Enhanced Cone Penetrometry
(Sonic CPT, Data Mapping, Monitoring Point Assessment)

A Multi-Agency Cooperative Development and Integration Effort

THE PROBLEM:

Cone penetrometry technology (CPT) has become an accepted (and preferred) method of subsurface characterization. Unfortunately, some well-consolidated geologies cause refusal by the cone penetrometer before advancing the sounding to the desired depth. Enhancements were needed to increase the likelihood that CPT could penetrate to the desired depth. The time and cost advantages of CPT needed to be extended to monitoring well and point placement to reduce long-term monitoring costs.

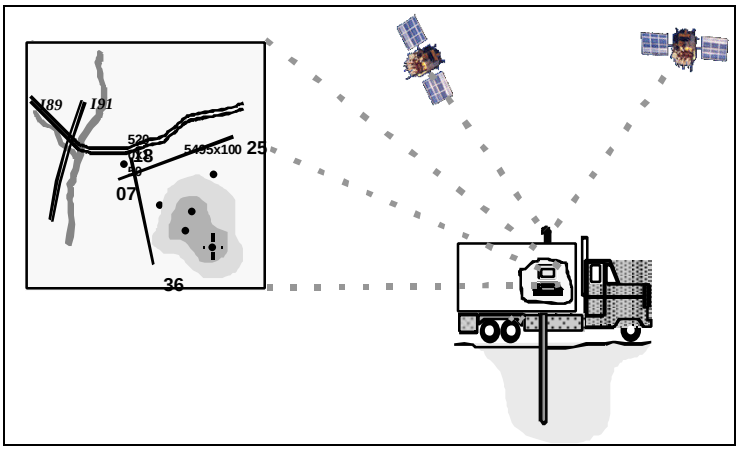
APPROACH:

Recent DoD and Air Force site characterization efforts have focused on: (1) developing advanced sensor packages; (2) developing methods to insure these packages can be delivered to the desired depth; and (3) developing user-friendly software mapping and visualization graphics packages which allow decisions to be made in near real-time. Integrating these three enhancements provides a rapid site characterization and monitoring capability that can operate in most soils.

THE SOLUTION:

The Air Force Research Laboratory, Materials and Manufacturing Directorate, Airbase and Environmental Technology Division (AFRL/MLQ), in conjunction with the US Army and DoE, developed a prototype Sonic CPT system to enhance the ability of CPT to reach desired depths. Integration of sonic technology with CPT provides the continuous profiling, real-time output, and sophisticated instrumentation capabilities of CPT with the improved speed and penetration available with sonic drilling.

An important application of CPT was installation of monitoring points at Hanscom AFB, MA, near existing drilled monitoring wells for monitoring point assessment. The correlation of information from CPT-installed wells and monitoring points with data from conventionally installed monitoring wells had previously been unverified. A sampling and analysis plan was developed, and samples were collected from both existing wells and nearby CPT-installed monitoring points at Hanscom AFB. The analytical results from the conventionally and CPT-installed wells were compared according to a statistically based experimental plan and demonstrated good correlation between the two well types.



The Air Force is also integrating a Global Positioning System/Geographical Information System (GPS/GIS) with CPT for site characterization and data mapping/visualization in real-time. Differential GPS provides centimeter accuracy to data mapping and reporting.

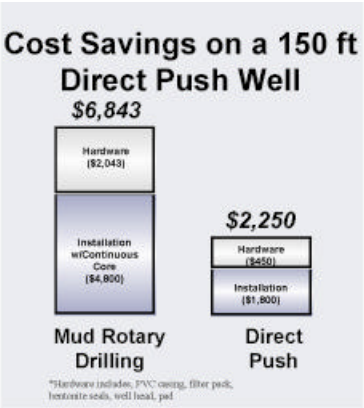
PAYOFF:

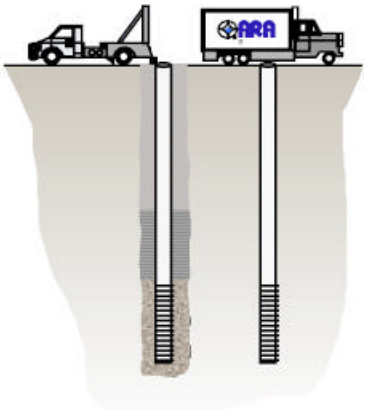
Enhanced CPT combines the speed and high penetration capabilities of sonic drilling with the economic, continuous data logging capabilities, and accuracy of CPT to provide superior site characterization technology. The integration of visualization systems improves the speed, cost, and safety of site characterization and monitoring activities. Better visualization systems allow even faster and more accurate site characterization. At Kelly AFB TX Sonic CPT provided penetration to desired depth where standard CPT met premature refusal.

COMMERCIALIZATION:

The technology is being transitioned to the Kansas City Corps of Engineers, other Army organizations, AFCEE, and DoE.

Cone penetrometer enhancements are generating characterization data more rapidly, providing the capability to map site geology and contaminant plumes in near real-time, and providing data equivalent or better than conventional techniques.





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