

Oasys Slope in Oasys Gofer

Limit Equilibrium analysis comes online!

Housekeeping

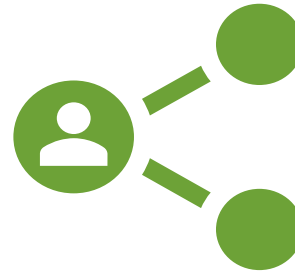
Before we get started



Q&A



Catch up
on-demand



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Speakers



Norbert Kovacs

Senior Business
Development Manager



Matthew Brown

Gofer Product Manager

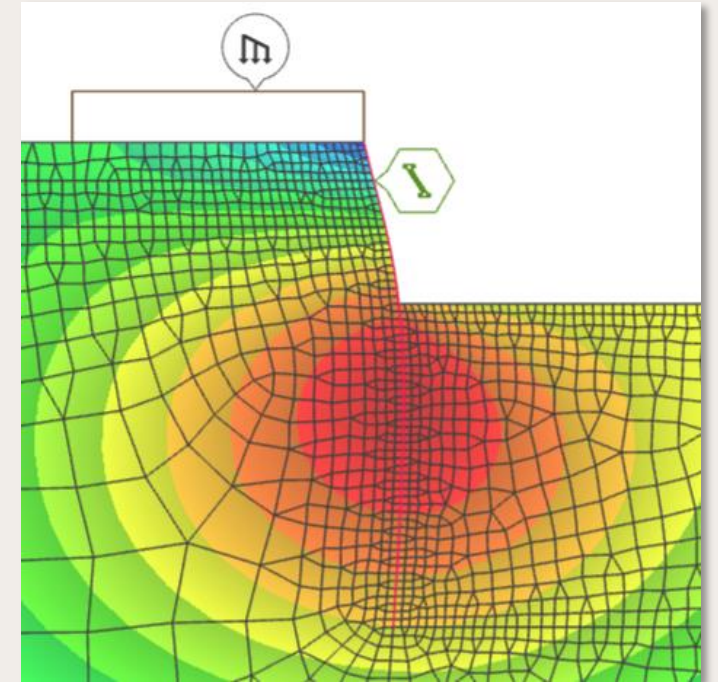
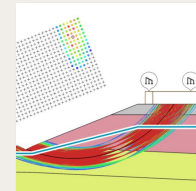
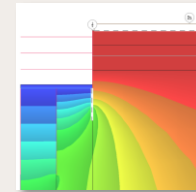
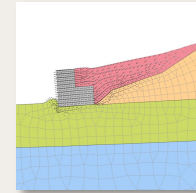


Sissira Pereira

Application Specialist

Agenda

- Introduction to Gofer
- Recent updates
- Slope in Gofer
- Example models
- Wrap-up and Q&A



What is Gofer?



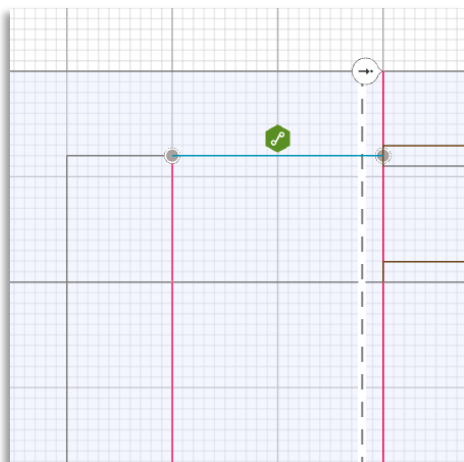
Geotechnical FEA reimagined

Gofer brings the advantages of cloud computing to geotechnical modelling.

[Go to Gofer](#) [Sign up](#)

What is Gofer?

New from Oasys, Gofer is our cloud-based geotechnical finite element analysis software that lets you build, analyse, and collaborate on geotechnical models.



Oasys Gofer: Adjusting a node to level

[Watch](#)

Oasys Gofer: Drawing freeform

[Watch](#)

Selection

Geometry

- Soil block 3
- Soil block 6
- Soil block 7
- Soil block 11
- Soil block 12

Import materials

My model library

Search

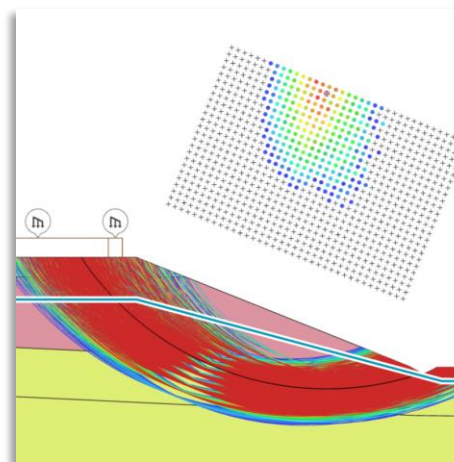
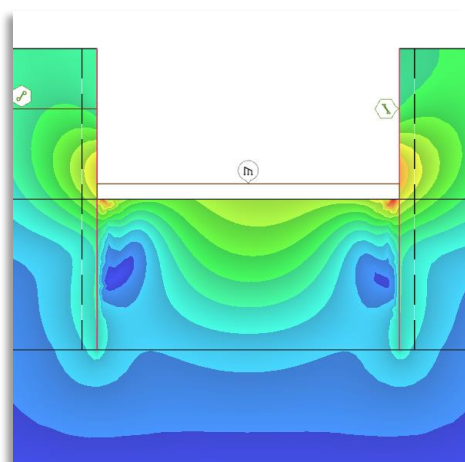
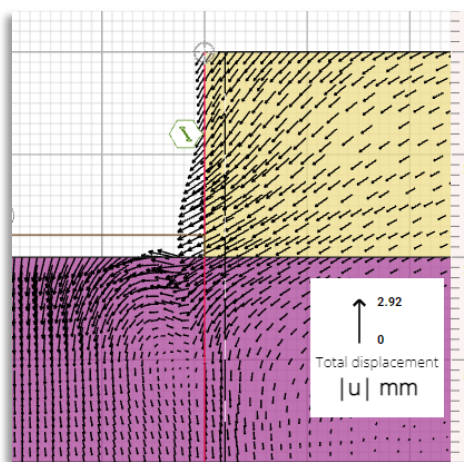
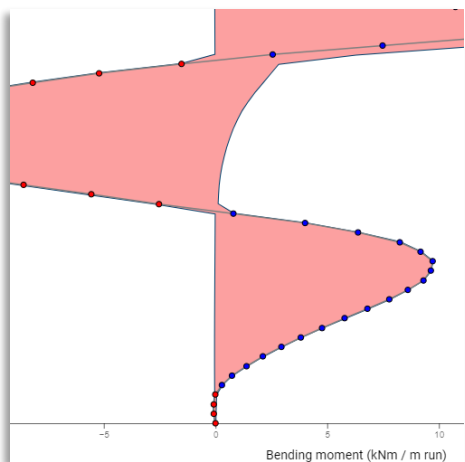
test model 1b [Select all](#)

- Sand
- Gravel
- Concrete

Example 1b - Inclined load on slab gw

Example 2a - Retained excavation

Example 2b - Retained excavation + detail



validation

(Harr, 1962; 1990)

steady state comparison of results.

Central St Giles, London

Flexible cantilever retaining wall validation

A case study comparing Gofer and Oasys Frew, using design models from the Central St Giles development, London.

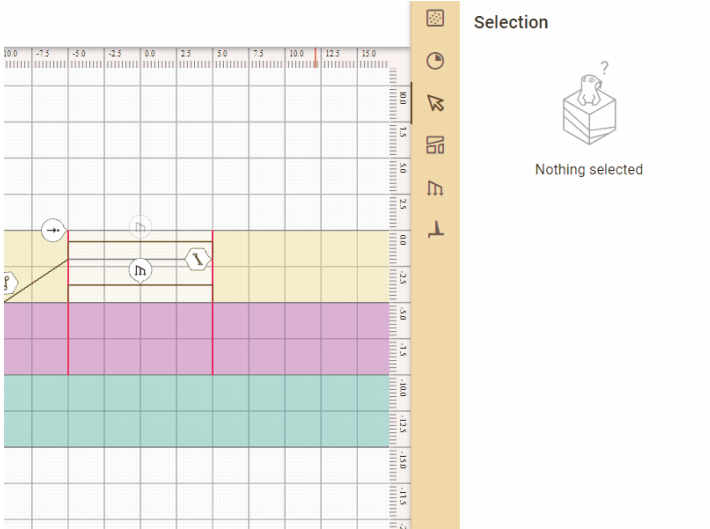
[Read more](#) [See model](#) [Read more](#)

C-phi i

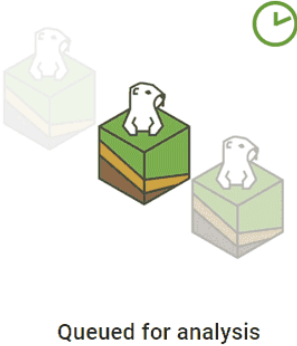
After Ch...

This case feature, c Oasys Slk

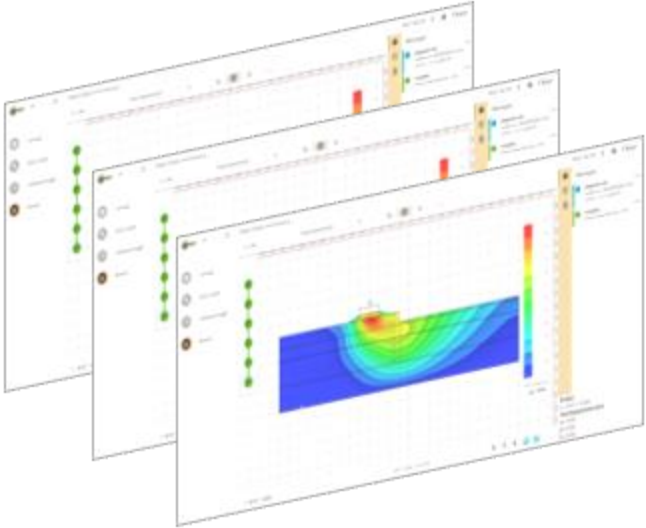
Why do engineers use Gofer?



Easy to model



Leveraging cloud



Next gen analysis

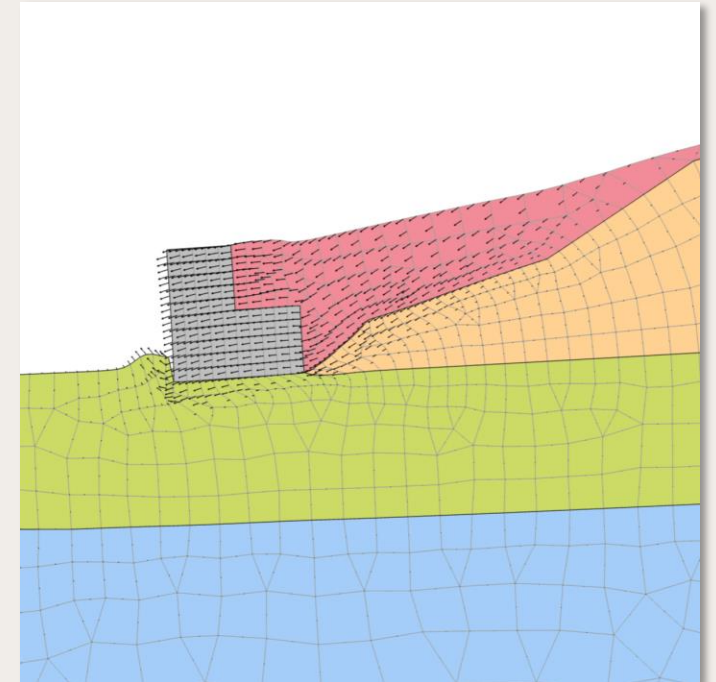
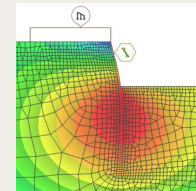
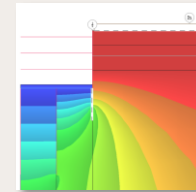
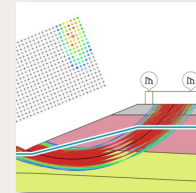
Recent updates



Interactive scaling capability

Batch Analysis API end point

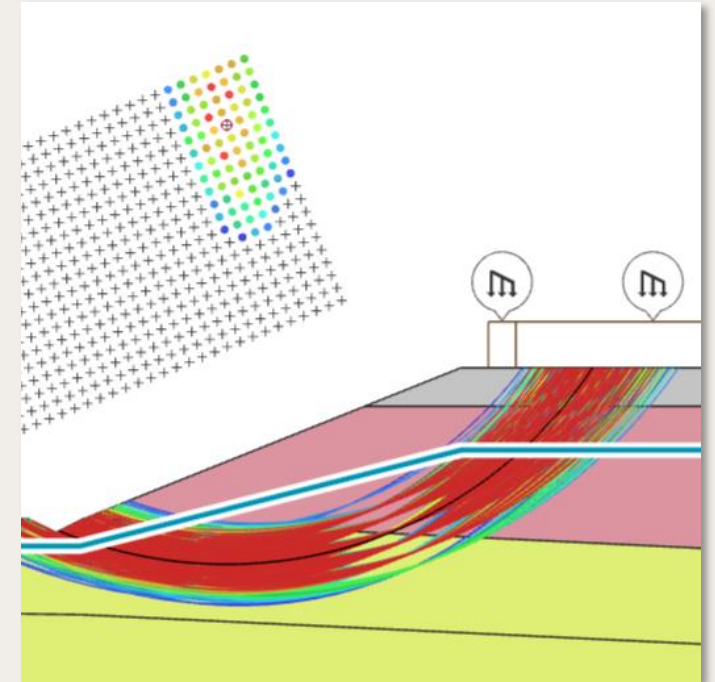
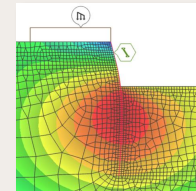
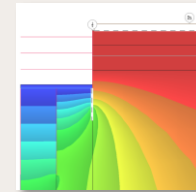
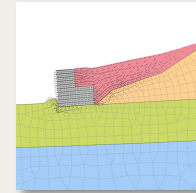
Adaptive error control algorithm



Slope in Gofer - background



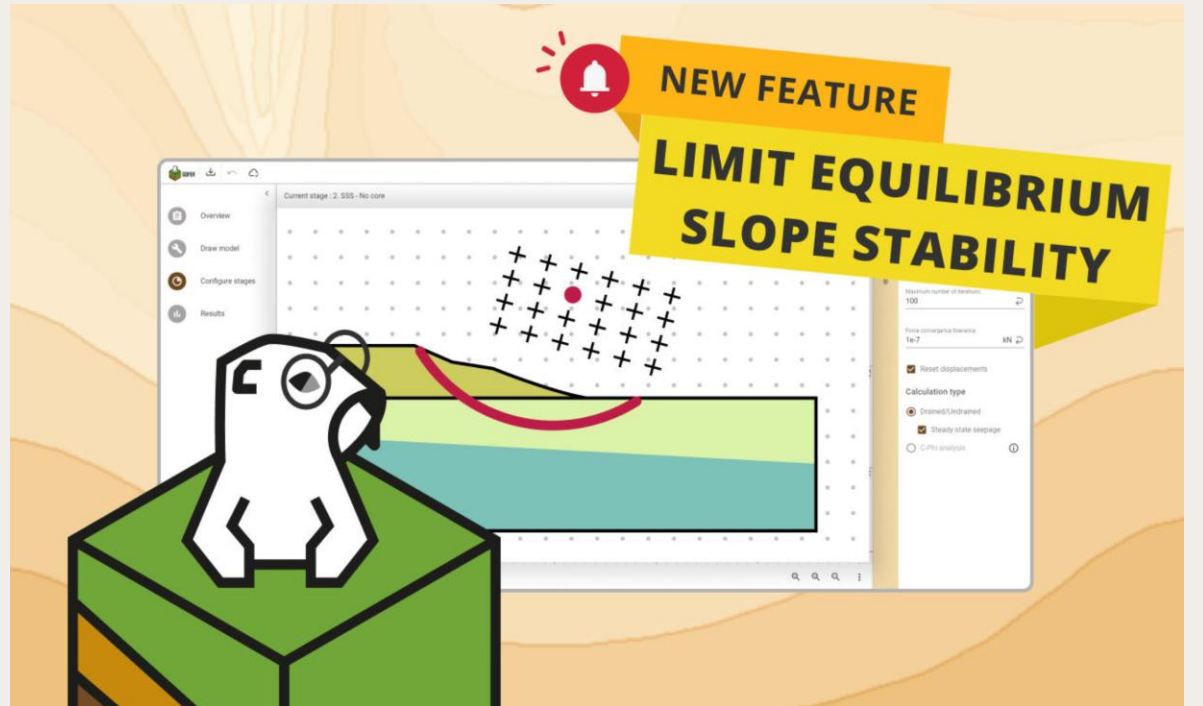
We are **integrating more calculation methods** with Gofer, making use of the modern interface and cloud capability



Slope stability in Gofer

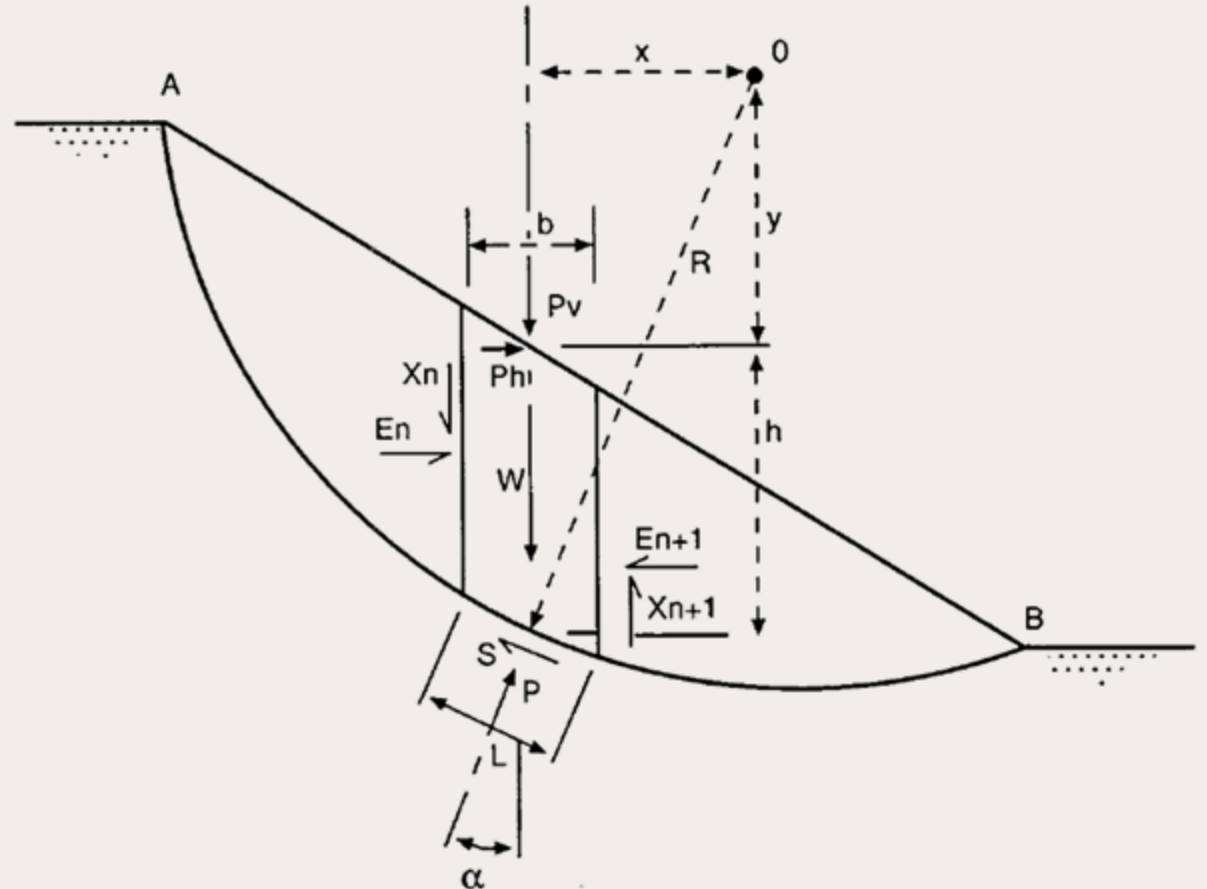


You can use Gofer to solve **limit equilibrium slope stability** problems, alongside the existing capability



Limit equilibrium slope stability

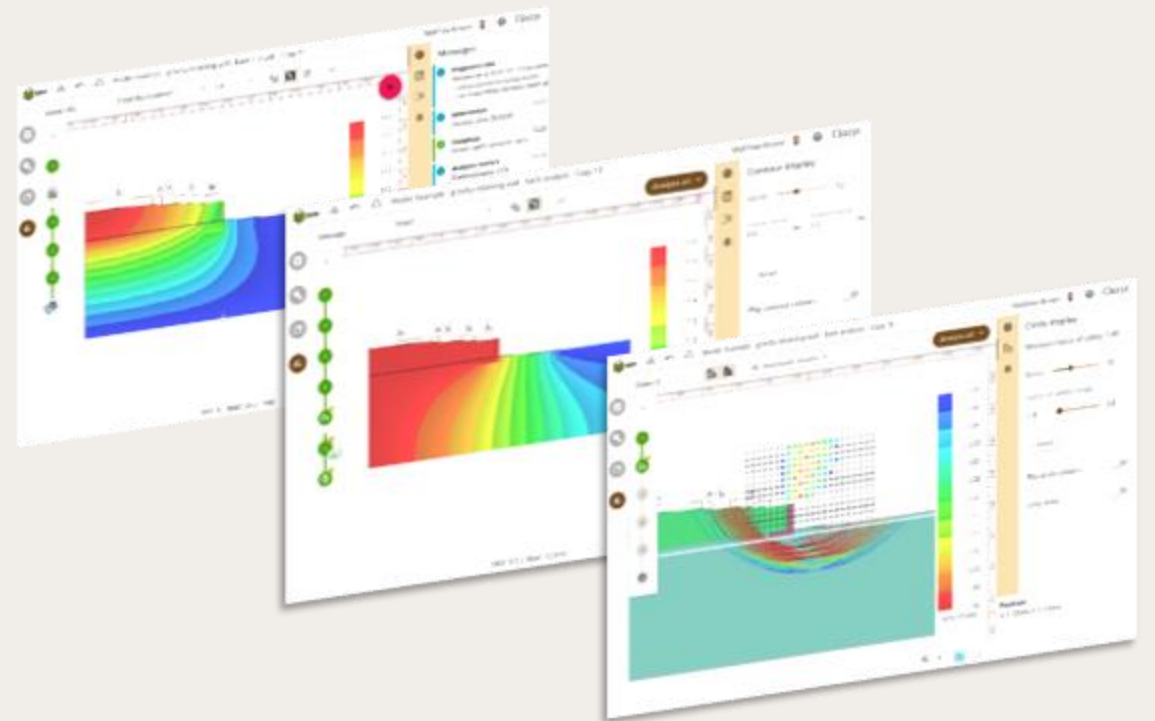
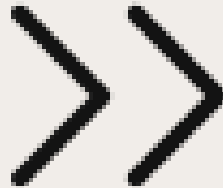
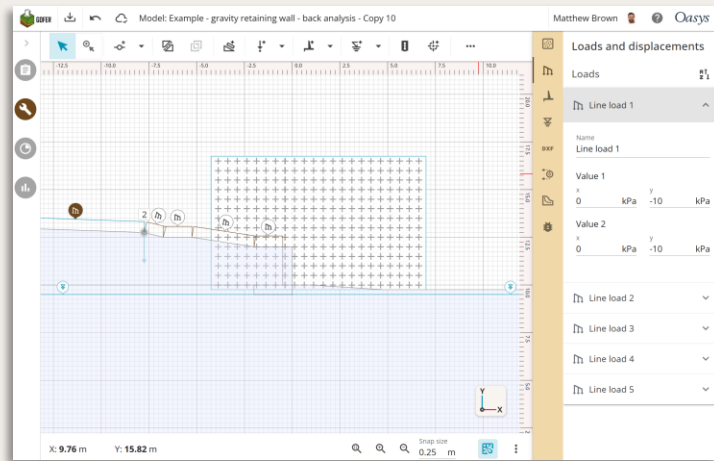
- Method of slices for limit equilibrium assessment
- Grid of potential circle centres assumed
- Large number of circles checked



The value for Engineers



One model set-up, multiple calculation outputs



Different approaches to Slope stability

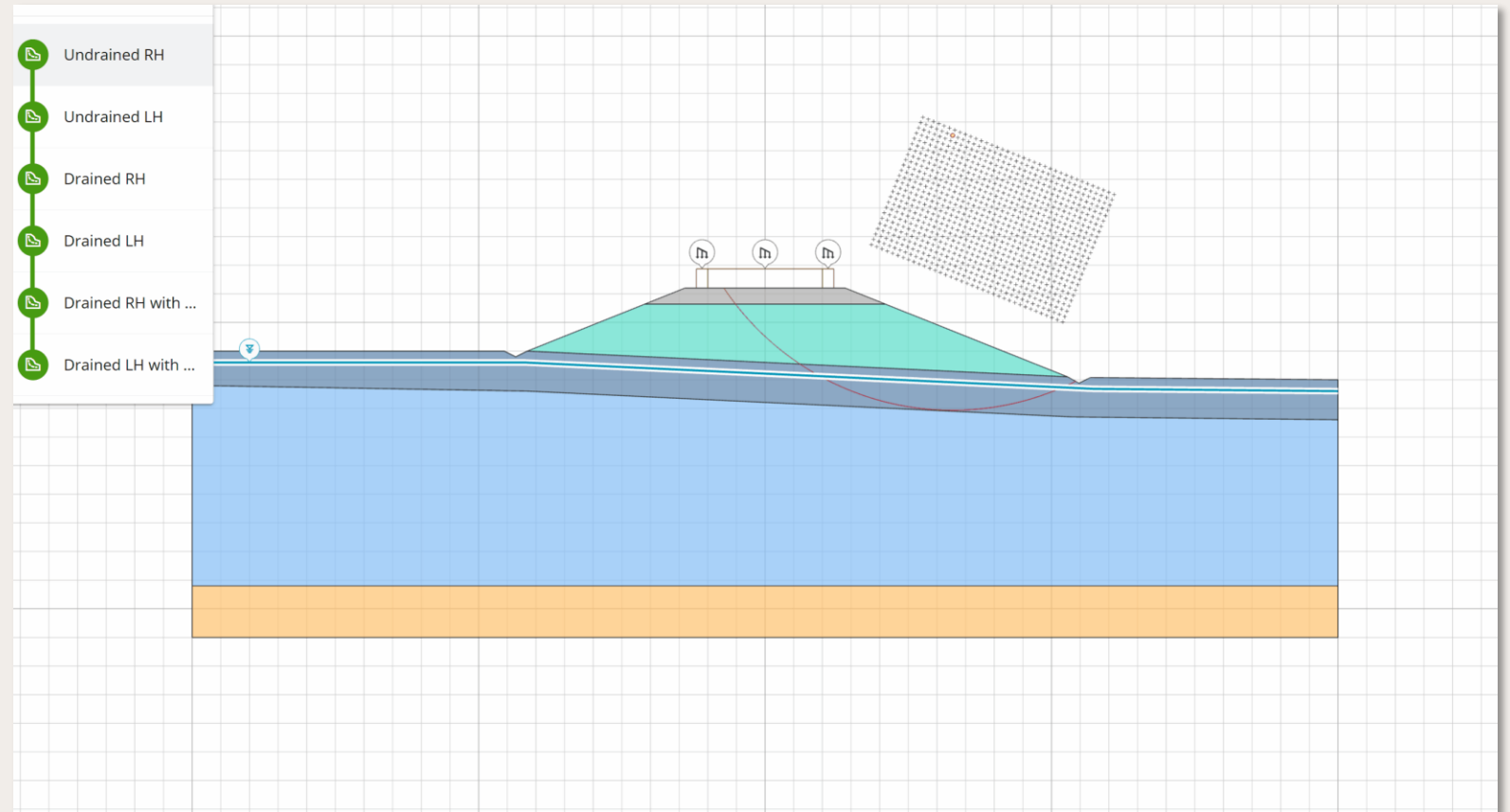


Use Gofer **just for limit equilibrium** calculations, **extend LE into FEA**, or add LE stages to **existing FEA models**




Feedback from Slope v21

- Multiple calculations in one place
- Editing model geometry, slope gradient
- Defining the grid of slip circle centres








New example models



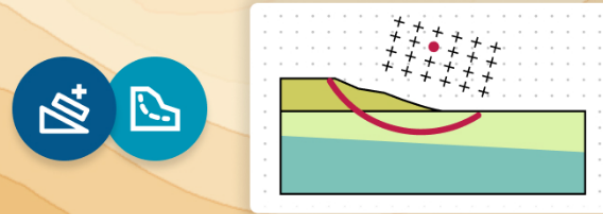


GOFER

<

-  My models
-  Models shared with me
-  **Example models**
-  Learn
-  News

LIMIT EQUILIBRIUM ASSESSING SLOPE STABILITY



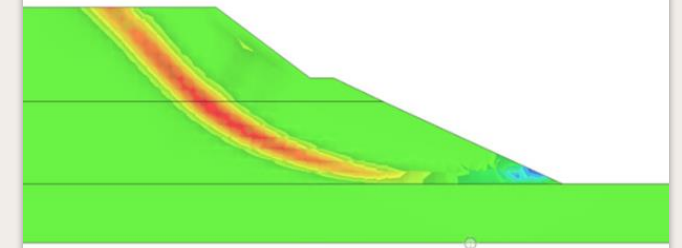
Limit equilibrium

Slope stability assessment

In this example, we calculated the existing factor of safety against slope failure for an embankment using the limit equilibrium method.

[See model](#)

[Read more](#)



Slope stability analysis

After Chowdhury and Xu, 2005

This case study examines Gofer's c-phi and limit equilibrium analysis features, comparing factor of safety results with a published case study.

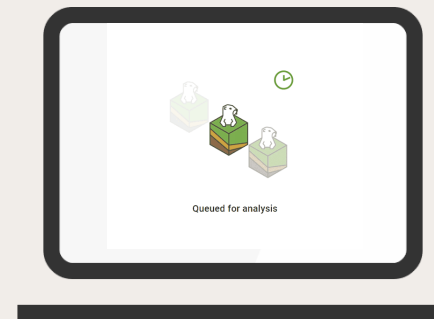
[See model](#)

[Read more](#)

API example – overcoming uncertainty



- BS EN 1997-1:2024 explicitly permits reliability-based design
- European Commission guidance¹ covers background and practical recommendations
- Gofer can be used for a reliability-based approach including Monte Carlo simulations



¹ European Commission, Joint Research Centre, van Den Eijnden, B., Knuuti, M., Lesny, K., Löfman, M., Mavritsakis, A., Roubos, A., Schweckendiek, T., Sciarretta, F., Ebener, A., Escher, K., Spross, J., Commend, S., Hehenkamp, M., Arnold, P., Wilhelm, S., Ene, A., Rimoldi, P. and Pereira, R., Reliability-based verification of limit states for geotechnical structures, Schweckendiek, T. editor, Publications Office of the European Union, Luxembourg, 2024, <https://data.europa.eu/doi/10.2760/1342542>, JRC139408.

API example – overcoming uncertainty



(4) The procedure in this Annex shall be used to evaluate the different terms in the following formula [repeated from Formula (4).5]:

$$X_k = X_{\text{mean}} [1 \mp k_n V_x] \quad (\text{A.2})$$

where

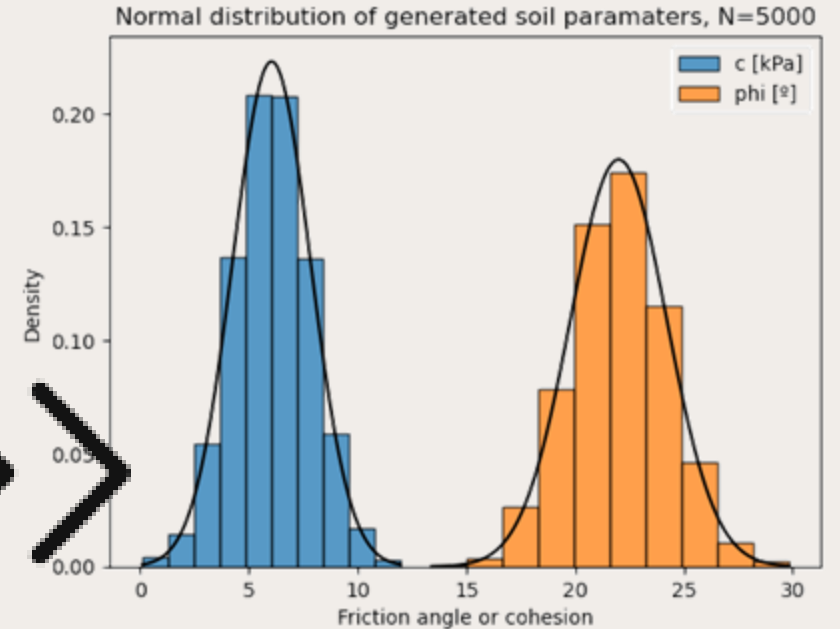
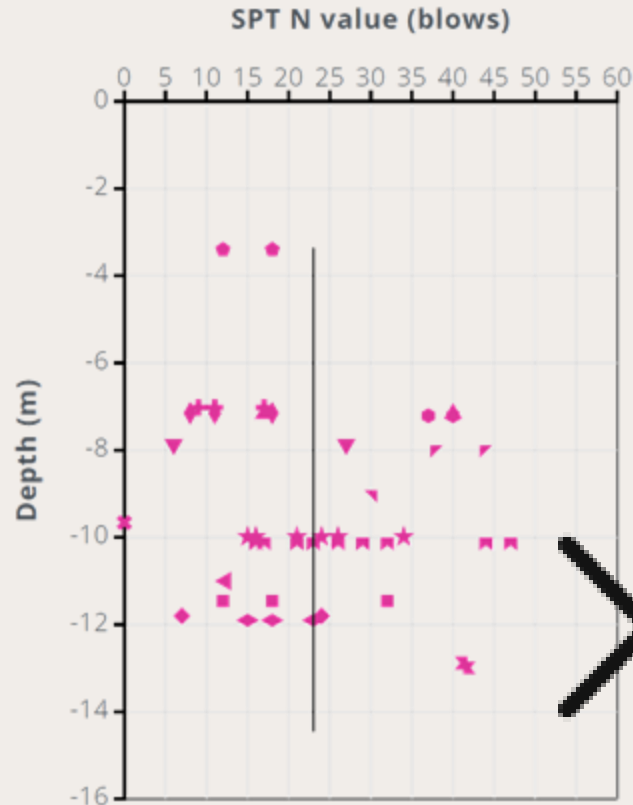
- X_k is the characteristic value of the ground property X ;
- X_{mean} is the mean of the ground property X from a number (n) of sample derived values;
- k_n is a coefficient that depends on the number of sample derived values (n) used to calculate X_{mean} ;
- V_x is the coefficient of variation of the ground property X [$V_x = (\text{standard deviation})/(\text{mean value})$];
- \mp denotes that $k_n V_x$ should be subtracted when a lower value of X_k is critical and added when an upper value is critical.

Table A.1 (NDP) — Indicative values of coefficient of variation for different ground properties

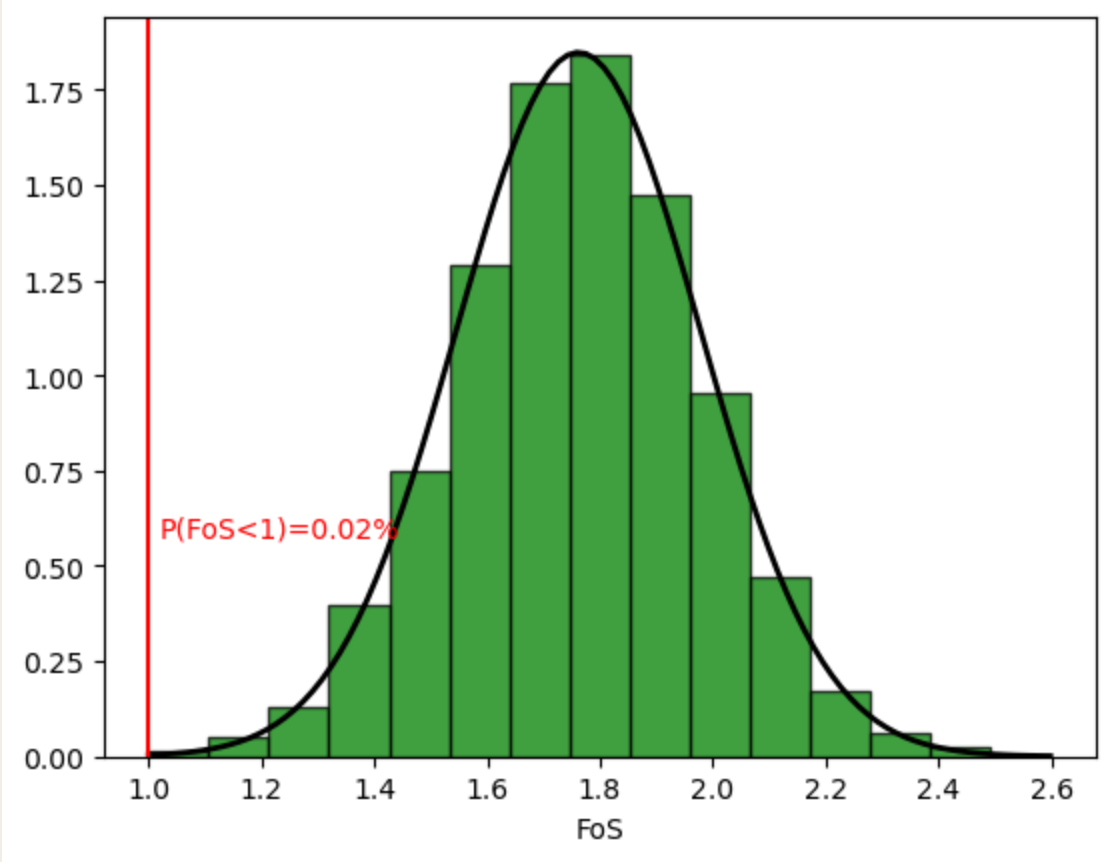
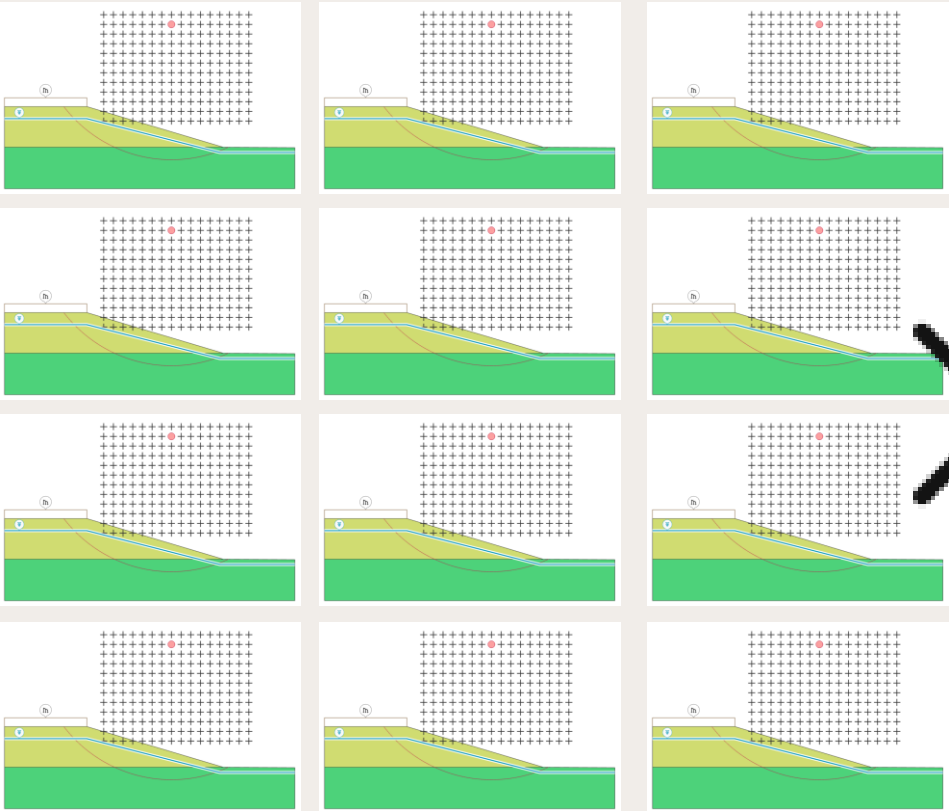
Soil / Rock Type	Ground property	Symbol	Coefficient of variation, V_x (%)
All soils and rocks	Weight density	γ	5–10
Fine-grained soils	Shear strength in total stress analysis	c_u	30–50
All soils and rocks	Peak or residual effective cohesion	c'_p or c'_r	30–50
All soils and rocks	Coefficient of friction	$\tan \varphi$	5–15
All soils and rocks	Shear strength at failure	τ_f	15–25
All soils and rocks	Unconfined compressive strength	q_u	20–80
All soils	Modulus of deformability ^a	E or G	20–70
Fine-grained soils	Vertical or horizontal consolidation coefficient	c_v or c_h	30–70
All soils	Hydraulic conductivity ^b	K	70–250

^a This refers to the different moduli of deformation whose symbols appear EN 1997-2:2024, 3.2.1.

^b Given the high value of the coefficient of variation for the hydraulic conductivity, this procedure should not be used.



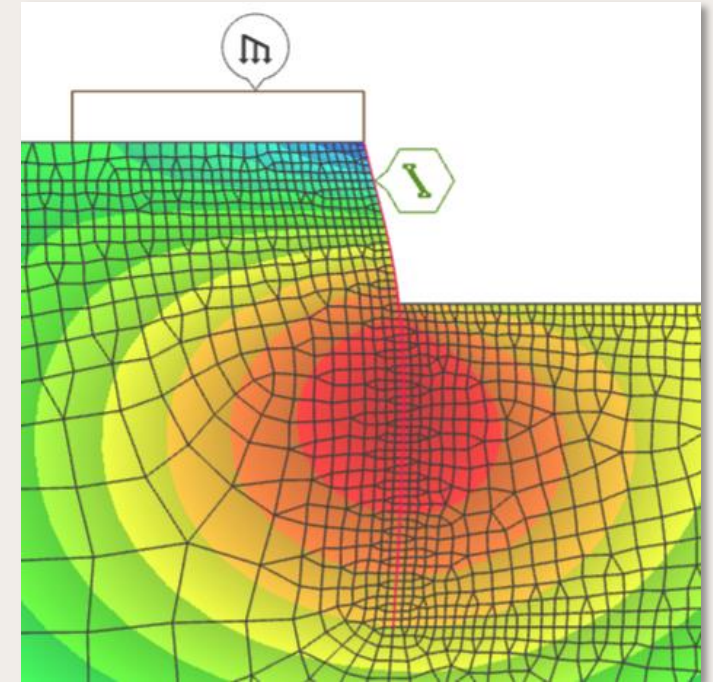
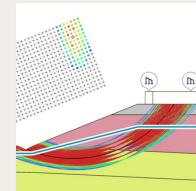
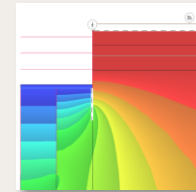
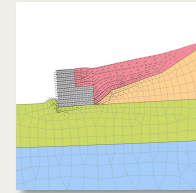
API example - overcoming uncertainty



Summary



- We are continuing to work hard on improving Gofer for our users
- Limit equilibrium slope stability capability is ready to use
- Easy to integrate with existing models, or extend Slope models into FE
- We welcome any feedback – please get in touch!





Any questions?

Ask your questions in the Q&A tab or in the chat!

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