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Preliminary geotechnical characterization of a site in southwest Nigeria using integrated electrical and seismic methods

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Abstract

Geophysical investigation using Vertical Electrical Sounding (VES), Electrical Resistivity Tomography (ERT) and Seismic Refraction at a proposed conference center site along Ajibode-Labani road, Ibadan, southwestern Nigeria has been carried out. The investigation aims at characterizing and delineating the subsurface strata to understand the weathered profile at the site. Understanding the weathered profile is essential in determining the suitability of the site for engineering construction of the future conference center. A total of 25 VES and 10 ERT profiles were acquired in a systematic grid pattern using both Schlumberger and Wenner configurations with Allied omega terrameter. The VES data were processed and analyzed using WinResist and the ERT data were inverted using RES2DINV. The data were combined to form a 3-D data set of the site and RES3DINV was used to produce the depth slices. Seismic refraction data were also acquired with an ABEM seismograph and processed using SeisImager and Fajseis software. Seismic data

were used in understanding the velocity distribution and thickness. The results of VES, ERT and seismic refraction show good correlation. Four sub-surface layers were delineated: top layer of reworked sand, clayey sand/ lateritic hard pan, clay/ sandy clay and fracture/ fresh basement. The 3-D model permits a pictorial view of the sub-surface in relation to materials that overlie the basement. The thickness of unconsolidated materials to bedrock varies from 2.7 m to 12.2 m which revealed inhomogeneity in weathering under the shallow sub-surface. It is found that the integrated geophysical tool is well suited to characterize and delineate sub-surface structure (weathered profile) for engineering site characterization.

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Preview

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