

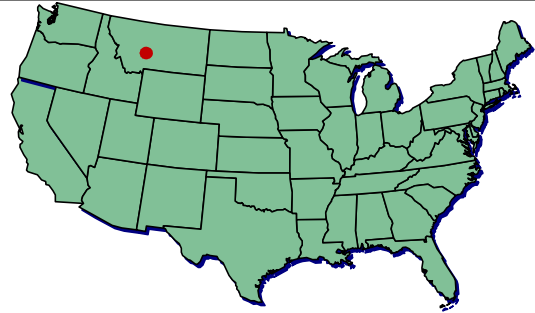
Geophysical Investigation of Historic and Prehistoric Burial Locations. Helena, Montana

Client Name:

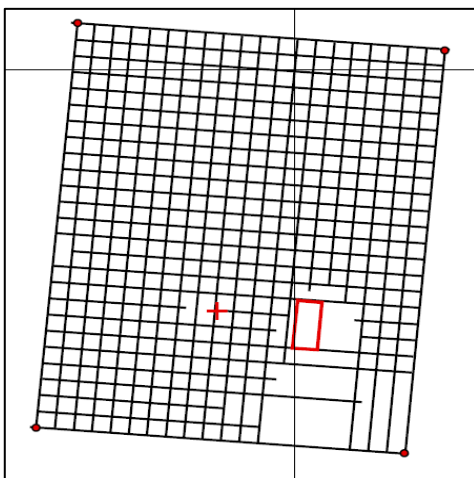
Montana Army National Guard

Project Description

FPM Geophysicists performed a geophysical survey to determine the presence or absence of two burials in the Helena, Montana region. Historical documentation dated the first burial location (Burial 1) to 1870 although it was not permanently marked until 1929. As a result, an alternate grave location was suspected. A previous archaeological investigation at a second location identified an area consisting of a two course pile of stones as a possible grave (Burial 2). Cultural artifacts associated with the area were determined to be prehistoric which allowed relatively dating the potential grave as prehistoric in age. Geophysical investigations included a Geonics Ltd. EM-61-MK2 and Ground Penetrating Radar (GPR) survey over the study area.



GSSI SIR-3000 GPR survey at Burial 1



Geophysical grid set up

Work Performed

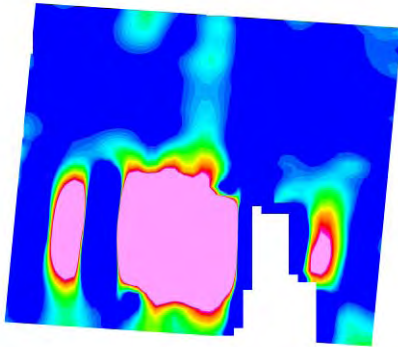
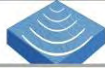
Geophysical surveys at the two burial locations were conducted with a Geonics, Ltd., EM-61 and GSSI SIR-3000 GPR system (400-MHz and 900-MHz antennas) in survey control grids established with UV-sensitive marking paint (grid marks disappeared within 2 weeks). Orthogonal transect orientation, spacing and grid sizes were selected to take advantage of the brush cleared areas and maintain transect intervals most effective for recording detailed, high-resolution data. Inaccessible portions of the sites (cross and headstone), surface obstructions (sagebrush), and significant surface features (rocks) were surveyed with a Differential Global Positioning System (DGPS).

Analysis and Results

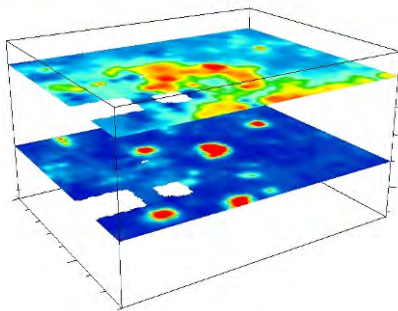
The most permanent remains of a body are the bones of the skeleton. As geophysical instruments are not generally capable of detecting bones, secondary indicators such as soil disturbances or detection of a coffin or metal artifact are suitable proxies that can be detected and interpreted to represent geophysical targets associated with buried human remains. Given the age of the two investigation areas, measurable contrasts were expected to be minimal, especially for the prehistoric location where no coffin or metallic debris was expected.

For more information, please contact:

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Processed EM-61 Data at Burial 1



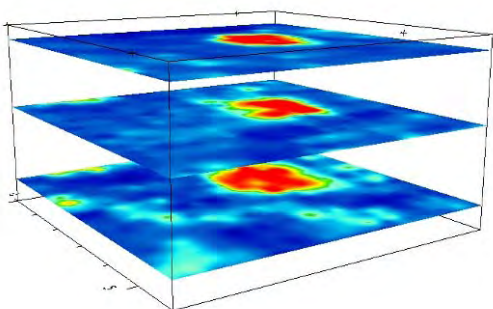
Processed 900-MHz GPR data at Burial 1 illustrated as depth slices.

At the Burial 1 location, a combination of antiquated, low-cost coffin construction, lack of embalming procedures, and a shallow burial (due to shallow bedrock observed at the site) resulted in the likelihood that little to no actual burial remains still exist.

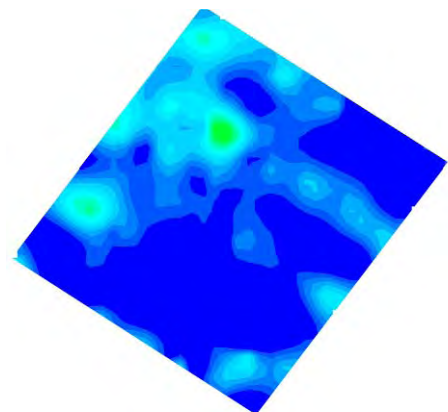
High amplitude responses originating from the cross (steel pipes) in the potential burial area limited the value of the EM61 for verifying the grave location or for detecting an alternate grave orientation. Subtle soil disturbances were observed in both the 400-MHz and 900-MHz GPR data which may be the result of shallow excavation for a burial (left figure – upper depth slice). However, only seen in the 900-MHz data were five shallow subsurface anomalies amongst the soil disturbance which may be remnants of historic crosses, fence posts or some other sort of marker (left figure – lower depth slice). These observations indicated an alternate grave location north of what was currently marked as Burial 1.

At the Burial 2 location, data analyzed from the EM61 survey indicated a very slight anomaly potentially due to motion noise and not the result of a prehistoric burial (bottom right).

GPR results with both the 400-MHz and 900-MHz frequency antennas indicated only reverberations (multiple reflections) from rocks near the surface (bottom left). Any subtle reflections from a prehistoric burial could not be determined amongst the reverberations from the surface rocks. The EM61 data conclusively confirmed that Burial 2 did not contain features of metallic content which may indicate the presence of a grave. GPR reflections were not conclusive to confirm the presence or absence of a prehistoric burial.



Processed 900-MHz GPR Data at Burial 2. Red indicates the multiple reflections from surface rocks



Processed EM-61 Data at Burial 2