Geological and geomorphological investigations of debris flow at Genting Sempah, Selangor

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In the afternoon of 30th June 1995, heavy rainfall in the Genting Sempah area caused the Karak Highway Tunnel to be flooded; traffic was diverted via the slip road linking the Kuala Lumpur-Karak Highway to Genting Highlands Resort. The heavy downpour triggered a series of landslides, followed by a debris flow which swept away 19 vehicles, resulting in the loss of 20 lives with one missing and 23 others injured. Investigations showed that the thunderstorm had caused another 72 landslides between km 1 and km 8 along the access road to Genting Highlands Resort.

The investigations revealed that, in the Genting Sempah area, the residual soil on the hillslopes is thin, with a thickness averaging 0.5 metre whereas at the tops and the toes of the hills, the soil cover is thicker, reaching 4 metres. Underlying the soil is slightly to moderately weathered, impermeable bedrock of granite, rhyolite and metasediments. As such, the infiltrated water would flow along the weathered bedrock-soil interface which is thus a potential slip plane.

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The disastrous debris flow occurred along a stream near the faulted contact between rhyolite and metasedimentary rocks at km 0.4 of the Kuala Lumpur-Genting Highlands slip road. The residual soil in the debris flow area consisted mainly of silty sand or sandy clay containing mainly quartz or quartz and illite/ kaolinite. This type of quartzose soil has very low cohesion, is often loose and can easily move under gravity, when water-logged, as a flow. Illite, which has the capability to absorb and retain water would have also contributed to the mass movement.

The debris flow was the culmination of three landslides occurring near the headwaters of the stream. Debris from two landslides, with one on the western bank near the middle reaches of the stream and the second occurring near the headwaters of the stream, were deposited on the valley floor, causing an impounding of the stream waters. It was debris from the third landslide at the headwaters of the stream which breached these two debris barriers on the valley floor, causing a debris flow of water, mud, boulders and fallen trees.

As rainfall of high intensity may cause similar landslides, it is recommended that Genting Highlands Resort Berhad should install electronic rain gauges linked to a warning system along the slip road and access road to prevent recurrence of similar disaster.