

# Executive Summary: Oak Hills Slide Case Study

CE-EN 544 – Seepage and Slope Stability  
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## Overview

Oak Hills is a neighborhood at the base of Y-Mountain located in Provo, Utah. In the early 1980's construction began on a level pad and an access road for a new house. The new house was to be built on the slope across the street from 1255 N 1500 W. The excavation for the level pad was located at the base of a large ancient landslide.

In the Spring of 1983 the excavation triggered a landslide. The slide was about 400 feet long and 100 feet wide. The slide moved more than 70 feet laterally and left a scarp that was about 40 feet high. The slide threatened to engulf one home but stopped 10 feet in front of it. By the time the slide was finished, Terrace Dr. was blocked and the home at 1255 N Terrace Dr. was abandoned.

In 1992 Dr. Rollins completed a case study on the site. Four borings were used to determine the soil properties at the site. They found no ground water in any of the boreholes but the soil was near saturation. Underneath the slide they found a Manning Canyon shale layer. Above the shale the material generally consisted of low-plasticity gravelly silt and silty gravel. After the analysis, Dr. Rollins made recommendations for removing the slide mass from the roadway and cutting back or reinforcing the slope to make it stable. Due to legal issues concerning responsibility for the slide, the slide mass was never removed from the road and the roadway remains blocked to this day.

Within the last few years the house at 1255 N Terrace Dr. was repaired. A new driveway was poured on the south side of the property to replace the one buried by the slide on the north side, giving the home access to the south segment of Terrace Dr.

## Analysis

UTEXAS was used to perform a slope stability analysis of the site. The original slope surface, excavation, and failure surface were estimated using a profile of the slide provided by Dr. Rollins. Ranges for the friction angle, cohesion, and unit weight of the soil at the landslide site were estimated to be 30 to 34 degrees, 0 to 100 psf, and 110 to 130 pcf, respectively.

First an analysis was done for the original slope assuming a circular failure surface. the factor of safety was found to be 1.587. Next, the original slope analysis was performed using the actual estimated non-circular failure surface observed in Dr. Rollins' case study. The resulting factor of safety was 1.077. These factors of safety show that the slope was stable before construction began.

The final UTEXAS analysis performed was to determine the factor of safety after the excavation. Using the non-circular failure surface found during Dr. Rollins study, a factor of safety of 0.893 was found. After the excavation of the access road and the level pad the slope was no longer stable. In addition to the low factor of safety resulting from the excavation, 1983 was an extremely wet water year. The soil was likely heavily saturated from the spring runoff and could no longer support its own weight, leading to the slope failure.

## References

ROLLINS, K.M. and Rollins, R.L. (1992) "Case Histories of Landslide Stabilization Using Drilled Shaft Walls." Transportation Research Record, Transportation Board, National Research Council, Washington D.C., No. 1343, pp. 114-122