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Case Study

Maierato, Italy Landslide (2010)

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BYU CEEn 544 – Seepage And SlopE Stability Analysis

# Executive Summary

## Site Background

The Maierato landslide occurred in Maierato, Calabria, Italy, on February 15, 2010. The small town of Maierato, in the region of Calabria, is located in southern Italy. The region is primarily covered in hills and occasionally experiences heavy rains, which has contributed to past landslides.

The soil in the region consists of basement rocks of schist and mica-gneiss that is overlain by coarse sandstone. The sandstone is then covered by evaporitic limestone, with interbedded levels of calcarenite with sand, silt and clay. This calcarenite is weakly lithified and easily eroded. Lastly, clay and sand layers lay above the limestone. In addition to this soil stratigraphic succession, there are also 3 active faults within the Calabria region.

## Problem Description

After the landslide occurred, eight investigation bore holes were drilled that provided information about the in-situ soil conditions. From the data the stratification of the soil showed presence of clays, clayey sands, sandy clays, evaporitic limestone, and sandstone amongst others. From the evaporitic limestone, a permeability ranging from 3E−8 to 4E−7 m/s was calculated, whereas for the Miocene sandstone showed an average permeability of around 5E−8 m/s. From shear and triaxial tests performed in sandstone and limestone samples. The limestone had a cohesion value of 10 kPa and an average friction angle of 33° with a very low Young’s modulus (between 6 and 24 MPa). For the Miocene sandstone, a friction angle of 37° (with zero cohesion) was observed with Young’s modulus between 70 and 175 MPa.

The Maierato landside was considered a complex and composite roto-translational rockslide. The landslide was a geological phenomenon caused by heavy rainfall. The rain contributed to the reduction of the cohesive component of soil shear resistance. This cause the pore water pressure along with gravity to be the main triggering mechanism for this landslide.

## Slope Stability Analysis

Factor of Safety (FS) is defined as the resisting stresses dividing by the driving stresses and slope failure occurs when resisting stresses equals the driving stress. The slope stability analysis was performed trying to achieve a FS =1. The analysis was performed on this slope failure using the computer program GSTABL7 Version 2.0. It was used to back calculate the mobilized shear strength at failure. The analysis noted the effect of changing the water table on the stability of the slope. The stability analysis indicated that the friction angle must be less than 25.5° to have caused the landslide (Paola Gattinoni, 2012) (John, 2010).

# References

Angelo Doglioni, A. G. (2013). Analysis of the Rainfall Preceding the Activation of the Large Maierato Landslide in 2010. *Landslide Science and Practice*, 107-114.

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Paola Gattinoni, L. S. (2012). The February 2010 large landslide at Maierato, Vibo. *Landslides*, 255-261.