COMPARE AND CONTRAST THREE GEOPHYSICAL INSTRUMENTS TO RESOLVE THE LOCATION OF A MUNICIPAL LANDFILL

Jessica Ann Roe, The University of New South Wales
John Triantafilis, The University of New South Wales
Fernando Acacio Monteiro Santos, The Universidade de Lisboa
Oliver Kuras, British Geological Survey

Municipal landfills are potential areas of contamination for water resources. This is the case in the highly permeable Botany Sands Aquifer of southern Sydney, where a decommissioned landfill is the source of at least one known leachate plume. In order to monitor and manage groundwater pollution, piezometers have been installed. However, these methods can be expensive, time consuming and involve permanent installations that provide spatially discrete data. As a means to better characterise the leachate plume and sediments, surface geophysical methods have been used. The value of this approach is not in the output data obtained from the individual instruments, but in the integration of all geophysical results, which combine to more accurately characterise the sub-surface conditions. The surface methods we have used include direct current resistivity (DCR) and electromagnetic induction (EM). In this paper we compare and contrast these methods in addition to a Capacitively Coupled Array (CCA) to assess the extent of leachate plume emanating from the municipal landfill in Astrolabe Park. In this study we detect, measure and map the location and spread of the leachate plume emanating from the landfill using the: ABEM automated resistivity system (DCR), a DualEM-421 (EM) and an OhmMapper (CCA).The results suggest each method has its advantages and disadvantages in terms of resolution, depth of investigation and ease of use. Inversion results from all three methods are well correlated, with each having identified a highly conductive zone (>35mS/m) which is consistent with the location of a known leachate plume. The results suggest that of the three instruments that the portability and speed of data collection of the DUALEM-421 and Geometrics OhmMapper could be used to map the entire park, with a view to developing a 3D models.