SEEP/W generated pore-water pressures in SLOPE/W stability analysis

1 Introduction

The objective of this example is to demonstrate how to use SEEP/W computed pore-pressures in a SLOPE/W stability analysis. The problem creates a perched watertable under long term net infiltration of precipitation. This perched condition can only be properly handled by directly using the SEEP/W results in SLOPE/W. It is not possible to use a piezometric line, for example, to describe the perched pore-pressure condition.

2 Problem configuration

The problem configuration is depicted in Figure 1. There is a less permeable layer at about mid-height in the slope. This less-permeable layer together with the infiltration on the upland creates a perched water table situation. The K_{sat} values are shown on the drawing. Beyond the slope toe the natural watertable is at the ground surface.

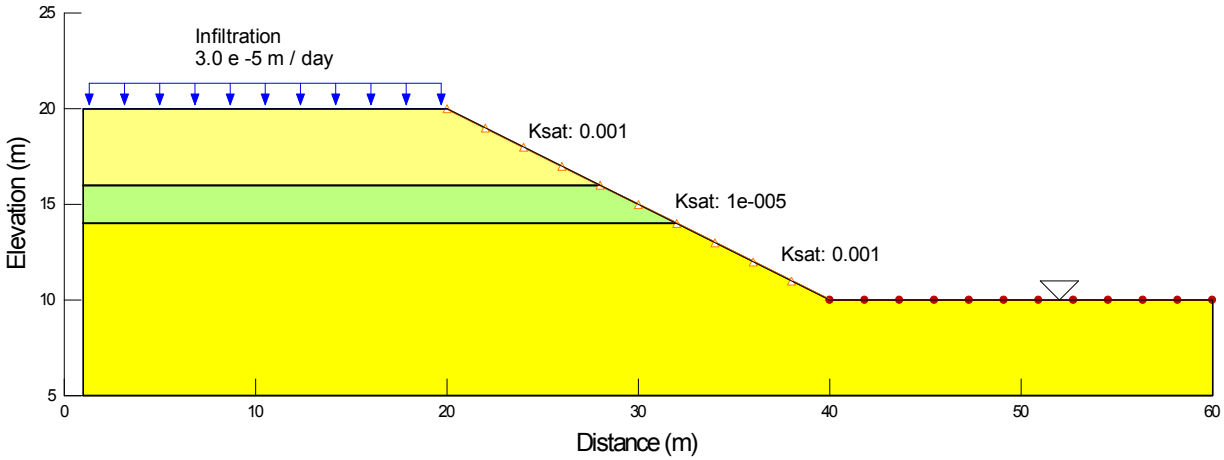


Figure 1 Problem configuration

3 Seepage conditions

The following diagram (Figure 2) shows the SEEP/W results. The contours are drawn in such a way that only the zones with positive pore-pressures are display. This clearly shows the perched zone.

Worth noting is that the infiltration enters through an unsaturated zone, then migrates down and to the left in a saturated zone , and then some of the seepage again passes through an unsaturated zone down to the regional groundwater.

Also, worth noting is that some of the seepage exits on the face of the slope. This reveals how the stratigraphy in natural slopes can cause wet spots and exfiltration on the slope face.

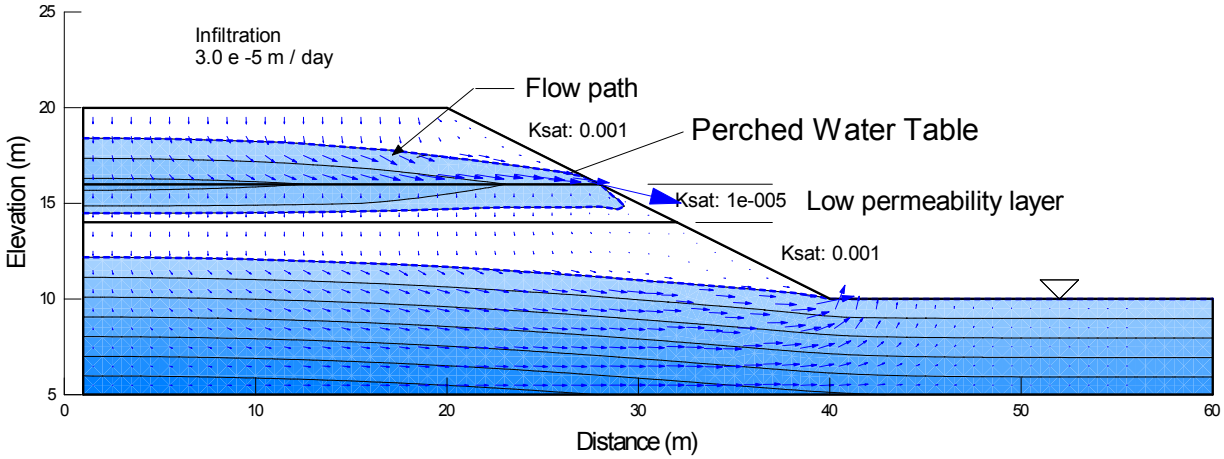
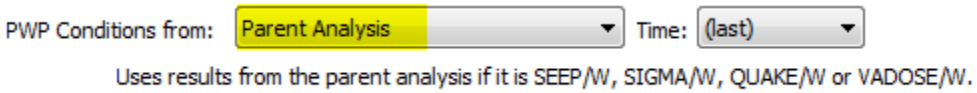


Figure 2 Perched positive ground water conditions

4 Stability analysis

The SEEP/W results can be used in a SLOPE/W stability analysis by making the SEEP analysis the parent of the SLOPE analysis and indicating that the pore-pressure conditions should come from the Parent.



As shown in Figure 3, the slip surface crosses the zero-pressure contour three times.

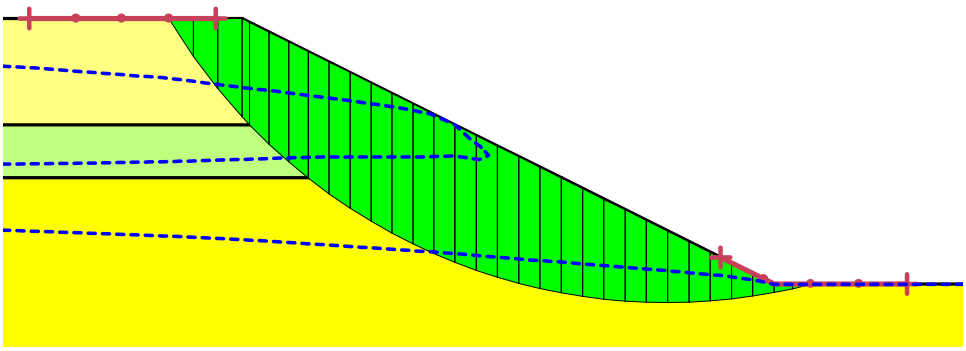


Figure 3 Slip surface crossing the zero-pressure contour three times

Plotting the pore-pressure along the slip surface produces the graph in Figure 4. The pore-pressure starts out negative at the crest, then becomes positive in the perched zone, goes negative again below the perched zone and returns to being positive when the slip surface enters the natural ground water.

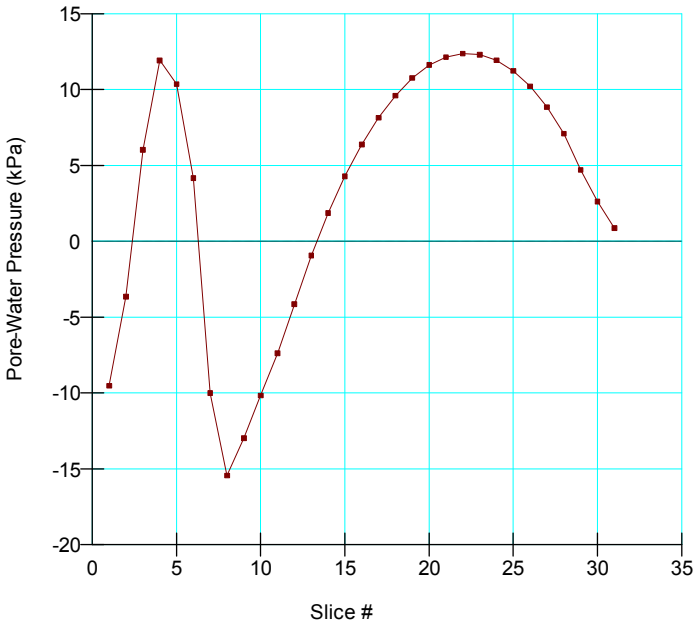


Figure 4 Pore-pressure distribution along the slip surface

5 Commentary

This example illustrates the power of using SEEP/W computed results in a SLOPE/W stability analysis. The only other way of considering such a perched condition without using SEEP/E results is to use a Spatial Pore-Pressure function in SLOPE/W where it is possible to define the pore-pressure at a series of Points and then contour the data points. This however is much more awkward and time consuming.