

Geophysical Investigation of a Cement Kiln Dust Site in Northern Michigan

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During March and June 2005, a geophysical survey was conducted at a cement kiln dust (CKD) storage site in northern Michigan along the shore of Lake Huron. This work included investigation with electromagnetics (EM) and seismic methods. The EM survey was run to locate potential leachate (salt) movement south and north of the CKD stack by detecting and mapping elevated ground conductivities. Seismic reflection and refraction techniques were used to locate and map glacial till and bedrock, as well as to provide better subsurface characterization in this area. The refraction method provided near-surface seismic velocities and depths to the top of bedrock along two profile lines: north of the CKD stack and directly on the stack. The reflection method provided the highest resolution of the bedrock interface directly under the stack. The presence of very high conductivities (80-140 milliSiemens/meter versus 5-15 mS/m background values) south and southeast of the CKD stack suggest the leachate is moving into the lake system in these directions along preferential pathways. Relatively low conductivities, measured north and east of the stack, show that salt migration in these directions is not as preferential. Approximately 17-35 feet of fill sediments overlie the bedrock along the north seismic line; approximately 80-105 feet of clay cap, kiln dust, and sandy sediments overlie the bedrock along the south seismic line. A thin, high-velocity sediment layer indicative of till is not readily apparent along the bedrock interface in the refraction and reflection results, and detection of this layer may be below the resolution of the survey. Along north and south seismic lines, the presence of shallow, broad bedrock depressions suggest potential zones of CKD leachate concentration; at least one notable EM peak in the north line can be correlated to a bedrock low.