April 1999, 10 CFR 40 was amended to include an approach for developing cleanup goals for tailings constituents other than radium in soil and for radiological contamination on building surfaces. Such constituents were previously addressed at CERCLA sites on a case-by-case basis by development of appropriate preliminary remediation goals (PRGs) and subsequent movement off the point of departure when appropriate rather than using a single, consistent, dose and risk-based approach. The amendment of 10 CFR 40 does not result in more restrictive remediation goals (RGs). Current RGs result in residual site risks within the CERCLA risk range and thus continue to be fully protective of human health and the environment. The 1998 SLDS ROD addressing accessible soil and ground water will not be revised as a result of the publication of Criterion 6(6). Changes in this standard are shown on Table VII-1.

Changes in Risk Assessment Methods

Standardized risk assessment methods have evolved into a more probabilistic approach since the ROD was signed. There have also been changes in determining risk-based PRGs for radionuclides. The changes include exposure parameters, chemical-specific parameters, and equations, and newer toxicity values. Adult-only ingestion slope factors for workers have been updated for Ra-226+D, U-235+D, and U-238+D. The soil-to-air volatilization factor replaces the particulate emission factor. The worker soil exposure PRGs have been separated into indoor and outdoor scenarios. The newer PRG equations include radionuclide decay correction. In January 2001, toxicity values for radionuclides in the *Health Effects Assessment Summary Table* were changed and USEPA revised its standard PRG calculation template. In addition, a newer version of the radiological assessment model has incorporated the new changes. These changes have had no impact on the remedy since post-remedial action risk assessments for the SLDS use the most recent risk assessment guidance and latest version of the model.

Expected Progress Towards Meeting RAOs

As stated above, excavation and off-site disposal of contaminated soil is being performed as prescribed in the ROD. Completed activities have met the RGs. A GRAAA has been initiated for the HU-B aquifer to address exceedance of the ILs as cited in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the response action?

Answer C: No, there have been no newly identified ecological risks, impacts from natural disasters, or other information that has come to light that could affect the protectiveness of the remedy.

HISS / Latty Avenue VPs

Question A: Is the response action functioning as intended by the decision documents?

Answer A: Yes, the response action is functioning as intended by the decision documents.

"Soils from the four interim storage piles, and accessible subsurface soil from the two Latty Avenue VPs, and the contiguous property that exceed the selected criteria of 5/15/50 pCi/g for Ra-226, Th-230, and U-238 respectively would be excavated and disposed at a licensed or permitted disposal facility. As used herein the 5/15/50 criteria define contamination such that Ra-226 and Th-230 are each limited to 5 pCi/g in the top 6 inches of soil and 15 pCi/g below the top 6 inches of soil. U-238 is limited to 50 pCi/g at all depths."

Engineering Evaluation/Cost Analysis (EE/CA) for the Hazelwood Interim Storage Site (HISS), (USACE 1998a).

Action Memorandum for the Removal of Radioactively Contaminated Material at the Hazelwood Interim Storage Site and Latty Avenue Vicinity Properties, June 1998 (USACE 1998b).

Removal Action Performance

The excavation and off-site disposal of contaminated material from the interim storage piles at the HISS was performed as prescribed in the EE/CA. Additionally, removal actions performed on a portion of VP-2(L) and Futura property have met the EE/CA criteria.

Systems Operations

The current operating procedures, which include the environmental monitoring program, maintain the effectiveness of the response actions.

Opportunities for Optimization

Optimization has occurred in two primary areas: system operations and the environmental monitoring program. General process improvements, including equipment changes and efficiencies implemented through experience have, over time, optimized operations and reduced the cost per cubic yard of contaminated soil excavated. One specific operations improvement consisted of the construction of a new loadout facility at the HISS to replace the original facility on Eva Avenue.

The environmental monitoring system is optimized through an annual evaluation. Sampling locations, frequencies, and target constituents are modified on the basis of historical data, trends, and the evolving nature of the response action. Some monitoring locations have been deleted and sampling frequencies reduced as a result of these evaluations.

Early Indicators of Potential Issues

Thin vegetative cover was noted during the site inspection.

Implementation of Institutional Controls

At the HISS, the storage piles were removed and limited excavation on VPs was performed. The remaining contaminated soil will be addressed subsequent to signature of the North St. Louis County sites ROD. No institutional controls are required at this stage of the CERCLA process to prevent exposure. COCs remaining at the site will be addressed under the selected remedy identified in the North St. Louis County sites ROD. Until then, a fence and appropriate signage is maintained around the HISS proper.

Prior to response activities at any property, temporary fences, gates, and/or barriers are installed around the work zone, warning signs are posted at designated intervals, and specific points are established for ingress and egress. Anyone not involved in the remediation is restricted from entry into the construction zone. As conditions change, controls are modified to restrict access.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of response selection still valid?

Answer B: Yes, the exposure assumptions, toxicity data, cleanup levels, and response action objectives used at the time of response selection are still valid and any changes in these values have no impact on protectiveness.

Changes in Exposure Pathways

There have been no changes in land use, no change in the understanding of the physical site conditions, and no new contaminants of concern. There are no unanticipated toxic by-products from the remedy.

Changes in Toxicity or Contaminant Characteristics

There have been some changes in the toxicity factors in a way that affects the protectiveness of the remedy. RESRAD version 6.0 (2001) incorporates the factors from Federal Guidance Report (FGR)-11 and -12 and allows for the use of FGR-13 whereas the previous versions of RESRAD used data from older models.

In FGR-13, EPA includes newer toxicity values for each radionuclide based on age- and gender-dependence of radionuclide intake, metabolism, vital statistics and baseline cancer mortality data, and a revised dosimetric model.

Changes in Risk Assessment Methods

Standardized risk assessment methods have evolved into a more probabilistic approach since the EE/CA was finalized. There have also been changes in determining risk-based preliminary remediation goals for radionuclides. In January 2001, toxicity values for radionuclides in the

Health Effects Assessment Summary Table were changed and USEPA revised its standard preliminary remediation goal (PRG) calculation template. In addition, a newer version of the radiological assessment model has incorporated the new changes. These changes will have no impact on the remedy since post-remedial action risk assessments for the HISS will use the most recent risk assessment guidance documents and latest version of both chemical and radiological risk assessment models.

Expected Progress Towards Meeting RAOs

As stated above, excavation and off-site disposal of contaminated soil was performed as prescribed in the EE/CA. Completed activities have met the response action criteria.

Question C: Has any other information come to light that could call into question the protectiveness of the response?

Answer C: No, there have been no newly identified ecological risks, impacts from natural disasters, or other information that has come to light that could affect the protectiveness of the response action.

SLAPS (Including Associated VPs)

Question A: Is the response action functioning as intended by the decision documents?

Answer A: Yes, the response action is functioning as intended by the decision documents.

"Soils from the SLAPS and the Ballfields (excluding the north ditch) that exceed the selected criteria of 15/15/50 pCi/g (respectively for Ra-226/Th-230/U-238) above background (by SOR) would be excavated and disposed of at a licensed or permitted disposal facility. Soils within the top 6-inch layer that exceed the 5/5/50 pCi/g above background (by SOR) will be excavated."

St. Louis Airport Site (SLAPS) Interim Action Engineering Evaluation/Cost Analysis (EE/CA), (USACE 1997a).

SLAPS Action Memorandum for the Removal of Radioactively Contaminated Material, September 1997 (DOE 1997b).

Engineering Evaluation/Cost Analysis (EE/CA) and Responsiveness Summary for the St. Louis Airport Site (SLAPS) and Action Memorandum, St. Louis, Missouri, March 1999 (USACE 1999a).

Response Action Performance

The excavation and off-site disposal of contaminated soil at the SLAPS is being performed as prescribed in the EE/CA. Complete activities have met the cleanup criteria as documented in (*Vicinity Property 38 Removal Action Summary, Berkeley, Missouri* (USACE 2001d); *Radium Pits Removal Action Summary Report FUSRAP St. Louis Airport Site* (USACE 2001e); *Post-Remedial Action Report for the St. Denis Bridge Area* (USACE 1999c*); St. Louis Airport Site Investigation Area 9; Final Status Survey Evaluation Berkeley Salt Storage Area (IA-9 Survey Unit 1)* (USACE 2000c).

The ground-water monitoring program at the SLAPS discovered levels of selenium in the shallow aquifer (HZ-A) above Clean Water Act default limits for Coldwater Creek and the MSD discharge limit of 200 μg/L for the Coldwater Creek treatment plant. The following treatment options were evaluated for the reduction of the selenium to acceptable levels: ion exchange, electro coagulation, reverse osmosis, iron-copper cementation, phytoremediation, chemical precipitation/ reduction, off-site disposal, and denitrification. Following bench- and full-scale testing which produced an effluent with less than allowable discharge limit, a bio-denitrification process was selected for pre-treatment of the water prior to treatment by the ion exchange system that was already in use. Existing excavations and on-site water storage tanks have been lined, filled, and inoculated with microbes obtained from MSD.

Systems Operations

The current operating procedures maintain the effectiveness of the response actions. The significant variances to costs are due to increased volumes of soil to be excavated and sent to off-site disposal and the bio-denitrification of the selenium contaminated water.

Opportunities for Optimization

Optimization has occurred in two primary areas: system operations and the environmental monitoring program. General process improvements, including equipment changes and efficiencies implemented through experience, have, over time, optimized operations and reduced the cost per cubic yard of contaminated soil excavated. A specific operations improvement was the construction of a new loadout facility at the SLAPS to replace the original facility on Eva Avenue.

The environmental monitoring system is optimized through an annual evaluation. Sampling locations, frequencies, and target constituents are modified on the basis of historical data, trends, and the evolving nature of the remedial action. Some monitoring locations have been deleted and sampling frequencies reduced as a result of these evaluations.

Early Indicators of Potential Issues

As discussed above, the only early indicator of a potential issue was the presence of elevated levels of selenium in the HU-A aquifer.

Implementation of Institutional Controls

No institutional controls are required at this stage of the CERCLA process to prevent exposure. In the future, institutional controls may be implemented if specified in new decision documents. COCs remaining at the site will be addressed under the selected remedy identified in the North St. Louis County sites ROD

Prior to response activities at any property, temporary fences, gates, and/or barriers are installed around the work zone, warning signs are posted at designated intervals, and specific points are established for ingress and egress. Anyone not involved in the response action is restricted from entry into the construction zone. As conditions change, controls are modified to restrict access.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of response selection still valid?

Answer B: Yes, the exposure assumptions, toxicity data, cleanup levels, and response action objectives used at the time of response selection are still valid and any changes in these values *have no impact on protectiveness.*

Changes in Exposure Pathways

There have been no changes in land use, no change in the understanding of the physical site conditions, and no new contaminants of concern. There are no unanticipated toxic by-products from the remedy.

Changes in Toxicity or Contaminant Characteristics

There have been some changes in the toxicity factors in a way that affects the protectiveness of the remedy. RESRAD version 6.0 (2001) incorporates the factors from Federal Guidance Report (FGR)-11 and -12 and allows for the use of FGR-13 whereas the previous versions of RESRAD used data from older models.

In FGR-13, EPA includes newer toxicity values for each radionuclide based on age- and gender-dependence of radionuclide intake, metabolism, vital statistics and baseline cancer mortality data, and a revised dosimetric model.

Changes in Risk Assessment Methods

Standardized risk assessment methods have evolved into a more probabilistic approach since the EE/CA was finalized. There have also been changes in determining risk-based preliminary remediation goals for radionuclides. In January 2001, toxicity values for radionuclides in the *Health Effects Assessment Summary Table* were changed and USEPA revised its standard PRG calculation template. In addition, a newer version of the radiological assessment model has incorporated the changes. These changes have had no impact on the remedy since post-remedial action risk assessments for the SLAPS use the most recent risk assessment guidance documents and the latest version of both chemical and radiological risk assessment models.

Expected Progress Towards Meeting RAOs

As stated above, excavation and off-site disposal of contaminated soil was/is being performed as prescribed in the EE/CA. Completed activities have met the removal criteria. However, the initial volume of soil to be excavated was underestimated and the remedy is progressing more slowly than anticipated.

Question C: Has any other information come to light that could call into question the protectiveness of the response?

Answer C: No, there have been no newly identified ecological risks, impacts from natural disasters, or other information that has come to light, which could affect the protectiveness of the response action.