Data for the Design and Costing of an Electrothermal In Situ and Surface Thermal Treatment Systems

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Background/Objectives. In situ thermal remediation technologies are often selected when other technical approaches have failed or it is more economic than alternatives such as digging and moving the contaminated soil. Electrothermal remedies are unique;

1. the time to achieve remediation is compressed from decades to months,
2. the relative placement of electrodes and extraction wells is critical to the efficacy of chemical mass recovery from heterogeneous soils and achieving performance goals ~ once the wells are drilled in place it is difficult to move them,
3. up front capital and operating costs are inherently high,
4. site conditions establish no drill zones and electrical grounding requirements to safely mitigate electrical interference with the existing utility grid,
5. infrastructure may need to be expanded to accommodate system installation, and
6. regulatory constraints on emissions and electrical systems are unique to every project.

This study focuses on the data and information needed to design in-situ electro-thermal and surface treatment systems for the remediation of contaminated soils. We believe this paper will be very useful to the consulting industry if they become involved in these kinds of projects.

Approach/Activities. Project data and information from completed projects are compiled and reviewed for their significance in the preparation of costs and technical design of the system. The data is organized as follows:

1. technical subsurface data, including, electrical resistivity profiling, soil properties, hydrogeology (ground water flow conditions),
2. detailed characterization of the chemical distribution (and its chemical components) that define the treatment volume,
3. electrical power availability including costs and timing,
4. existing infrastructure including location of buildings, lay down areas, road ways, residential areas, ongoing business operations,
5. infrastructure subsurface data, including buried utilities, pipes, and tanks,
6. regulatory constraints including electrical installation compliance, vapor emission and liquid discharge constraints, reinjection of treated water, and
7. performance goals.

Data and information is compiled in such a way that it is useful for preparing the costs and technical design for a project. Important metrics considered are cost per cubic yard, energy requirements per cubic yard, number of extraction / electrode wells and schedule.

Results/Lessons Learned. Every project is different and they are unique because of site-specific conditions. The technical design is more determined from subsurface features, electrical properties, and characterization of the treatment volume. Surface features that affect the technical design of the electrical system are largely dependent on the existing utility ground and methods used to minimize interference with it. The treatment plant design is based on the chemical estimates and mass loading, the regulatory constraints for emissions and discharge, and chemicals being treated. The cost estimate considers the technical data and the logistics and expansion cost data needed to construct and operate an electro-thermal remedy. The

results provide a range in terms of cost per cubic yard that is useful when viewed in the context of site-specific data.