**Magnetic Susceptibility**

There are three basic methods for the use of magnetic fields in geophysics to detect patterns underground: gradiometery (which detects the ambient magnetic signals of subsurface patterns), conductivity (which detects in magnetization of underground patterns), and susceptibility (which detects patterns of attraction or repulsion to a magnetic field).

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**What is a Magnetic Susceptibility Survey?**

Magnetic susceptibility (MS) survey is an electromagnetic technique that measures the ability of a material to be magnetized in response to an applied magnetic field. This includes different types of buried features and materials including soil. Surface soils, such as topsoil, often become magnetically enhanced during the soil formation process, as they tend to concentrate magnetic minerals, which results in a higher magnetic susceptibility than the lower lying subsoils. When a grave is dug and refilled, the magnetically enhanced topsoil gets redistributed within the grave, leading to a detectable lowering in the magnetic susceptibility of the grave compared to the ground around it.

**What Role Can It Play in Identifying Missing Children?**

Identifying graves through MS survey, like any remote sensing approach, is challenging. Like all geophysics techniques, the ability to identify a buried feature, such as grave, depends on how different the grave fill is from the surrounding soil. This will vary from site to site.

MS surveys for grave identification are extremely uncommon and historically would not be considered practical due to its relative slow speed and limited depth of penetration. Its main utility has been reconnaissance surveys to identify larger features such as habitation areas, building foundations or define areas of interest for more detailed gradiometer survey. While this still holds true, ongoing research has established that, while not as efficient at identifying burials as ground penetrating radar, there are some circumstances where it may prove useful. This might include situations where GPR survey does not work effectively, such as areas of high soil conductivity (e.g. clay soils or salty soils near coastlines) or in areas where low lying vegetation prevents the efficient operation of the GPR. MS instruments are not adversely affected by conductive soils and as they are usually carried above the ground, they can clear low lying vegetation. MS readings are collected at the same time as conductivity readings in some electromagnetic survey instruments.

**What are the Challenges of Magnetic Susceptibility Survey?**

MS surveys need to be collected carefully and require special training. Courses for Indigenous communities to build this capacity are being developed. MS instruments are negatively affected by many features in a built environments where buried services and other areas of disturbance can create too much noise for effective identification of graves. More research is needed to establish just how applicable this approach might be.

There are different types of magnetic susceptibility instruments, which operate at significantly different speeds and prospect to very different depths. Some also allow for simultaneous collection of conductivity readings, leading to greater efficiency. Consultation with an archaeologist familiar with the technique is highly recommended. It cannot locate children who do not have a burial. Our understanding of this tool improves if we share information between communities, but this can be difficult.