GEOPHYSICAL ANALYSIS OF THE UPPER SIX METERS OF SOIL, EAST-CENTRAL DUGWAY PROVING GROUND, IN SUPPORT OF MILITARY AND HOMELAND SECURITY INTERESTS

Kevin Parkman, US Army ERDC;
Lee Perren, US Army ERDC;
Seth Broadfoot, US Army ERDC;
Jason McKenna, U.S. Army Engineer Research & Development Center;
Lillian Wakeley, U.S. Army Engineer Research & Development Center

Abstract: October 2010 field investigations in the east-central part of Dugway Proving Ground included geophysical investigations coupled with extensive soil sampling and field investigations of stratigraphy in support of military and homeland security interests. Soil sampling centered on two pits 280 m apart excavated to a depth of > 6m, augmented by boreholes between the pits and a fine grid of electrical, electromagnetic, and magnetic surveys between and to the west of the pits. The soils team collected minimally disturbed samples at 20-cm intervals in density-drive cylinders. Field activities also included stratigraphic description, measurement of magnetic susceptibility, and determination of in situ moisture and density. Geophysical surveys within the pits included Geonics EM38-MK2 measurements at selected depths. Geophysical surveys conducted at the earth’s surface between the pits and west of the pits utilized an AGI SuperSting R8, Geonics EM-31 and EM38-MK2, and Geometrics OhmMapper and G-858 Magnetometer. Sediments observed in the study area were interpreted as fine-grained lacustrine and shoreline deposits representing a shallow arm of Lake Bonneville, as well as related alluvial-fan and windblown deposits. Sediment sources for the soils in the study area were the surrounding mountains: Davis and Little Davis Mountain to the south and southeast; Cedar Mountains to the north, northeast, and northwest; and Little Granite Mountain to the West. Field observations and subsequent laboratory analyses – including grain-size analyses, density, porosity, and saturated hydraulic conductivity – revealed evidence of at least two periods of lacustrine deposition punctuated by subaerial exposure and soil formation. Geophysical surveys show a wide variation in electrical conductivity values over the entire site with gradual changes in electrical conductivity values from areas of high conductivity (100-200 mS/m) to areas of lower conductivity (10-20 mS/m) consistent with soil bodies in the shallow subsurface that are discontinuous laterally and vertically, as expected in a near-shore environment. The research provides critical details essential for understanding the performance of prototype and developmental sensors in various environments of interest to military operations and homeland security.

No full paper available.