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CENTER FOR MULTIDISCIPLINARY RESEARCH IN TRANSPORTATION

Project Summary Report 0-4376-S

Project 0-4376

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PROJECT SUMMARY REPORT

Investigate the Availability of Technology To Identify Buried Non-Metallic Pipelines: Findings and Recommendations

Summary: This research project was sponsored by the Texas Department of Transportation (TxDOT). The project was geared toward identifying state-of-the-art technologies which can be used to precisely locate and identify underground non-metallic pipelines.

What We Did…

The following criteria were used to select a technology during the evaluation phase of this project:

- Identification of both metallic and non-metallic pipes and different pipe sizes.
- Accurate location for stacked-up utilities.

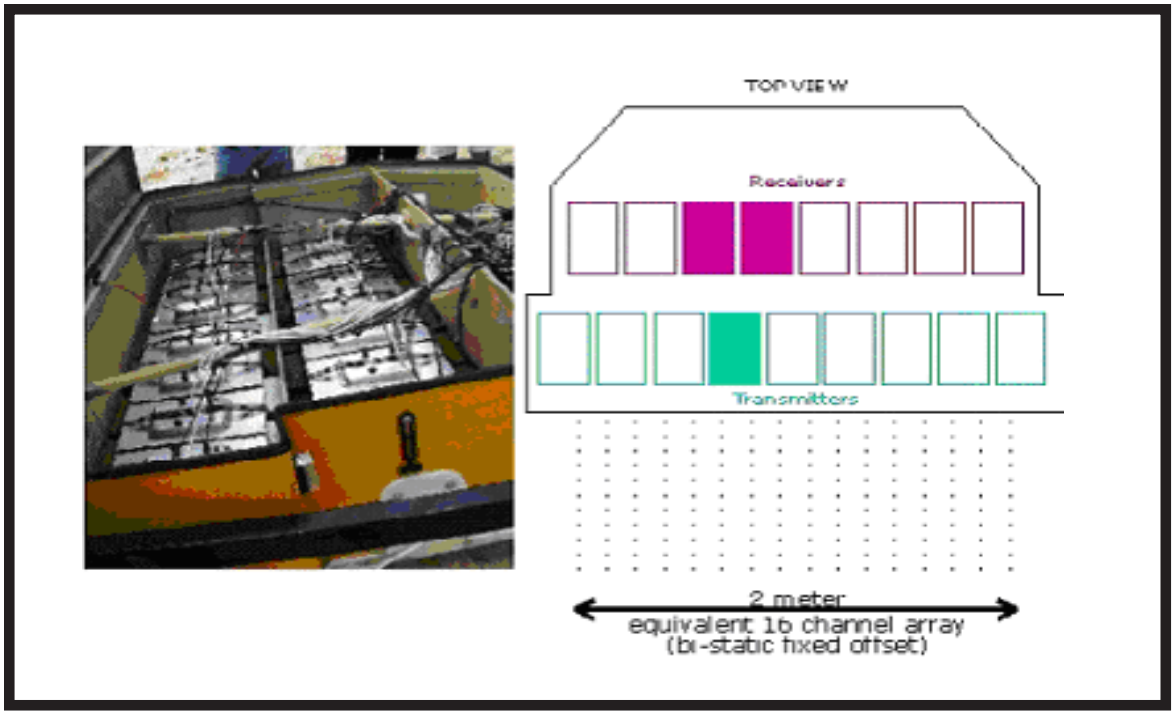

Figure 1. Inside view of CART trailer housing and Antenna Array (Witten Technologies, Inc.)

- Extent of interference from nearby metallic objects.
- Level of training required to operate the equipment.
- Extent of data processing required to get a readable plot of utility locations.
- Effect of different soil layers on data acquisition and processing.
- Reproducibility of the results.

In order to minimize the risk of damage to underground utilities, precise location and identification of utilities is important within the practical constraints of the technology, operator, and operating conditions. In addition to the above criteria, the following factors were also considered: effectiveness in all types of terrain conditions; rugged construction and multi-mode operation, i.e., walk behind, wheeled carts, or truck mounted; combination of technologies to improve effectiveness; compatibility with CAD and GIS; and reasonable cost.

What We Found…

The information available from the vendors and scientific literature was reviewed. It was found that technologies are available which can be used to locate and identify non-metallic pipelines.

However, the following technology constraints must be taken into consideration during the selection process: (1) any one technology cannot locate all types of utilities, (2) soil type is a major factor affecting location and identification of utilities, (3) interference from nearby objects is noticeable in some cases, e.g., power lines and transformers, (4) effective depth for utility location and identification is a limiting factor, (5) resolution of images for smaller diameter utilities at greater depths is a problem, and (6) initial cost is far greater than what the market is willing to pay for the services.

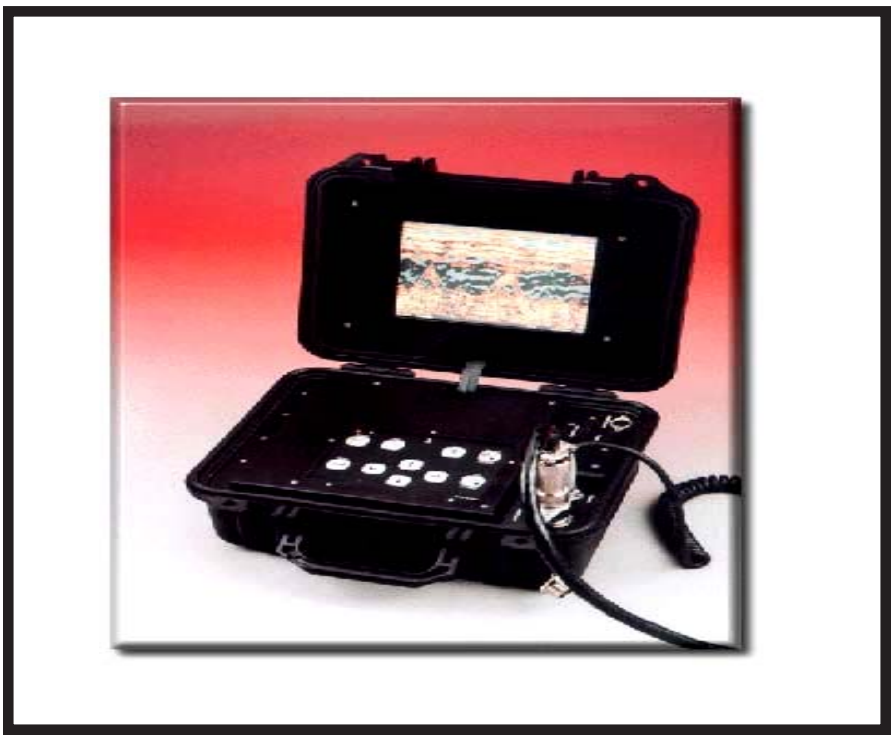

Figure 2 Subsurface Interface Radar System (SIR System 2000)

Cost-benefit analysis for providing a technology or combination of technologies, versus cost of possible damage resulting from bursting of underground high-dollar value assets, showed that costs associated with the technology provision, modifications, and crew training can be recovered in less than an hour from revenues generated from operation of these utilities.

The Researchers Recommend . . .

Using these technologies, damage to underground utilities during construction can be averted. GIS-compatible utility maps should be prepared to supplement the existing data for underground utilities in TxDOT rights-of-way, because precise location and identification of these underground utilities is required during planning and execution of new construction projects.

Figure 3 Nogging Smart Cart from Sensors and Software Inc., in operating mode.

After review of manufacturers' literature and careful consideration of all the facts, the following technologies were selected for additional evaluation :

(1) Pipe Hawk GPR System, ERA, UK,

(2) SPR Scan System, ERA, UK,

(3) Path Finder Utility, Geophysical, NH,

(4) Subsurface Interface Radar system and Antenna, TN,

(5) GPR Cart System, GeoRadar Inc., CA,

(6) RAMA/GPR MALA Geosciences,

(7) CART Imaging System, Witten Technologies, Inc.,

(8) Interragator II ACS System, VEERMER, and

(9) Smart Cart-Sensors & Software, Canada.

The selection was then narrowed down to three technologies based on the information available from the literature, vendors, and published electronic resources.

For More Details…

The research is documented in the following report:

Report No. 4376-1, Investigate the Availability of Technology to Identify Buried Non-Metallic Pipelines

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