**Electrical Resistivity (ERT) investigation for de-characterization of a tailings dam in Goiás state, Brazil**

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# Abstract

The de-characterization of tailings dams is the process of reshaping of the terrain of a tailings dam as an essential step to ensure the mitigation of potential risks related to mining operations. Geophysical methods, such as Electrical Resistivity Tomography (ERT), are proven to be effective in assessing subsurface conditions and identifying potential risks within these structures. This study presents the results of an ERT campaign conducted before the de-characterization of a tailings dam, with a specific focus on the interpretation resistivity anomalies related to water saturation.

The study area is a large tailings dam located in a mining district in central Brazil. The primary objective of the ERT investigation was to assess the subsurface conditions, identify areas of potential concern, and delineate zones of water saturation within the dam. The ERT survey was conducted using a multi-electrode system, arranged in a Dipole-Dipole array, with an electrode spacing of 10 m, which allowed to obtain 8 levels of subsurface investigations, to a depth of approximately 30 m below the surface.

Preliminary analysis of the ERT data revealed distinct low resistivity zones within the tailings dam. These zones were interpreted as being indicative of water saturation due to their characteristic low resistivity values. The presence of water-saturated zones within the dam is of particular concern as it can compromise the stability of the structure and pose environmental risks, including the potential for seepage and contaminant migration during the de-characterization process.

To further validate the interpretation, the results were compared to geotechnical data, including conventional instrumentation and piezocone penetration tests (CPTU) at selected locations close to the identified low resistivity zones. From the geotechnical instruments, the water level indicators were the ones that better supported the ERT results, suggesting the presence of water within the most conductive zones (resistivity values below 50 Ohm·m).

The identification of water-saturated zones within the tailings dam is critical for effective de‑characterization. The ERT campaign provided valuable insights into the subsurface conditions, allowing for the identification of zones of attention that needed to be taken into account throughout the work. By focusing on the zones of water saturation, appropriate strategies can be implemented to mitigate potential risks, enhance stability, and prevent environmental contamination during the de-characterization work.

When correlating ERT data with CPTU assays, as it wasn’t possible toestablish a robust correlation between these two datasets*,* we recommended that future investigations involve the simultaneous acquisition of both data sets at closely spaced locations. This would allow for better comparisons between the electrical resistivity variations from ERT and the corresponding soil properties and pore pressure measurements from CPTU.