

# LHAAP-16 Landfill - Remedial Design

## SELECTED REMEDY: Cap Maintenance, In-Situ Bioremediation, Biobarriers, Monitored Natural Attenuation, and Land Use Controls

### Site History & Characteristics

LHAAP-16 is a capped landfill located in the south-central portion of the Longhorn Army Ammunition Plant (LHAAP). The site encompasses approximately 20 acres, of which approximately 13 acres are covered by the landfill cap. The landfill was established in the 1940s and was used for disposal of solid and industrial wastes until the 1980s when disposal activities were terminated. The Army and the USEPA signed a Record of Decision (ROD) in 1995 approving an interim remedial action, which included the construction of a multilayer landfill cap that was completed in 1998. In 1996 and 1997, a groundwater extraction system was installed to prevent the groundwater plume from migrating to Harrison Bayou. After resolution of a dispute between Army and EPA in March 2016, the 2011 Draft Final ROD was revised and the Final ROD was finalized in September 2016 with a selected remedy of Cap Maintenance, In-Situ Enhanced Bioremediation, Biobarriers, Monitored Natural Attenuation (MNA), and Land Use Controls (LUCs). The Remedial Design (RD) for the LHAAP-16 selected remedy was approved in January 2017.

### Nature and Extent of Contamination

Contaminated media at LHAAP-16 include buried source material and the Shallow and Intermediate Zone groundwater beneath and downgradient of the landfill. The landfill cap prevents rainfall from infiltrating and leaching contaminants from principal threat wastes within the landfill. However, groundwater in contact with the buried waste material provides a mechanism for transportation of COCs away from the landfill. Groundwater contaminants of concern (COCs) are trichloroethene [TCE], cis-1,2-dichloroethene [DCE], 1,1-DCE, 1,2-dichloroethane (DCA), 1,1,2-trichloroethane (TCA), methylene chloride, vinyl chloride [VC], perchlorate, and five metals (arsenic, chromium, manganese, nickel and thallium).

### Remedial Action Objectives (RAOs)

- Protection of human health and the environment by preventing exposure to landfill contents;
- Protection of human health and the environment by reducing leaching and migration of landfill hazardous substances into the groundwater;
- Protection of human health by preventing human exposure to the contaminated groundwater;
- Protection of human health and the environment by preventing (COCs and COC by-products) from migrating into Harrison Bayou at levels that cause surface water in Harrison Bayou to exceed surface water criteria; and
- Return of groundwater to its potential beneficial uses as drinking water, wherever practicable.

### Selected Remedy Description and Remedial Design

- **Landfill Cap Maintenance:** Monitor, maintain, and repair the existing landfill cap, as necessary. Landfill cap inspections will be performed annually or as needed to evaluate vegetation, erosion, settlement, and the drainage system. Groundwater monitoring systems and site access features will be inspected annually, as needed, and maintained.
- **In Situ Bioremediation (ISB):**
  - Ø ISB will be used to reduce contaminant mass and lower the contaminant concentrations in the most contaminated portion of Shallow and Intermediate Zone groundwater (referred to as Mid-Plume ISB) in conjunction with phased shut down of the existing groundwater extraction system.
  - Ø Emulsified vegetable oil (Electron Donor Solution - Extended Release [EDS-ER™] formulation) was selected as the substrate for the Mid-Plume ISB.
- **Biobarriers:**
  - Ø Three biobarriers will be installed in Shallow Zone groundwater immediately downgradient of the landfill to control migration of COCs. EDS-ER™ was selected as the substrate. Biobarrier #1, #2, and #3 are approximately 270 feet, 140 feet, and 100 feet long, respectively.
  - Ø One biobarrier approximately 195 feet long will be installed near Harrison Bayou in Shallow Zone groundwater to prevent contaminated groundwater from seeping into Harrison Bayou. Anaerobic Biochem Plus (ABC+), an oil-based product with Zero Valent Iron (ZVI) was selected as the substrate.
- **MNA:** Will be conducted to monitor shallow and intermediate groundwater zones to ensure continued degradation of COCs and daughter products and also to ensure that surface water in Harrison Bayou is not adversely affected by groundwater. Specifically, MNA will include the following:
  - Ø Evaluation of MNA based on performance objectives after 2 years of quarterly monitoring;
  - Ø Reapplication of bio-amendments if MNA is found to be ineffective; and
  - Ø Long-term monitoring (LTM) semiannually for 3 years, then annually thereafter until recommended otherwise by the five-year review. LTM will not be initiated until MNA performance monitoring is proven effective.
- **LUCs:** LUCs prohibit access to contaminated groundwater except for environmental monitoring and testing; preserve the integrity of the landfill cap and restrict intrusive activities (e.g., digging) that would degrade or alter the cap; restrict land use to nonresidential; and maintain the integrity of any current or future remedial or monitoring systems. Implementation includes:
  - Ø Initial notices of soil and groundwater contamination and land use restrictions were submitted to federal, state and local governments involved, and owners and occupants of properties subject to LUCs.
  - Ø LUC boundaries will be finalized, approved by TCEQ and EPA, and a legal description appended to the survey plat.
  - Ø LUCs will be recorded in Harrison County records.
  - Ø The Texas Department of Licensing and Regulation will be notified of the LUCs.
  - Ø Upon transfer of Army-owned property, the Army will provide written notice to the transferee and within 15 days of transfer, the Army will provide written notice to USEPA and TCEQ describing the mechanism by which the LUC will be implemented.
  - Ø USEPA and TCEQ will be notified within 72 hours of discovery of site activity inconsistent with the LUC performance objective.
  - Ø Annual inspections

### Performance Monitoring and Reporting

- Response Action Completion Report (RACR) – Will be prepared for TCEQ as the final LUC Remedial Design;
- Comprehensive LUC Management Plan – Will be prepared for the future owner or occupant of LHAAP-16;
- LTM – Will occur semiannually for 3 years after MNA proves effective, then annually thereafter;
- Five-Year Review – Will be prepared by USEPA to review the performance of the selected remedies.

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