

APPLICATION OF CONTINUOUS SEISMIC PROFILING AND WATER-BORNE GROUND-PENETRATING RADAR METHODS AT THE THOMSON AND SCANLON RESERVOIRS NEAR CLOQUET, MINNESOTA

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The U.S. Geological Survey and Minnesota Pollution Control Agency (MPCA) collected approximately 43 line-kilometers of continuous seismic profiling (CSP) and water-borne ground-penetrating radar (GPR) at the Thomson and Scanlon reservoirs near Cloquet, Minnesota, to evaluate the thickness and composition of sediment overlying bedrock. The reservoirs are part of the St. Louis River and the Minnesota Hydro-Electric Power network providing nearly 74 megawatts of hydroelectric power. Both reservoirs have been identified as Areas of Concern under the U.S. Environmental Protection Agency's (EPA) Great Lakes Restoration Initiative. Historical industrial activities associated with the manufacture of building and paper products resulted in the discharge and deposition of dioxin waste in the reservoir bed sediments. The geophysical data were collected in support of a larger EPA effort to identify and remediate sediments contaminated with dioxins in the St. Louis River watershed of the Lake Superior Basin.

Radar and seismic data were collected simultaneously along the same lines on Thomson and Scanlon Reservoirs during August 2017, and processed and interpreted to characterize the thickness and composition of the water-bottom materials and the transition to bedrock in order to inform and refine the hydrogeologic framework. Estimates of water-bottom sediment material thickness and composition from the CSP and GPR data are in generally good agreement in shallow water areas where the depths to bedrock were known from physical probing and core data. Attenuation of the radar waves within the water column limited the utility of the GPR in deeper water (e.g. >4m). In these areas, the CSP data were used to interpret sediment thickness and composition. The results of the CSP and GPR surveys and will be used by the MPCA to assist in the development of a remediation plan for in-situ treatment of dioxin-bearing sediments in the reservoirs.