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Guaranteed Remediation Certainty
Our Word Is Who We Are

Project Example - Fast-track Guaranteed Performance and Time Based Remediation of TCE in Low Permeability Soil - Olney, IL

This was a guaranteed ***performance and time based remediation with insurance****.*

Project Reference*:* Mr. Waye Sheu, Malcolm Pirnie, Chicago, IL (847) 517-8114 #103.
Contracting and Pricing*:* Performance and Time Based, Guaranteed Fixed Price
TRS Project Price: $232,000.
Contaminants Treated: Trichloroethene (TCE).
Technology Applied*:* Electrical Resistance Heating (ERH).
Geology: low permeability clay and silt.
Hydrology: Groundwater at 20 feet bgs.
Treatment Interval**:** 2 to 10 and 20 to 35 feet bgs in 2 adjacent areas.
Site Constraints: Guaranteed remediation adjacent to the exterior of a building wall under a strict timeline with liquidated damages.
Beginning Contaminant Levels*:* Average 24,233 mg/kg.
Cleanup Levels Achieved*:* Average 0.0174 mg/kg.
Average % Reduction Achieved: >99.999%.
Total TRS Price: $242,000.00
Remediation Time Period*:* 56 days (August – Oct. ‘04).

Figure 1. Picture of Site

Background

Thermal Remediation Services, Inc. (TRS) as a subcontractor to Malcolm Pirnie Incorporated (MPI) in fall 2004 completed a fast-track remediation of trichloroethene (TCE) in soil at a site located in Olney, Illinois. TRS provided a guaranteed, performance and time based fixed price that was based on reaching defined cleanup objectives including the Illinois Environmental Protection Agency (IL EPA) Csat limit of 4,400 mg/kg, in soil within 20 weeks of notice to proceed.

To help expedite the process, MPI secured the necessary permits as well as the power service drop for the ERH system. In addition, MPI personnel supervised the drilling and all sampling and analysis for the project. MPI provided local site support through their local branch, including monitoring of the ERH system and on-site data recording.

Site Information

The ERH System was installed in an area of a former above ground storage tank (AST) that contained TCE. The AST had been previously removed, but site investigation results indicated TCE concentrations above acceptable limits were present in the subsurface at varying depths. Consequently, the project site was subdivided into two distinct treatment areas to facilitate cost-effective and rapid remediation.

The site lithology consists of primarily silty clay that increases in density at depth with intervals of very tight silty clay with clayey to silty sand intervals. The groundwater table is approximately 20 feet below grade surface (bgs). Based on the tight subsurface conditions associated with the fine-grained soil lithology, and through a series of technology comparisons, MPI determined that ERH thermal treatment would provide their client the most effective, least disruptive treatment to achieve the site goals within a very short time period.

The two treatment areas as previously described are shown in Figures 2 and 3 (Site Diagram and Subsurface Cross Section). The lateral extent of Area 1 (Shallow ERH Treatment Area) was approximately 400 square feet with an ERH treatment interval from two to 10 feet bgs. Area 2 (Deep ERH Treatment Area) covered approximately 600 square feet with an ERH treatment interval from 20 to 35 feet bgs. The combined treatment volume was delineated as 1,000 square feet equating to approximately 500 cubic yards.

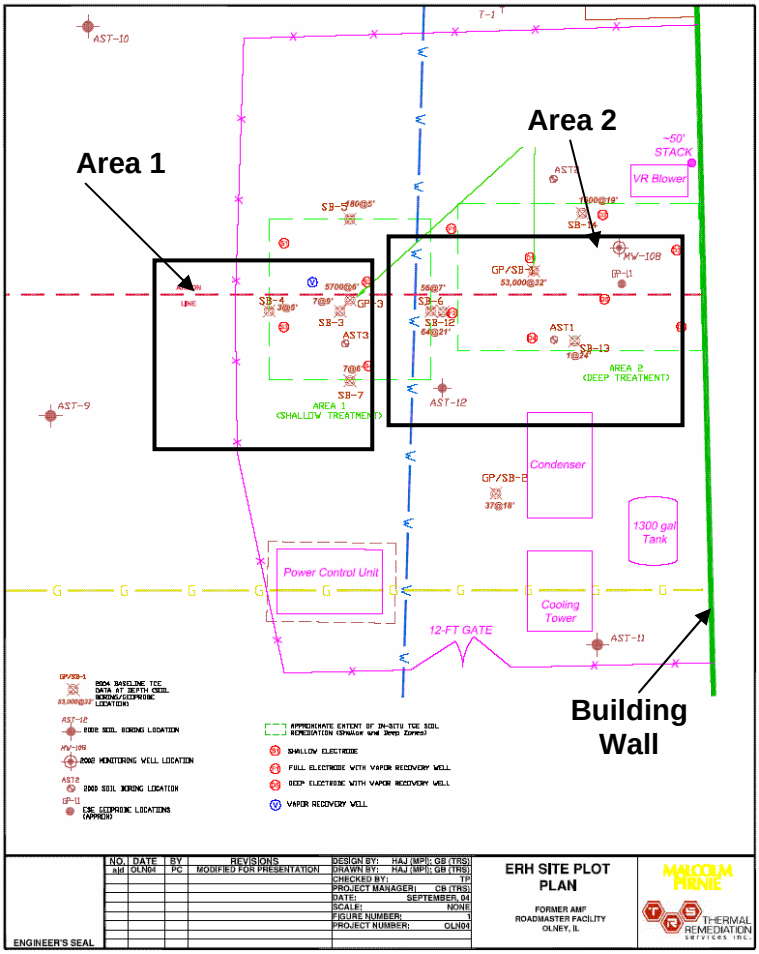

Figure 2. Site Diagram

Design Flexibility

TRS personnel provided MPI with a flexible electrode design that provided distinct remediation intervals for the two areas while operating concurrently from the same Power Control Unit (PCU). This unique approach saved the client money and focused the application of energy into the intervals that required remediation. The design provided for four shallow electrodes in Area 1 with separate vapor recovery wells and six deep electrodes with co-located vapor recovery wells for Area 2. In addition, based on the distinct contamination intervals in the two treatment areas, TRS installed two more electrodes with co-located vapor recovery components in the area between the shallow and deep ERH treatment zones to ensure full remediation of the project site.

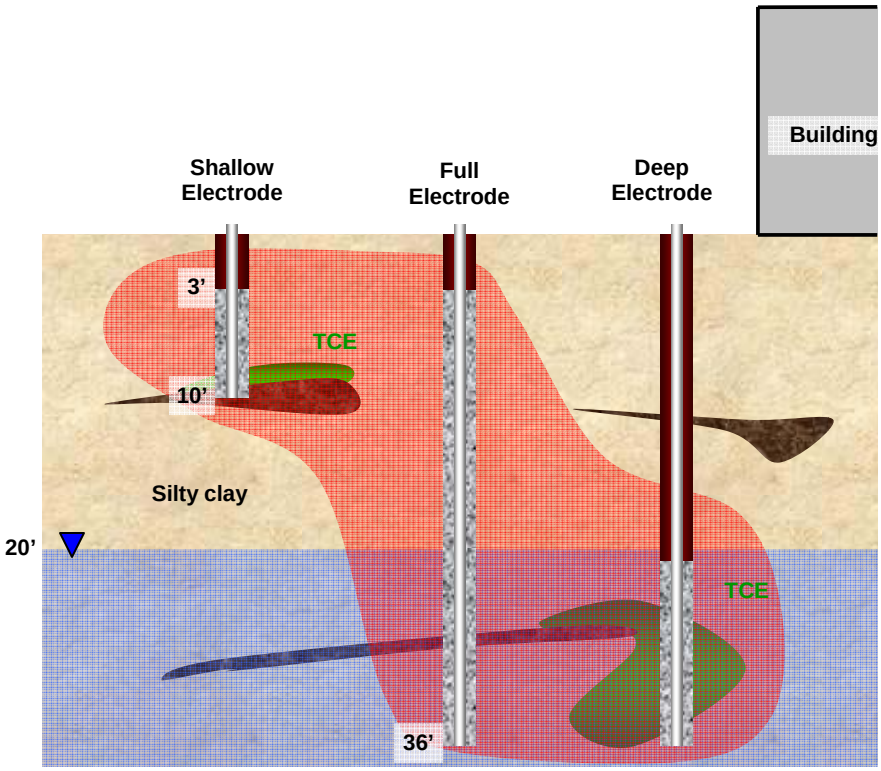

Figure 3. Subsurface Cross Section

Operations

After operations began on September 22, 2004, TRS quickly obtained the design level of average ERH power input of 120 kilowatts (kW) with a 500 kW PCU. Subsurface design temperatures were obtained in the target treatment interval for TCE by October 7, 2004, for Area 2 and October 8, 2004, for Area 1. Relevant temperature data for both treatment areas is provided in Figures 4 and 5. The temporary temperature drop shown on the figures is attributable to a system maintenance period.

In conjunction with the power input and increasing subsurface temperatures, vapor concentrations began to increase in the samples collected from the vapor recovery system. The vapor recovery concentrations obtained a peak concentration on October 13, 2004; approximately five days after TCE volatilization temperatures were reached in the subsurface in both treatment areas.

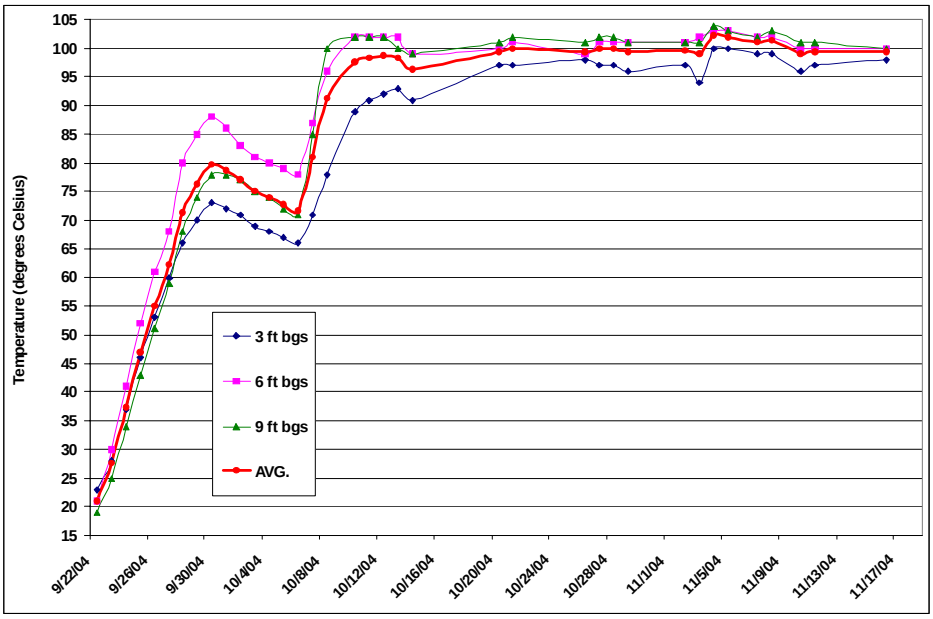

Figure 4. Subsurface Temperatures in Area 1

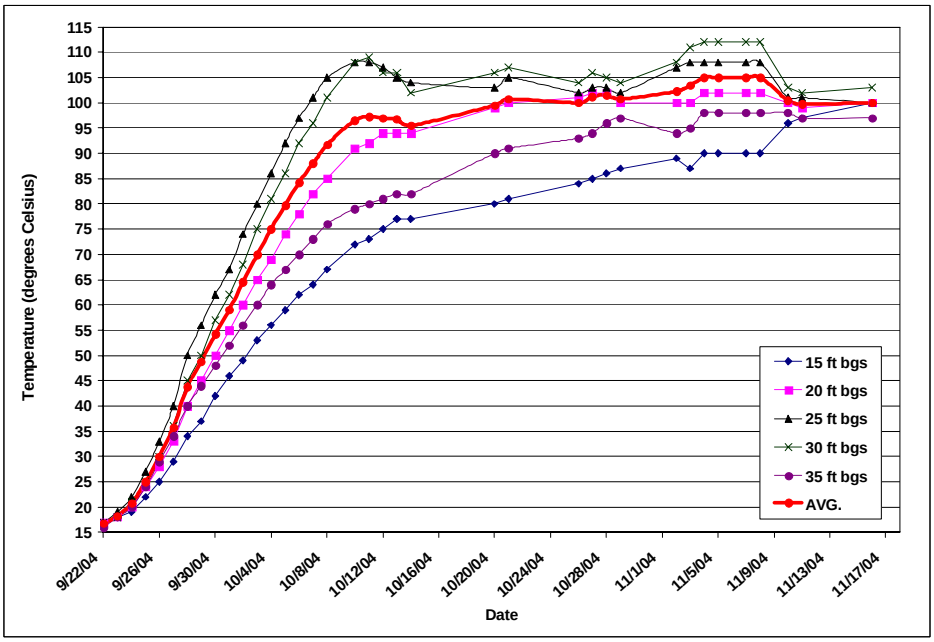

Figure 5. Subsurface Temperatures in Area 2

Results

By implementing TRS's unique ERH system design, MPI was able to achieve a **>99.999%** reduction in TCE concentrations as shown in Table 1. Figures 6, 7 and 8 present TCE concentrations in soil before and after ERH in Areas 1 and 2. The final concentrations of TCE in soil are nearly 100,000 times lower than the IL EPA Csat limit of 4,400 mg/kg.

Table 1. Analytical Results for Confidential Site, Illinois

Location	Depth Below Grade (Feet)	Soil Cleanup Goal Illinois EPA (mg/kg)	Baseline JAN - 2004 (mg/kg)	Post ERH Remediation NOV – 2004 (mg/kg)	Percent Reduction (TCE) Actual
Area 1 SB-16	6	4,440.78	5,700	0.047	**>99.999%**
Area 2 SB-15	24	4,440.78	14,000	0.021	**>99.999%**
Area 2 SB-15	28	4,440.78	NS	0.0016J	NC
Area 2 SB-15	32	4,440.78	53,000	ND	**>99.999%**

Notes

SB: Soil Boring | NS: Not sampled | ND: Non-detect | NC: Not calculated | mg/kg: milligrams per kilogram

Illinois EPA Csat: soil saturated limit (Csat)

J: Laboratory qualifier (estimated value)

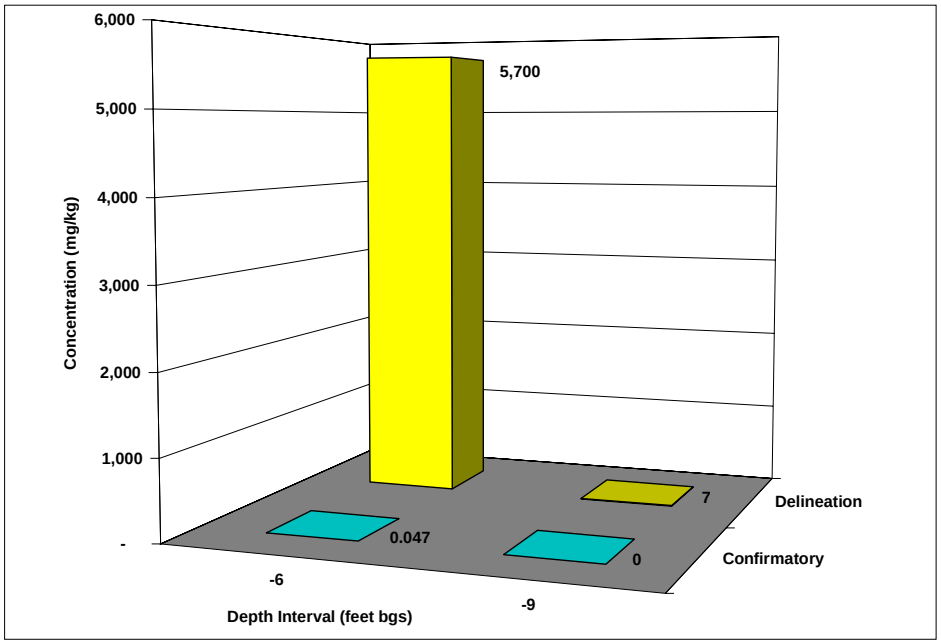

Figure 6. TCE Concentrations in Soil Pre and Post ERH in Area 1

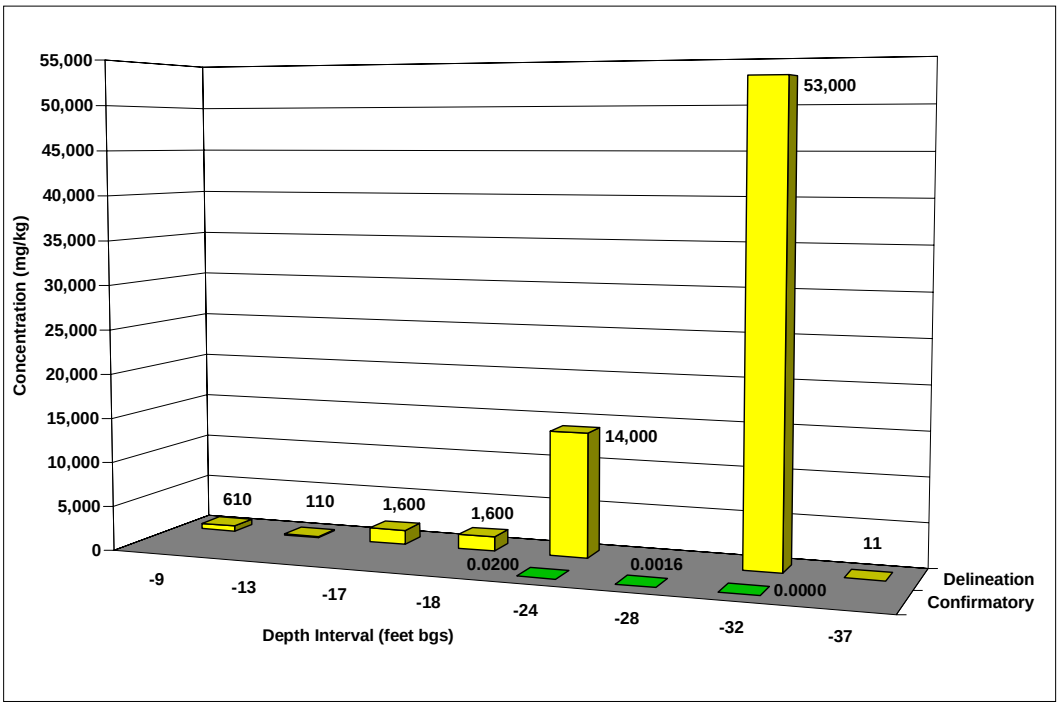

Figure 7. TCE Concentrations in Soil Pre and Post ERH in Area 2

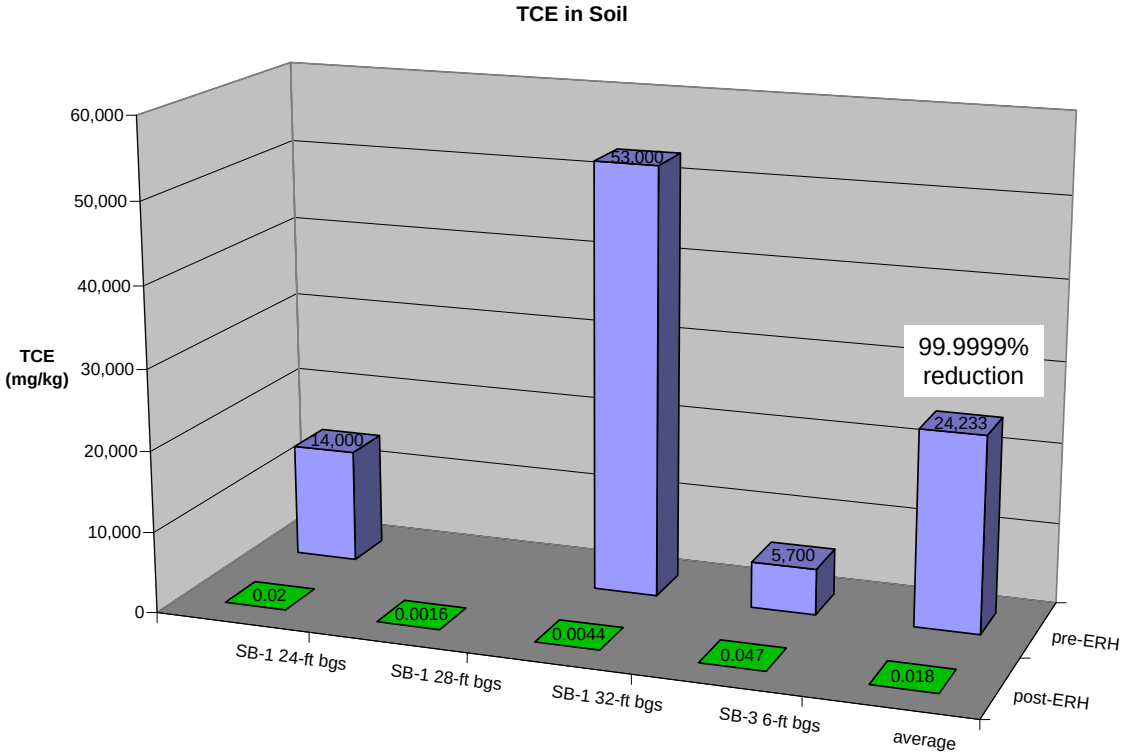

Figure 8. Average TCE Concentrations in Soil
Pre and Post ERH in Areas 1 and 2