

**GEOLOGICAL FACTORS AND THEIR EFFECT ON CUT SLOPE INSTABILITIES:
A CASE STUDY AT BELIATTA ON SOUTHERN EXPRESSWAY**

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The Southern Expressway is a highway from Colombo to Mattala. There are several cut slopes along this road. Due to the high rainfall in the area, some of these slopes become unstable during rainy seasons. One such location at Beliatta (Chainage 19+000 km on the Southern Expressway extension) was chosen as the study site where the moderately to highly weathered rock was exposed due to soil erosion leading to slope instability. Understanding the factors causing the slope instabilities can reduce the risks involved with suitable mitigation measures. Here we analyzed the geological factors which govern these slope instabilities. The analysis relied on two types of data: borehole data and discontinuity data. Twelve boreholes were selected out of 20 boreholes drilled on both sides of the slope at the Beliatta site. The groundwater level and soil column, moisture content, grain size distribution, Atterberg limits and Standard Penetration Test (SPT) values were measured. The Dips software (version 6.008) was used to analyse the discontinuity data, and a kinematic analysis was performed. The occurrence of a pegmatite body and the high plasticity of the soil were identified as the main geological factors governing slope instability. Weathered pegmatite is rich in clay, which is impermeable, and therefore pore water pressure increases in that area, affecting slope stability. The stability of the slope has been influenced by the weak zone developed on shear zone at the location. There is a possibility for an occurrence of a wedge failure in the moderately weathered rock mass. Other types of failures are at a low possibility. By kinematic analysis, it was found that when the slope angle is reduced to 34°, the probability of occurring planar sliding, wedge sliding, direct toppling, and flexural toppling become zero. The slope mitigation designs can be improved by using the findings of this study, and it can be further improved to find the particle size distributions and shear strength values.

Keywords: Borehole data, Discontinuities, Kinematic analysis, Soil parameters, Southern Expressway