

## Investigation into a ground subsidence in limestone formation in Kuala Lumpur

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Geo-environment

A ground subsidence of about 25 m diameter and maximum depth of depression of 1.5 m occurred at a site near Dewan Bandaraya Kuala Lumpur's road. It caused structural damage to the adjacent single storey bungalow which was scheduled for redevelopment and also threatened the safety of an adjacent 6-storey apartment.

SSP Geotechnics Sdn. Bhd. was appointed by Dewan Bandaraya Kuala Lumpur (DBKL) to investigate the causes of the subsidence and to advise DBKL on the effect of the subsidence on the adjacent properties and to recommend appropriate remedial measures.

The desk study included analysing the geology, its previous and present land use topography and the activities at the site as well as its surrounding areas. The site geology consists of Kenny Hill formation overlying the Kuala Lumpur limestone/marble.

A layer of sandy of silty alluvium to a thickness of up to 16 m was found above the Kenny Hill residual soil. The Kenny Hill residual soil consists of medium dense clayey silty sand and gravel, with occasional gravel and clayey silt of up to 45 m thickness. A 13 m cavity in limestone without in-fill was found in one of the four boreholes drilled during this investigation.

This cavity confirmed the hypothesis that the subsidence occurred due to the collapse of voids or arching of soils above the limestone. The voids or arching of soils formed over the cavities or subterranean channels in the limestone bedrock due to loss of soils into the cavities, when the cavities or channels collapsed or extended to soil-rock interface. The voids enlarged with time and arched over the limestone until the collapse of the arch. In this site the collapse of voids or arched soils was likely to have been triggered by the boring activities a few metres away from the subsidence.

In view of the close proximity of the adjacent structure to the cavities, it was recommended the DBKL direct the developer, especially of the recently completed 6-storey apartment, to appoint an independent engineering consultant to assess the safety and recommend precautionary measures if needed. DBKL only needs to backfill the subsided area and rehabilitate the road since the road is considered to be low risk as compared to the adjacent building.