

# PROJECT PROFILE

## ST. LOUIS AIRPORT SITE (SLAPS)

### Project Information

SLAPS is a 28-acre Hazardous, Toxic, and Radioactive Waste (HTRW) Site that was purchased in the Mid 1940's to store residuals from a Mallinckrodt Chemical Works Facility chosen to refine Uranium Ore into Uranium metal during the Manhattan Project Era. During that Era, SLAPS consisted of multiple dump sites for pitchblende raffinate, barium cake, tailings of Uranium scalping operations from magnesium fluoride slag, oil, metal scrap, and 52,500 barrels. In 1989, SLAPS was placed on the National Priority List by the USEPA, which requires clean-up to proceed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

In 1998 an Engineering Evaluation/Cost Analysis was approved and the USACE contracted Stone & Webster under a Total Environmental Restoration Contract (TERC) to remediate SLAPS for future land use. PE was contracted in the winter of 1999 to perform technical services for Stone & Webster. Through multiple task orders, those services have included Pre-Design Investigations (PDIs), Remedial Designs (Design Basis Memorandums (DBMs) to Final Designs), Engineering During Construction (EDC), Removal Action Oversight, Quality Assurance/Quality Control (QA/QC), Safety, Data Management & Interpretation, & Document Control.

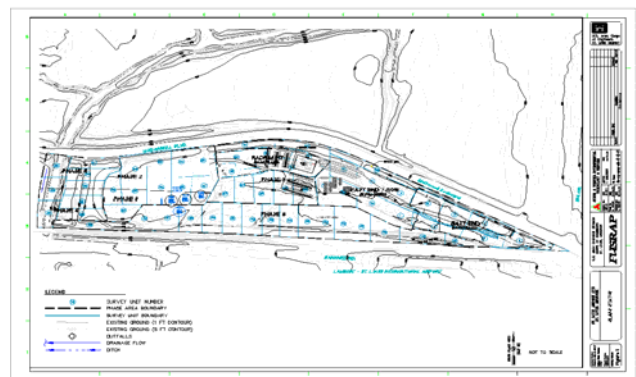
### Work Plans

PE prepared several **Work Plans** for Removal Actions (RAs), Sampling and Analyses, Pre-Design Investigations, Water Management, and Grading and Drainage. In conjunction with the preparation of these plans, PE assisted in the revisions of a number of Site Wide Work Plans such as the Site Safety and Health, Contractor Quality Control, Remedial Design, and Project Management. The acreage of land and volume of contamination covered by these work plans is approximately **28 acres** and **300,000 cubic yards** of mixed hazardous and radiological waste.

The **Removal Action Work Plans** provided overall guidance for the successful completion of the associated construction work at the SLAPS and was consistent with documented discussions with the U.S. Army Corps of Engineers and the Design Basis Memorandums (DBMs) prepared by **PE**. The work plans provided guidance on items such as potential constituents of concern, waste characterization and management, RA activities, water management, and transportation and disposal. The necessary interfaces with regulatory agencies and stakeholder entities were described and the references along with the proposed sequence of events to ensure the proper and timely completion of the work were provided. In addition to the RA work plans, work at SLAPS was conducted in accordance with the Site Safety and Health Plan, the Contractor Quality Control Plan, the Project Management Plan, the Remedial Design Work Plan, and the Water Management Plan.

As specified by the SLAPS *Engineering Evaluation/Cost Analysis*, work plans included excavation of the mixed hazardous and radiological waste, managing the materials on site, and transporting materials for off-site disposal. Resulting excavations were backfilled and restored to the interim grades of the Final Grading and Drainage Plan designed and prepared by **PE**.

The CADD drawings prepared for the work plans identified construction limits, surface and subsurface investigation locations, contamination contour maps, cross sections with existing, excavation, ground water, and final grades, excavation sequences, water management during removal activities, volume calculations, and construction notes and specifications. The excavation sequence was imperative as it specified an engineered method of excavation accompanied with water management strategies that described where to install berms, sumps, basins, and other miscellaneous erosion control and water management structures.



*CADD Drawing of Remediation Areas*



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Figures within the work plans consisted of organizational charts, facility layouts, and flow charts for off-site disposal. Tables included preliminary remediation criteria, NPDES limitations, applicable or relevant appropriate requirements (ARARs), personal protective equipment, monitoring and action level summaries, airborne limits, radiation work instructions, posting charts for radiation areas, airborne radioactivity areas and radioactive materials area, permits, licenses and notifications, submittal requirements, and definable features of work.

### Investigation and Field Studies

In the late 1980's to early 1990's, a Remedial Investigation/Feasibility Study program (RI/FS) was performed at SLAPS under two Department of Energy contractors. PE reviewed the historical RI/FS reports with respect to the radiological and chemical analytical results, hazardous waste clean-up levels, contamination depths, and surface elevations and locations. This information was entered into ArcView 3.2 (Geographical Information System) and used to create 3-foot layers of contamination from surface to the maximum depth of excavation. PE evaluated data gaps and anomalies and identified areas that required additional investigations, which resulted in pre-design investigations (PDI).

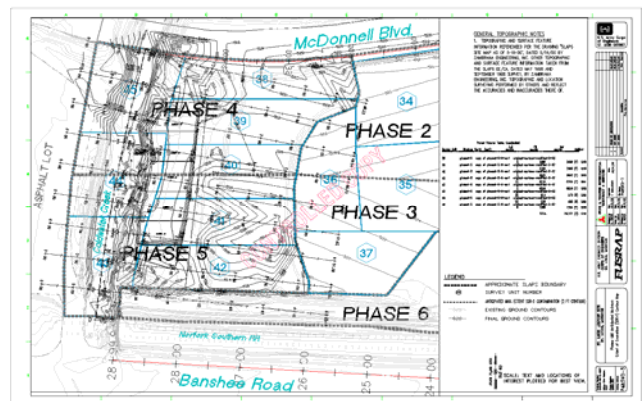


Pre-Design Investigation at the Radium Pits

PDIs consisted of preparing a sampling and analysis plan, surveying the borehole locations with a GPS, and soil sampling operations using rotary-auger drill rigs, push-probe rigs, hand augers, and surface sampling equipment. Soil samples were screened using a NaI 2X2. Samples were sent for analysis when the instruments read twice background. Raw data was used to calculate the Sum-of-Ratios (SOR). Material that exceeded a SOR greater than 1 was deemed contaminated and was required to be removed (Clean-up goals as identified in the MARSSIM by the DOD, DOE, EPA, and NRC).

Each borehole with associated analytical results were qualitatively and quantitatively selected to be used for creating a 3-dimensional model of contamination. After data management, interpretation, and quality assessments were performed, point files were created that specified existing elevations, locations (northing and easting), and depths of each PDI and historical borehole. The pointfile was downloaded into AutoDesk Land Desktop, Release 3.0 and interpolation was used to create contamination contour maps similar to the one on the right.

PE prepared summary reports that included boring locations, historical analysis, investigation summary and analysis, health and safety, depth of contamination, transportation and disposal analysis, metals analyses, geotechnical analysis, **data quality assessments**, drilling logs, analytical data for soil and air samples, and chains-of-custody. The reports were submitted to USACE for review and acceptance. Information from these efforts has been included in the **Feasibility Study/Proposed Plan** for the North County Sites, and will be used for the **Record of Decision**.



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Approximately 350 boreholes were drilled and a dozen monitoring wells were installed at SLAPS for sampling radiological and chemical constituents of concern in soil and ground water. **PE** prepared the Sampling and Analysis Plans and assisted in the PDIs for all phases of work at SLAPS and on several Vicinity Properties as field engineers for borehole logging, soil, air, and water sampling, and drilling oversight for safety and quality purposes.

Coldwater Creek (CWC), a *zero-discharge creek*, runs north/south at the west of SLAPS. **PE** was tasked to revise an existing NPDES permit utilizing a *Risk Assessment* approach to justify higher levels of Selenium in excavation water discharge. Work included the collection and evaluation of stream flow data, statistical projection of missing data for 7-Day Q10 low flow calculations, evaluation of actual receptors in CWC environment, acute and chronic toxicity calculations, regulation of water discharge flow rates, introduction of mixing zones, permit revision, technical rationale for approach, and negotiations with US EPA Region VII and State regulators.

Additionally, **PE** performed a risk assessment on dust control at SLAPS to minimize the potential exposure of radioactive concentration in the air at the site boundary from wind blown contaminated soil. An application rate of water was also calculated in order to maintain the minimum potential exposure limit.

### Engineering Support and Remedial Design

**PE** was responsible for the remedial design (RD) at SLAPS and adjacent Vicinity Properties (VPs). SLAPS consists of nine RA phases: East End, Radium Pits, East End/Right-of-Way (EE/ROW), Phase 1, Phase 2, Phase 3, Phase 4, Phase 5, and Phase 6. The East End RD and RA, and the Radium Pits RD were performed prior to **PE's** involvement at SLAPS. The table below provides information on the phases and the RDs prepared by **PE**.

	Acreage	Volume (in 1000 CY)	Maximum Depth of Excavation (in ft.)	Value Engineering	Design Analysis	CADD/Microstation	Contamination Modeling	Groundwater Modeling	Engineered Excavation	Water Management	Sheet Pile Design	Grading & Drainage Design
<b>SLAPS</b>												
EE/ROW	5	36	12	✓	✓	✓			✓	✓	✓	✓
Phase 1	2.3	41	20	✓	✓	✓	✓		✓	✓		✓
Phases 2 & 3	5.5	57	19	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phases 4 & 5	3.5	24	18	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phase 6	7.5	88	18	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Vicinity Properties</b>												
VP 38	1	7	6	✓		✓	✓		✓	✓		✓
GIFREHC	1/2	.45	2	✓		✓	✓		✓	✓		✓
FUTURA	1/8	.2	10	✓		✓	✓		✓	✓	✓	✓

**Table 1 – Remedial Designs at SLAPS**



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Designs were performed for the removal of soils with concentrations of radiological contaminants above the proposed remediation criteria. Under Alternative 2C of the *Engineering Evaluation/Cost Analysis (EE/CA) and Responsiveness Summary for the St. Louis Airport Site (SLAPS)*, soils from SLAPS that exceed the selected Criteria of 5/5/50 pCi/g within the top 6-inch layer (respectively for Ra-226/Th-230/U-238) and 15/15/50 pCi/g below the top 6-inch layer (respectively for Ra-226/Th-230/U-238) above background by sum-of-ratios (SOR) would be excavated and disposed of at a permitted facility.

Value engineering was performed routinely during the RD to include optimization of material handling and loadout; soil storage, blending, and conditioning options; transportation, disposal and backfill options.

The design analysis for each RD considered removal volumes with export limitations, minimization of clean soil removal, underground or above ground utilities, soil strength, dust control to minimize airborne particulate emissions, height restrictions, backfill, grading, material handling, management, and disposal, and the interface of clean soil with contaminated soil. The design analysis also addressed the stability of the excavations through geotechnical investigations and calculations, the dewatering of the excavations through hydrogeology, and the controlling of surface water flow through hydrology. Design analysis reports (DAR) were prepared that covered the general parameters, technical requirements, design objectives, design assumptions, and applicable calculations supporting the individual work areas within SLAPS. The DARs were completed in accordance with ER 1110-324-700.

**PE** used **Microstation**, **AutoCAD (AutoDesk Land Desktop, Release 3.0)**, and **ArcView, Release 3.2** for creating drawings that included contours, profiles, details, plans, maps, and notes and specifications during the design efforts at SLAPS. This software was also used in creating the models for contamination and ground water. As mentioned earlier, pointfiles from the PDI contained elevations that were downloaded into AutoCAD and interpolated to create a contaminant contour map. In addition, ground water contour maps were created by entering the ground water elevations that were identified during the PDI and from monitoring wells and well points that were installed on-site.

RAs were designed to be from east to west and from shallow to deep excavations based on the surface water and ground water flow of the site. These were the primary driving factors for how the excavation was engineered. Additional factors were sheet pile, current status of the RA, and time of season the RA was to be performed.



*Tarpping an excavation before a Storm*

Water management for storm water and ground water was key during the RD and RA in an effort to minimize the volume of contaminated surface and ground water since there was no water treatment process. Construction-related water consisted of surface water from undisturbed areas, ongoing excavations, cleared excavations, and ground water from dewatering activities. Designs for management resulted in berms, sumps, basins, tarp-covered excavations, and grading backfill away from future excavations.

Calculations for groundwater seepage into excavations along potentially perched water-bearing horizons were incorporated into the remedial design. The hydraulic conductivity of the uppermost groundwater aquifer (clayey silt loess) was determined using rising head slug tests in temporary



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monitoring wells and from groundwater observations in existing excavations. Expected volumes of groundwater were calculated for the remedial design based upon the anticipated exposed surface area of the saturated portion of the aquifer. Rates of groundwater seepage into the excavation were estimated using the hydraulic conductivity values and the expected groundwater gradient toward the excavation. Anticipated gradients were adjusted for proximity to and flow rates in Coldwater Creek and, more significantly, for seasonal groundwater elevation variances that historically fluctuated between four and seven feet. Gradients at individual designed excavation locations were further adjusted to compensate for any potential dewatering of the aquifer that may have occurred, or was anticipated to occur, prior to remedial action at each excavation location.

Surface water management was also included in the remedial design, and particular emphasis was made on segregation of potentially contaminated water from unimpacted water for all phases of the remedial design. Seasonal precipitation variances, groundwater elevation fluctuations, existing gradients and slopes, and final grading requirements were considered for all aspects of remedial design and work sequencing. All work was designed and executed in compliance with Federal and State of Missouri rules and regulations

Geotechnical investigations were performed at SLAPS along highways and railways. Standard penetration tests, torvanes, and pocket penetrometers were performed during drilling and sampling efforts. Additional samples were taken in accordance with ASTM standards for triaxial tests, unconfined compressive strength tests, atterburg limits, moisture content, USCS, and gradation. Soil classification and strength data such as moist unit weight, cohesion and angle of internal friction was determined from lab results and used to calculate loaded and unloaded excavation slopes as well as an unsupported or cantilevered sheet pile excavations along McDonnell Boulevard and Norfolk Southern's Railroad.



*Sheet Pile Installation along McDonnell Boulevard*

Grading and Drainage was designed to control storm water flow across SLAPS to facilitate multiple phases of RA activities and to prevent run-off from completed excavations to current excavations. Value engineering was used during the design to achieve the following goals:

- Direct water to appropriated drainage ditches and outfalls in order to prevent flooding of roads and ponding of water
- Minimize backfill to restore the site to useful final grade with adequate drainage for future land use or development
- Provide final grade elevations to which completed survey units may be backfilled, thereby minimizing rework in final site restoration

The design was in compliance with St. Louis County Department of Highways and Traffic Design Criteria and met the engineering design requirements of the Metropolitan Sewer District. Maximum flow volumes that could be accommodated by each Outfall, slopes and sideslopes for channels of drainage were calculated and drainage ditches were designed to prevent flooding of SLAPS and McDonnell Blvd.



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**PE** prepared cost estimates and scopes of work for utility abandonment and relocation (water, sewer, electric), trucking services, trailer relocations, sheet pile installation, fence installation, dust control procedures, and laboratories [soil (geotechnical and radiological), air, water analysis]. **PE** also prepared bid packages for drilling services, sheet pile services, fabrication services, and laboratory services.

#### Response Actions, Removals, and Operations and Maintenance

**PE** provided field engineers, superintendents, and QA/QC representatives for oversight of SLAPS RA activities, which consisted of:

- Installation and maintenance of erosion and sediment control structures and decontamination facilities
- Excavation and loadout of contaminated soils followed by transportation to a permitted facility for disposal
- Field screening of soils to direct the excavation and final site survey to confirm achievement of clean-up levels
- Management and, if necessary, treatment of surface water and ground water as encountered during excavation dewatering
- Backfilling, compaction, final grading, and restoration of excavated areas
- Decommission or install wells as directed by USACE



*PE Superintendent Overseeing  
Load-out Activities*

Field engineers provided on-site support including but not limited to excavation and design techniques, utility locating, water treatment, ground water and storm water control and management, equipment selection, drawing/specification modifications and clarifications, as-built drawings, field surveying and staking with a Global Positioning System and laser levels, soil and water sampling, and soil testing for transportation and disposal, utility locating, oversight of all excavation and backfill activities, and coordination with the Operations Manager.

Superintendents managed RA activities at SLAPS and VPs from mob/demob to final restoration. QA/QC representatives ensure that all work performed at SLAPS meets or exceeds the standards set forth for the project in the Contractor Quality Control Plan.

Additionally, **PE** performed oversight for the installation of multiple monitoring wells for continuous monitoring of remediated and unremediated areas at SLAPS and Vicinity Properties. **PE** also performed the sampling, data analysis and management of these wells.

