

ADAPTATION OF GPR TECHNIQUE IN IDENTIFICATION OF SLIP SURFACES OF LANDSLIDES

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Proper establishment of slip surfaces of landslides is an essential step in mitigation process. Presently, conventional methods such as geotechnical investigation, instrumentation and continuous monitoring of movement along with pattern of fluctuation of ground water table are applied. However, they are time consuming, costly and sometime difficult to apply under risky and difficult terrain condition. As an alternative, Ground Penetration Radar (GPR) would be an indirect option, which is rarely applied in current mitigation procedures practice in Sri Lanka. This study aims in adaptation of GPR technique for the establishment of slip surfaces of slow moving landslides. Five such landslides located at Madamodara-Kithulgala, Kendawa-Bulathkohupitiya, Ketawala-Badulla, Badukekanda-Badulla and Ketandola-Rathnapura were selected for the survey, which was conducted using the GPR machine assembled in Norwegian Geotechnical Institute (NGI). The antenna and frequency range used here are 1.5 m in length and 10 e6 – 180 e6 Hz, respectively with a penetration depth up to 30 m. 'Replay' software developed by NGI and 'Matlab 2014a' were used for image interpretation. Each landslide was surveyed along the axis and the lines perpendicular to the axis at three locations covering entire body of landslide. The resulted depth of slip surface from the images was calibrated with the help of respective borehole logs.

According to the results, the depths of slip surfaces of above mentioned landslides at deepest points were recorded to be 6.3 m, 8 m, 9.5 m, 8 m and 13.5 m, respectively. Those depths recorded at different survey lines were observed to be overlapped with the depths of slip surfaces identified from borehole logs. The accuracy of detected slip surfaces by GPR compared with borehole logs is +/- 0.35 m. It is also observed that the orientation and spatial distribution of slip surface can also be marked clearly. Hence, it is well noted and proved that the slip surfaces can be identified accurately as obtained from the conventional methods and applying GPR in the aimed purpose is effective, time saving and safe. GPR is a cost-effective technique as it significantly reduces the cost incurred with geotechnical investigations. By increasing the number of survey lines, more data can be collected, which helps in sound characterization with higher accuracy. Further, more surveys conducted in landslides in future would give more experiences, which lead in establishment of slip surfaces more accurately.

Keywords: GPR, Landslide slip surface, Depth of slip surface
