H82 Detecting Buried Metallic Weapons in a Controlled Setting Using a Conductivity Meter

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The goal of this presentation is to introduce the attendees to the utility of the conductivity meter as a geophysical instrument used by forensic investigation teams in the search for buried weapons. Participants will gain a better understanding of how law enforcement agencies can benefit from the use of a conductivity meter when searching for buried metallic weapons.

This presentation will impact the forensic community by demonstrating how the use of geophysical technologies by law enforcement for evidence searches is becoming more frequent. The field of forensic archeology has proven important for the improvement of forensic searches by performing controlled research with various geophysical technologies. By conducting controlled research, it is possible to test the applicability of geophysical instruments during searches for buried evidence at potential crime scenes or areas of disposal.

This research project will involve the use of a conductivity meter to test the applicability of this instrument to detect buried metallic weapons. Overall, this project is one aspect of a larger project which includes multiple geophysical tools and tests their ability to detect buried metallic weapons. This presentation will solely focus on introducing the attendees to the conductivity meter and to the extent of its applicability for buried weapon detection. The overall objectives of the research were to: (1) investigate the capability of the conductivity meter to detect weapons of various metallic components and sizes at depths up to approximately 75cm, and (2) to create some guidelines on the proper use of a conductivity meter in a forensic setting.

The conductivity meter chosen for this research was the portable Geonics EM38. This model is approximately 1m in length, has a maximum detection depth of 1.5m, and can provide preliminary results in the field. For purposes of this research project, the conductivity readings were recorded while the instrument was on the ground by pressing a trigger button on the handle. The conductivity values were saved using a portable data logger attached to the conductivity meter and were first uploaded into data management software provided by Geonics Limited. Next, the conductivity data was imported into Golden Software's Surfer 8 (version 8.4) for analysis of the conductivity values for each data collection depth, and presentation of the data as contour maps.

A mixture of 32 metallic items was specifically chosen for this research project representing three categories: firearms, miscellaneous metals, and blunt and sharp force objects. The items used include 16 street-level decommissioned firearms (including pistols, revolvers, shotguns, and a rifle) that are constructed from various metals, 6 miscellaneous pieces of metals (including copper and aluminium), and 10 blunt or sharp force weapons (such as a hammer and a machete). The weapons were chosen to represent an assortment of various sizes and compositions. The research site was located in a flat and grassy area that was regularly mowed. The items were buried in 7 rows over a data collection grid measuring 15 by 19m. The size of the grid ensured that the weapons were evenly spaced with enough distance between each to avoid false results. Each burial hole was marked with an orange, plastic stake to easily identify each burial location. The conductivity values were obtained by recording data every 25cm along transects also separated by 25cm. Conductivity data was first collected when the weapons were buried at a depth of 30-35cm. The weapons were then reburied 5cm deeper each time data collection was performed down to a maximum depth of approximately 75cm.

Initial results show that the conductivity meter is able to detect multiple targets from all 3 categories at several depths. For example, at a depth of 45-50cm, 10 of the 16 firearms, 2 of the 6 miscellaneous metals, and 6 out of 10 blunt or sharp force items were detected. The items that were not detected were mostly the smallest items in the grid such as the small revolvers, the copper tube, the piece of rebar, the knife, the screwdriver, and the brass knuckles. At deeper depths, the conductivity meter was still obtaining strong signals from the larger weapons such as the shotguns, the rifle, the machete, the hammer, the mallet, the prybar, the scissors, and some of the larger hand guns such as the magnum and the Ruger. It is also important to note that the control hole was never detected and therefore the positive results were the result of the detected weapons and not the disturbed soil. Overall, the conductivity meter provided strong results at all depths tested with large weapons and would be a viable geophysical instrument for law enforcement agencies that are searching for large hand guns, shotguns, or rifles.

Forensic Archeology, Conductivity, Controlled Research