USE OF 3D GPR TO PERFORM POST-CLOSURE DUE DILIGENCE ON WASTE LAGOON CAP

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# Abstract

Waste storage ponds and lagoons are designed to contain hazardous materials with geomembranes used to line and cap these features. These barriers are essential for preventing the transport of chemicals and pollutants from the waste into the surrounding soil and groundwater. Following closure and capping of these ponds, they are typically monitored for settlement to ensure long term integrity. Given their critical role in environmental protection, it is vital that these liners meet stringent safety and regulatory standards. Over time, settlement of waste material may result in undermining of the cap materials (i.e., geomembrane), leading to potential compromise of the cap. Therefore, detecting features that may lead to these conditions is crucial for ensuring long-term environmental safety.

Some areas within a former 60-acre contaminant/waste storage pond in Virginia were exhibiting signs of differential settlement in the form of surface depressions, which could indicate an unsupported or compromised liner. The site is primarily an open, grass-covered field with drainage swales with steep slopes. During closure, waste material was dewatered and regraded prior to being capped with a high-density polyethylene (HDPE) liner, overlain with approximately two feet of soil fill.

To assess the condition of the liner, a 3D ground-penetrating radar (GPR) survey was performed using a UTV-mounted GPR system with a 450-MHz center frequency. This system used offset transmitters and receivers to collect 18 channels at 5 cm intervals in a single swath. Over 100-line miles of data were collected within the survey area. The GPR data confirmed the presence of the liner, revealing varying depths across the site. Additionally, the data helped identify the location and depth of known underdrain pipes and anomalies attributed to material migration. These anomalies were characterized by disruptions in the interpreted liner, and by high amplitude reflectors/diffraction hyperbolas beneath the interpreted liner. Results were also presented as georeferenced time slices. These depth slices were based on the interpreted liner depth and anticipated depth of known sub-liner features present at the time of pond closure.

In this presentation, we will discuss the results and advantages of using 3D GPR technology for monitoring waste storage pond liners and detecting potential breaches.