

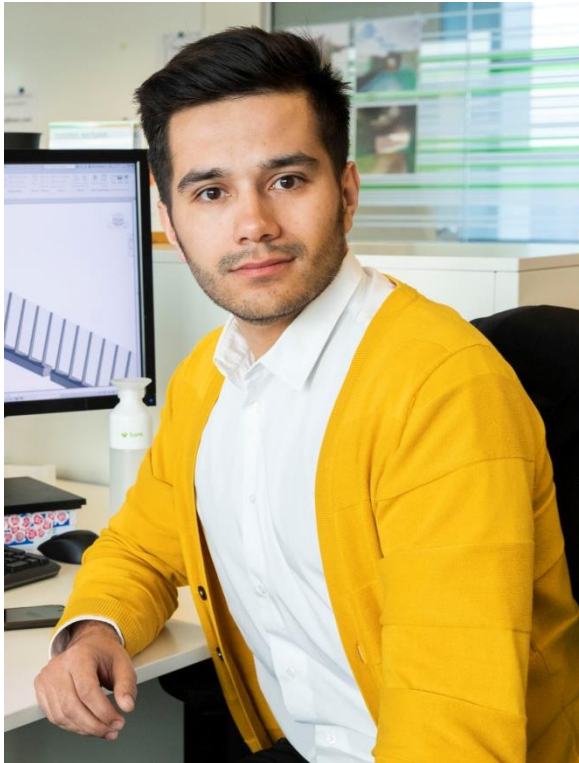
# Parametrisch ontwerpen fundering geluidswallen

Gino Koolman – BIM services

Tom Laumen – Geotechniek



## Voorstellen



Gino Koolman

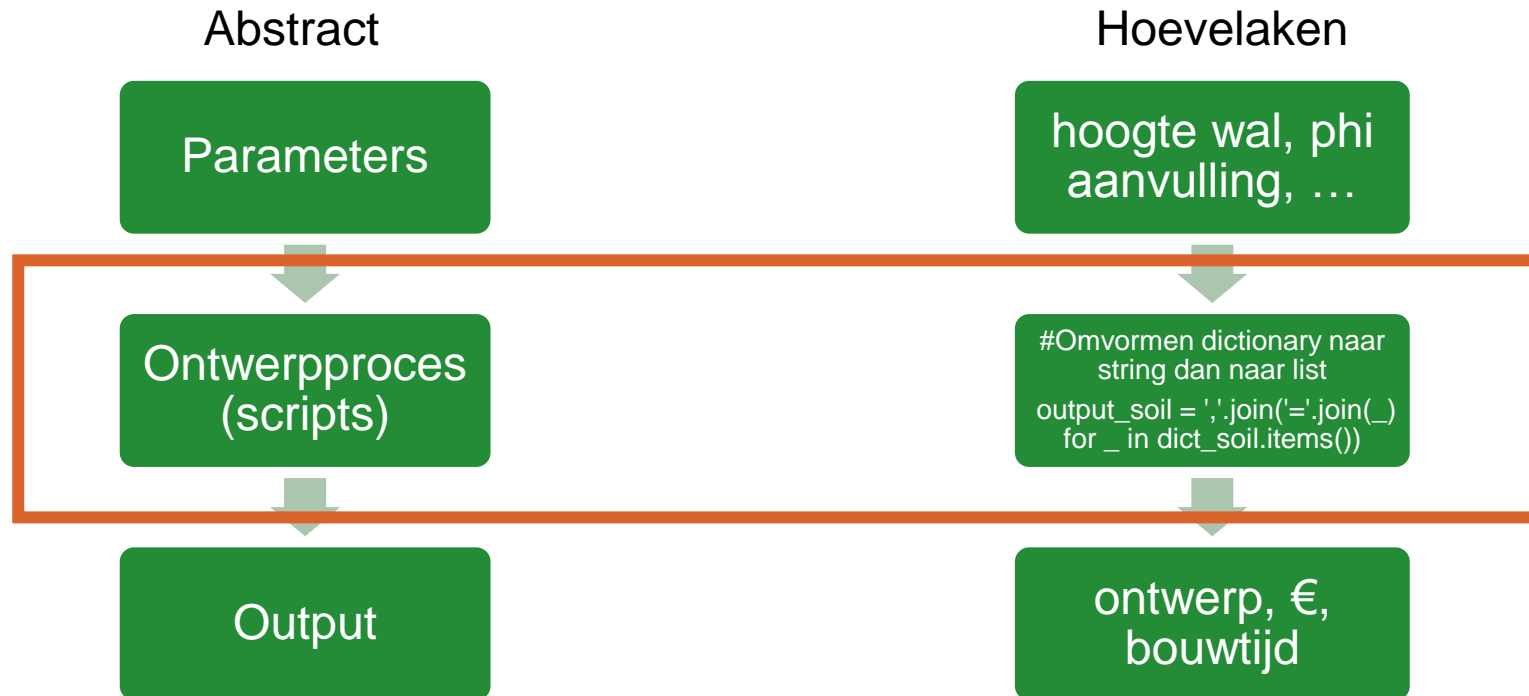


Tom Laumen



Roland Oldenkamp  
(BESIX)

# Wat is parametrisch ontwerpen?



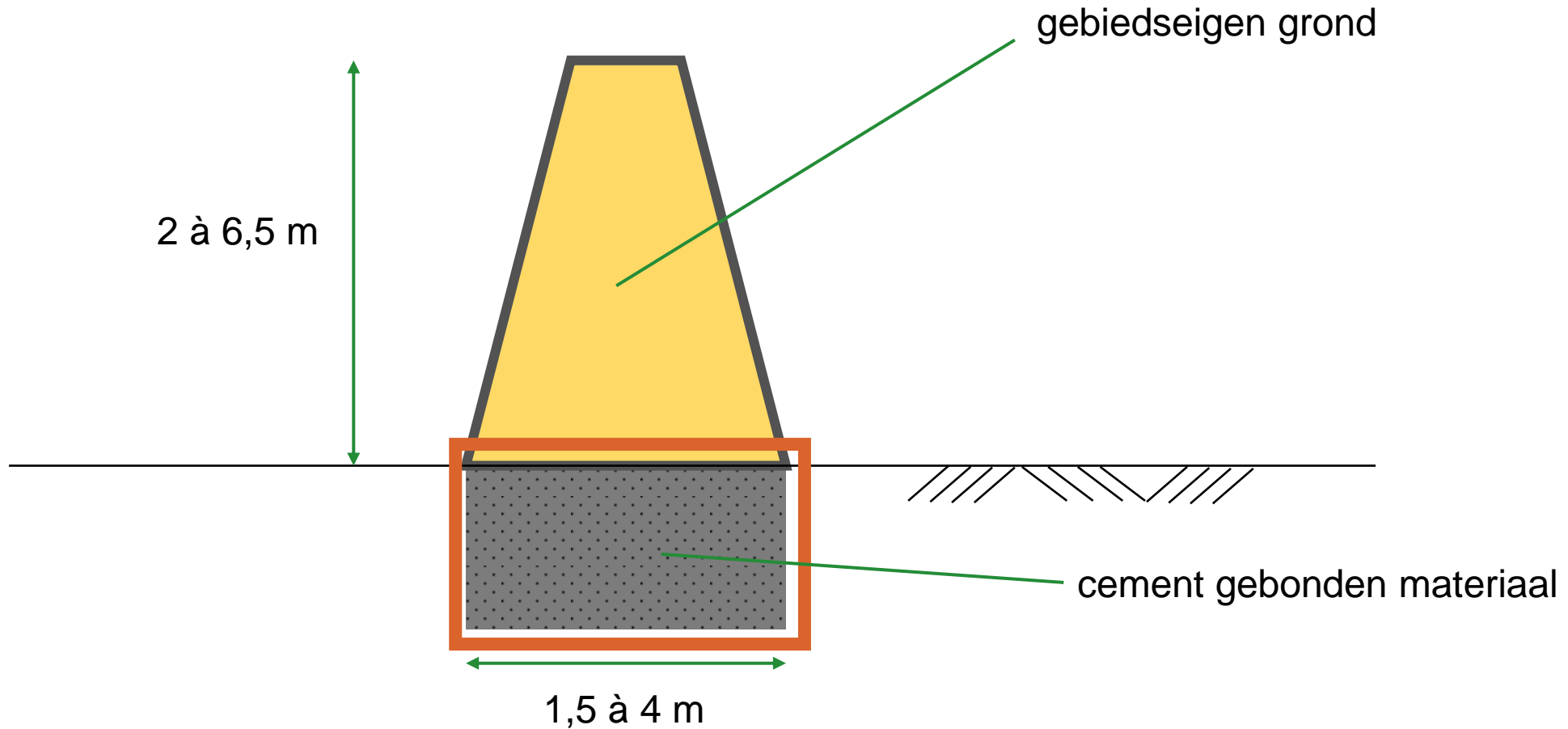
## Product (scripts)

- Drie funderingsvarianten (funderingsstrook)
- Parametrisch aanvulmateriaal
- Geautomatiseerde maaiveldgeometrie
- Variërende ondergrond
- Itereren minimale fundering
- Parametrisch modelleren

## Geluidswallen A1A28

- Grond gevulde wal (gewapende grond)
- Gefundeerd op staal
- 15 km

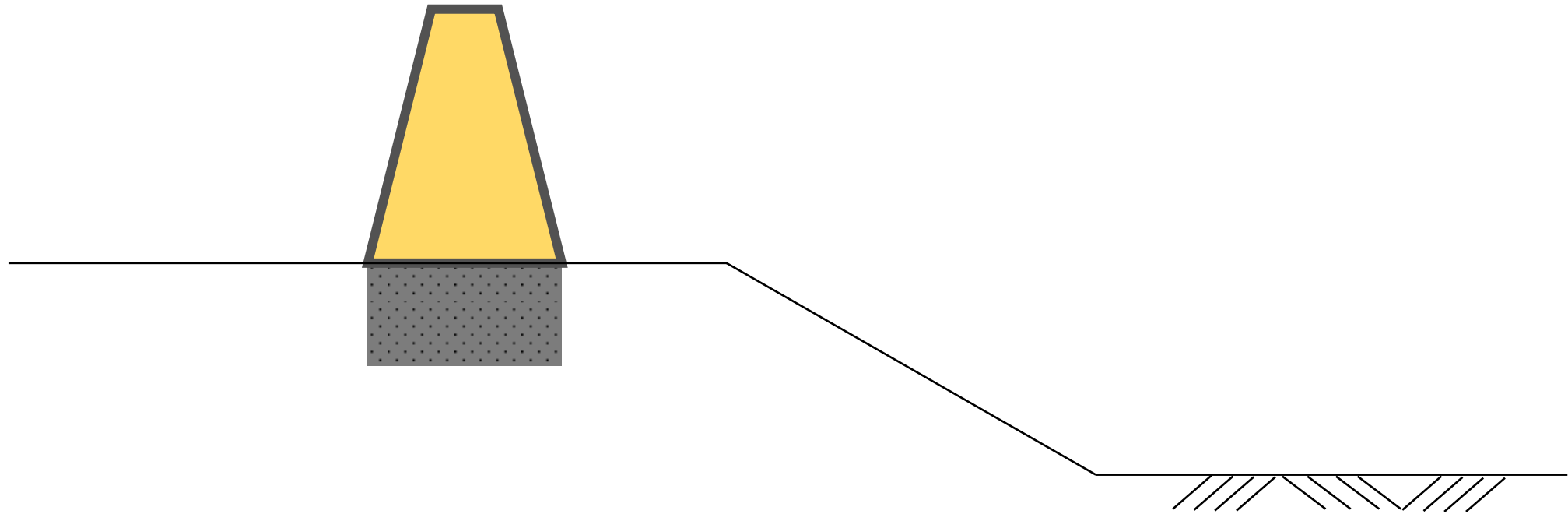
## Geluidswallen A1A28



## Geluidswallen A1A28

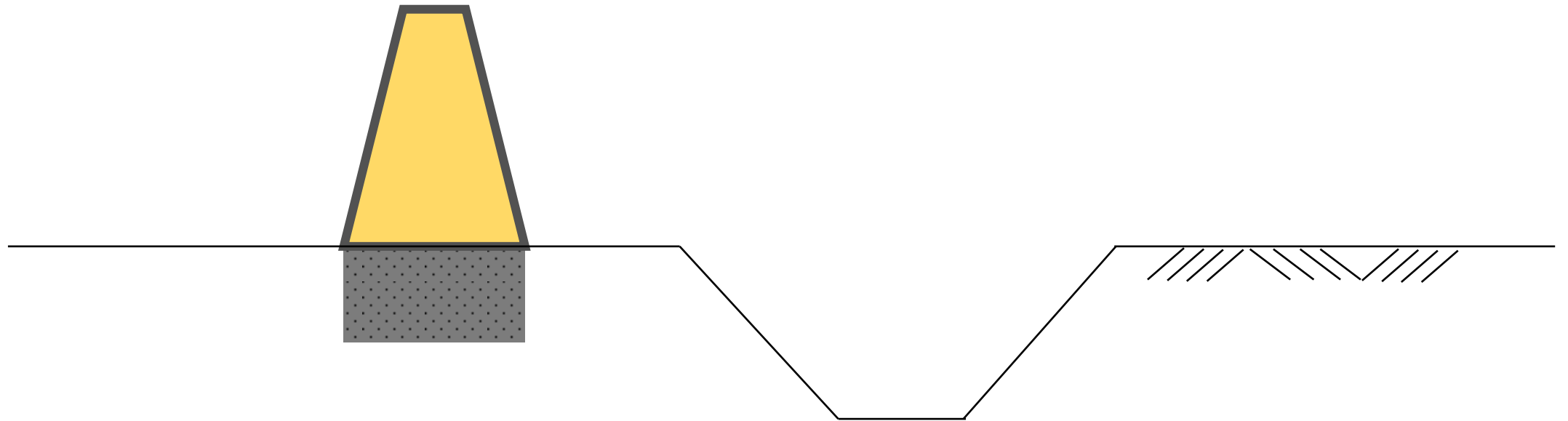
- Wisselende geometrie weg (talud/sloot)
- Variërende ondergrond
- Veranderende belasting

# Geluidswallen A1A28

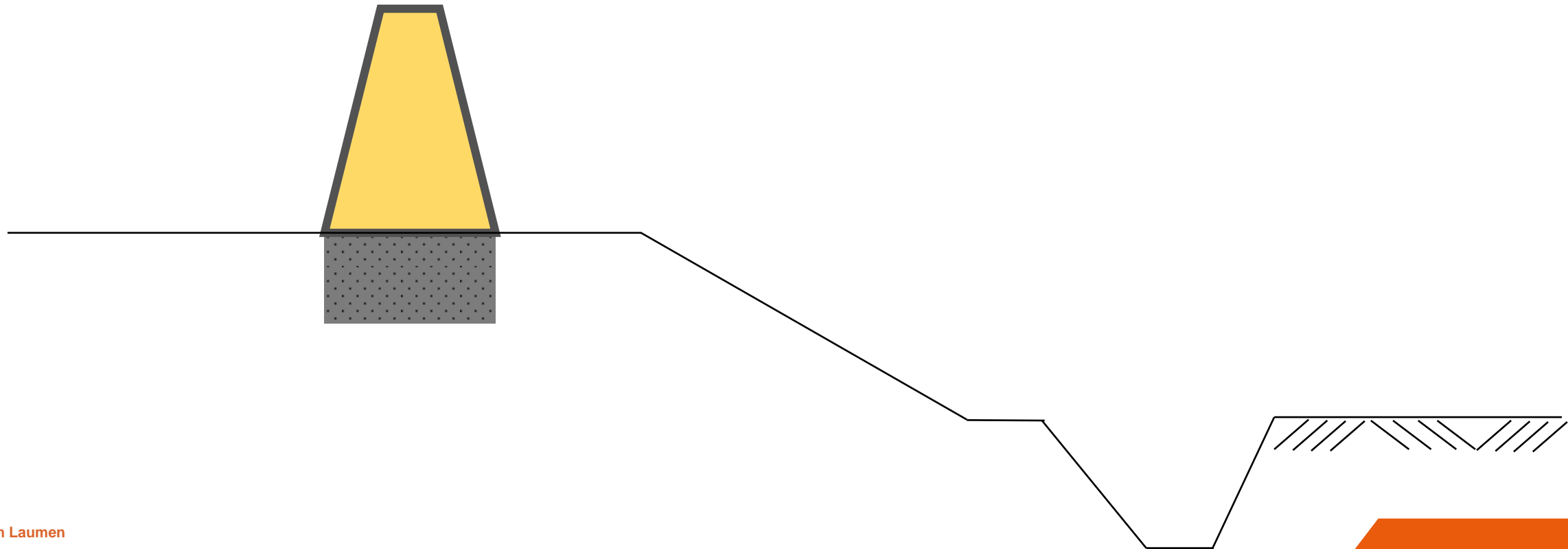




# Geluidswallen A1A28

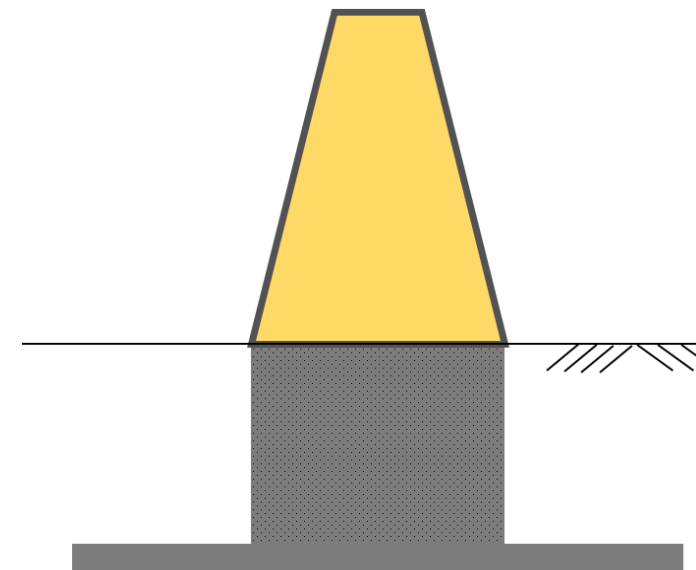
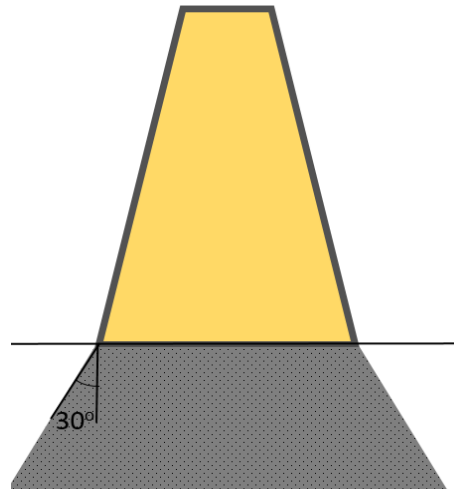
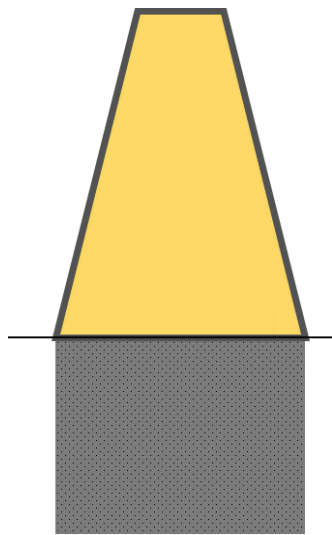


# Geluidswallen A1A28

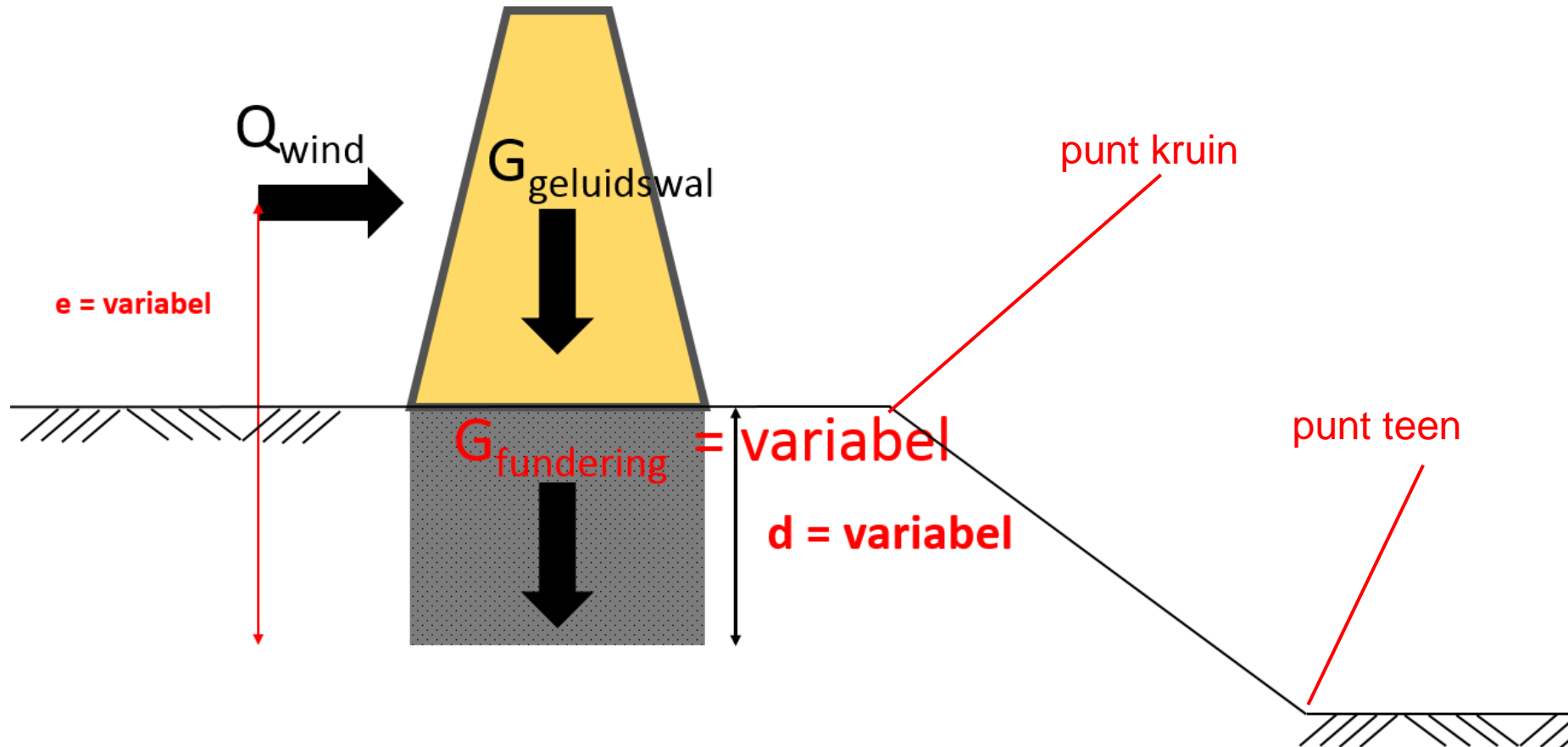


## Geluidswallen A1A28

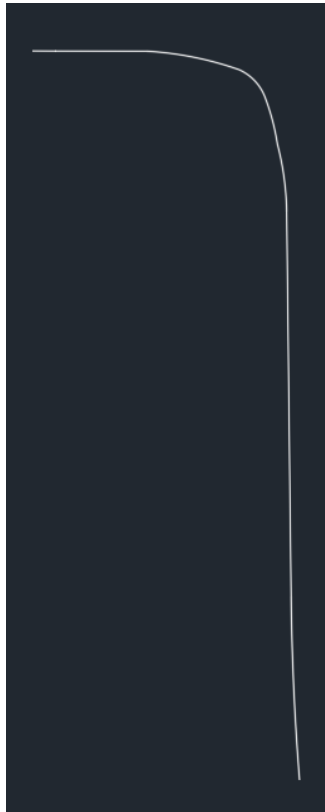
- Uitwerking tot 3 funderingsvarianten



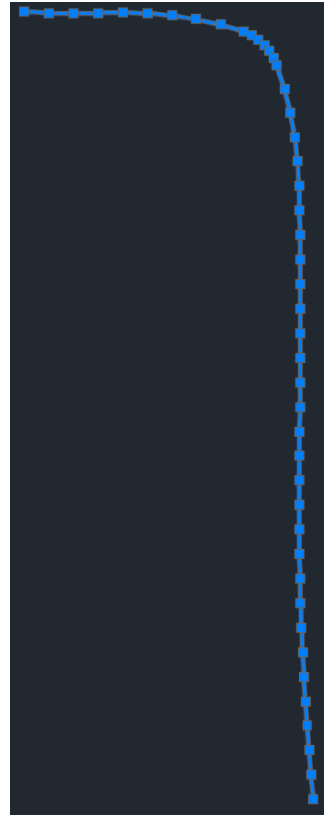
# Geluidswallen A1A28



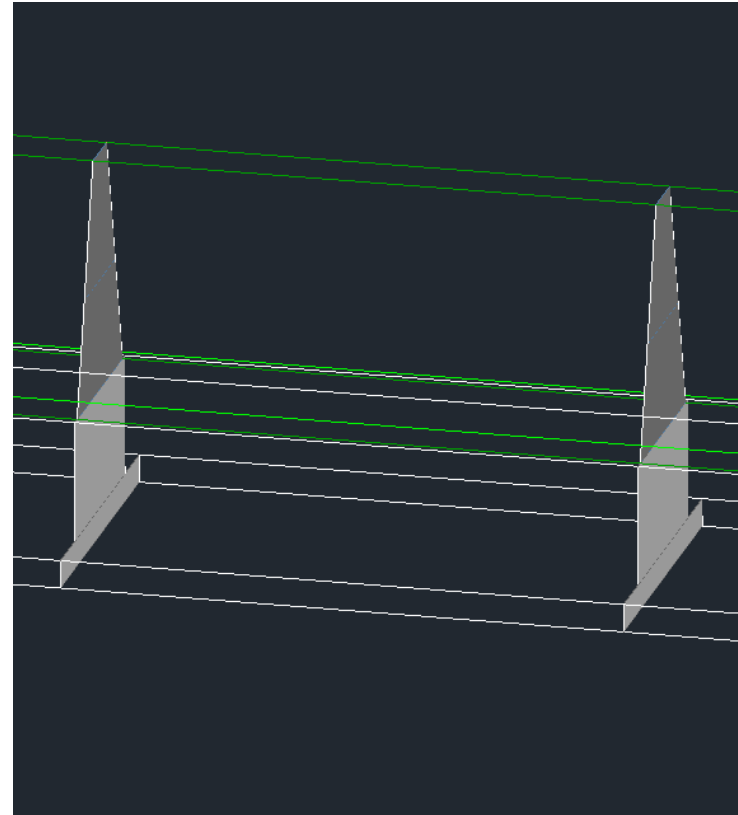
## Geluidswallen A1A28



Geluidslijn

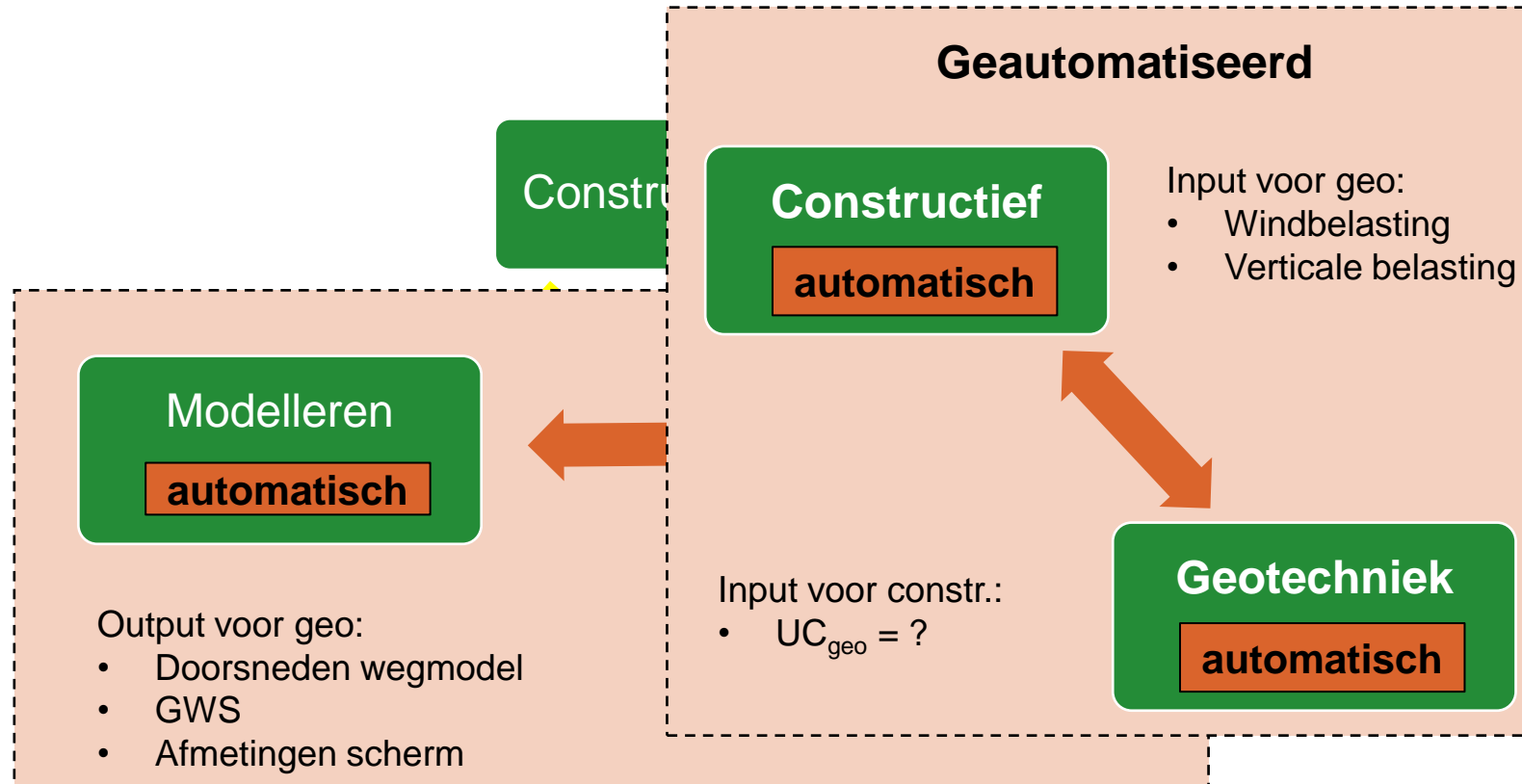


Schermlijn



GBC

# Geluidswallen A1A28



# Geluidswallen A1A28

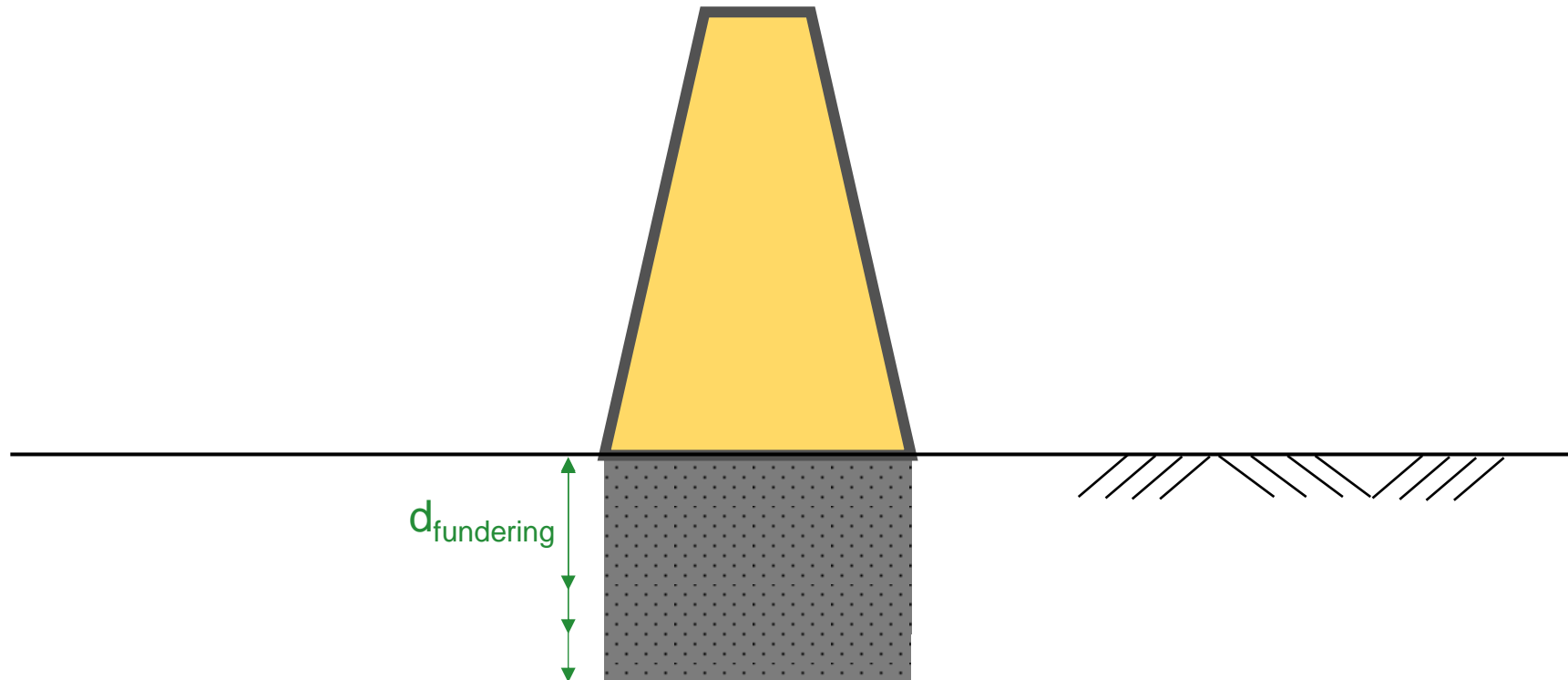
## Proces geotechniek

- Draagkracht: python script
- Iteraties dimensies tot UC<1
- Selectie sondering door geo
- Semi-automatische interpretatie grond

```
1 def diepte(list_CPTs, dict_CPTs, input_funderingstype):
2     import numpy as np
3     import matplotlib
4     import matplotlib.lines as mlines
5     import matplotlib.patches as mpatches
6     import matplotlib.pyplot as plt
7     import os
8     import copy
9     import xlswriter
10
11
12     #Eigen functies gemaakt voor berekeningen
13     from ber_Rd_BH import ber_Rd as ber_UC
14     from ber_ontw_par_en_spanningen import par_spanningen as par_sp
15     from gedr_draagkr_UC import gedr_draagkracht_UC as gedr_draagkracht_UC
16
17
18     #NIEUWE FUNCTIES
19     from run_karakt import selectie_maatgevend_GO as selectie_maatgevend_GO
20     import samenvoegen_sondering_boring as sondering
21
22     #Input
23     GBC = str(input('Welke GBC ga je berekenen? ')) #voorbeeld: "GBC521_deel3"
24     naam_bestanden = str(input('Hoe wil je de output bestanden noemen? (extensie niet bijvoegen!) ') + '_' + str(i
25     input_bestand = str(input('Hoe heet het input bestand (zonder extensie)? ')) #"validatie_v2_deel3"
26
27
28     akkoord_verder_rek = False
29
30     while akkoord_verder_rek == False:
31         input_verder_rek = str(input('Start je vanaf het begin of ga je verder? [b of v] '))
32
33         if input_verder_rek == 'b':
34             akkoord_verder_rek = True
35
36         elif input_verder_rek == 'v':
37             start_doorsnede = int(input('Bij welke doorsnede wil je beginnen? '))
38             akkoord_verder_rek = True
39
40         else:
41             akkoord_verder_rek = False
42
43
44     akkoord_boring_input = False
45
46     while akkoord_boring_input == False:
47         input_boringen = str(input('Is er input vanuit het 3D model van de ondiepe boringen? [j of n] '))
48
```

# Geluidswallen A1A28

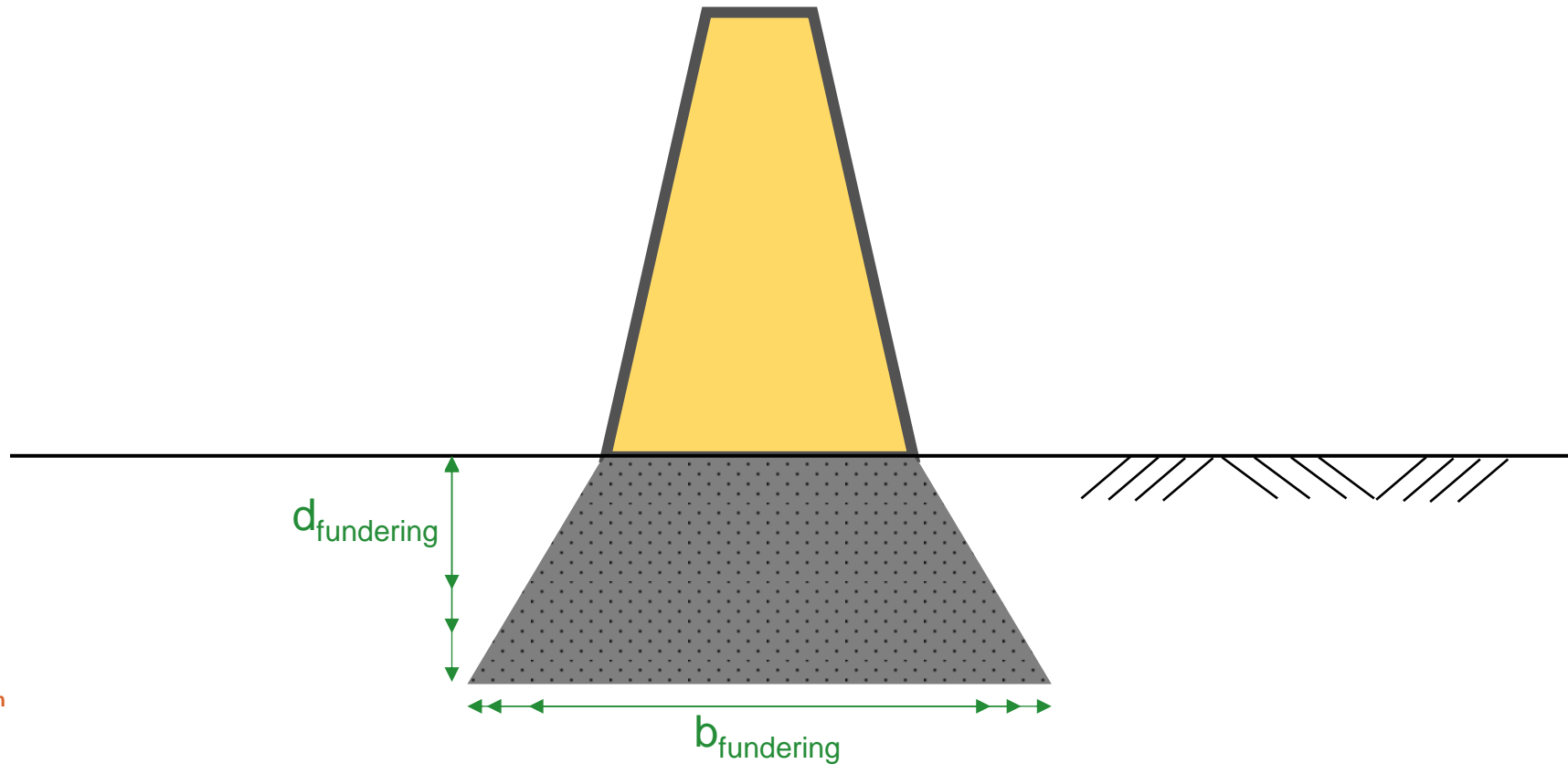
## Proces geo-constructief





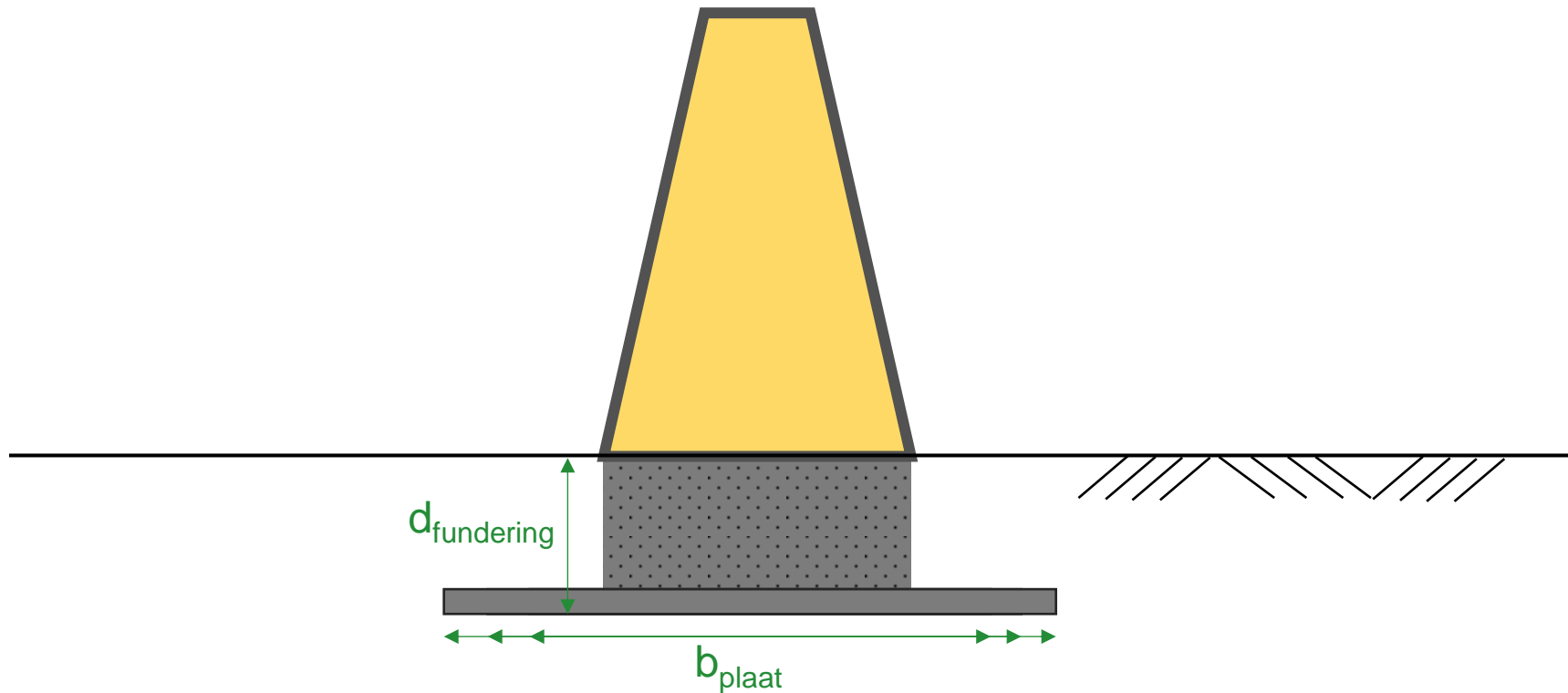
# Geluidswallen A1A28

## Proces geo-constructief



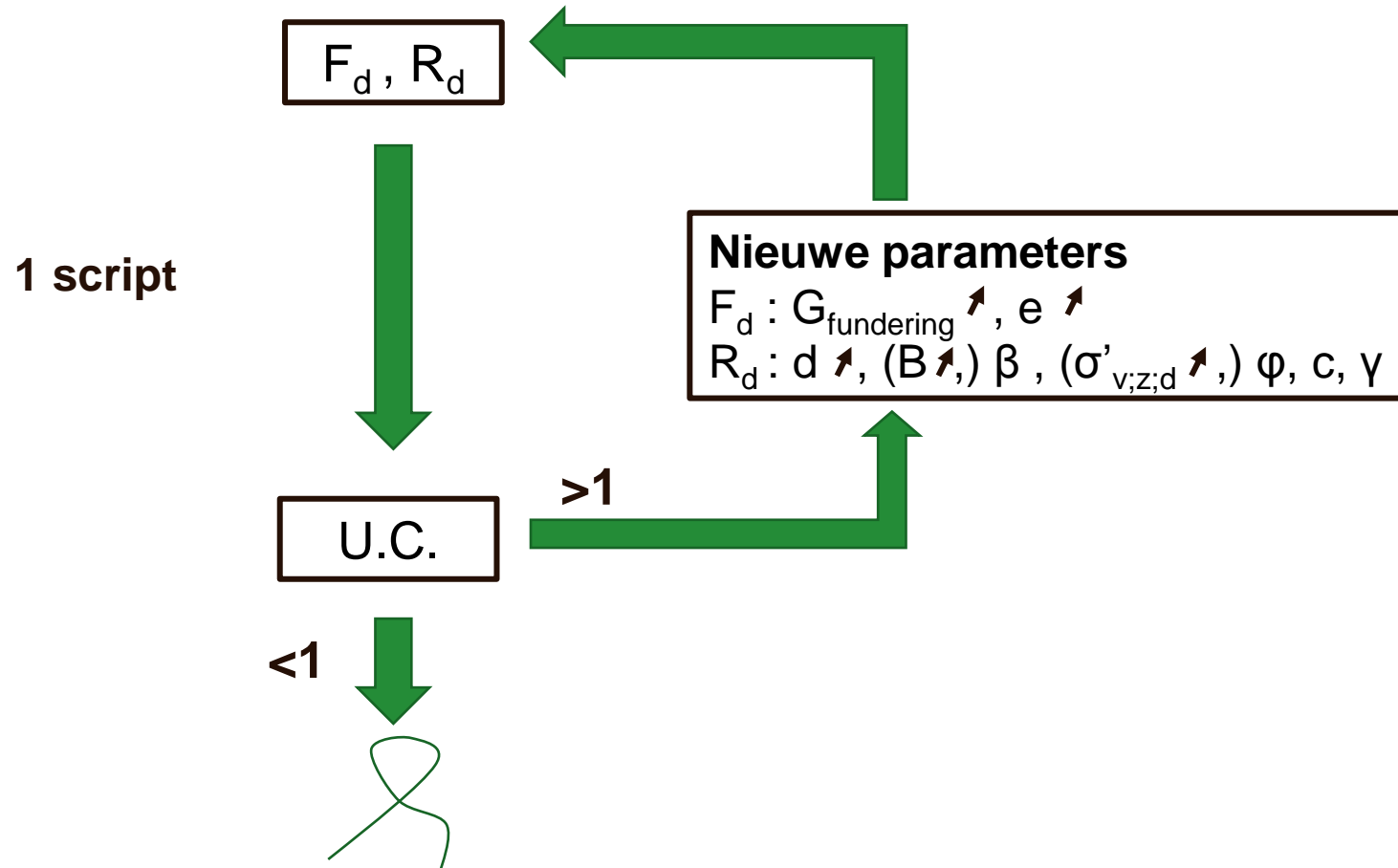
# Geluidswallen A1A28

## Proces geo-constructief



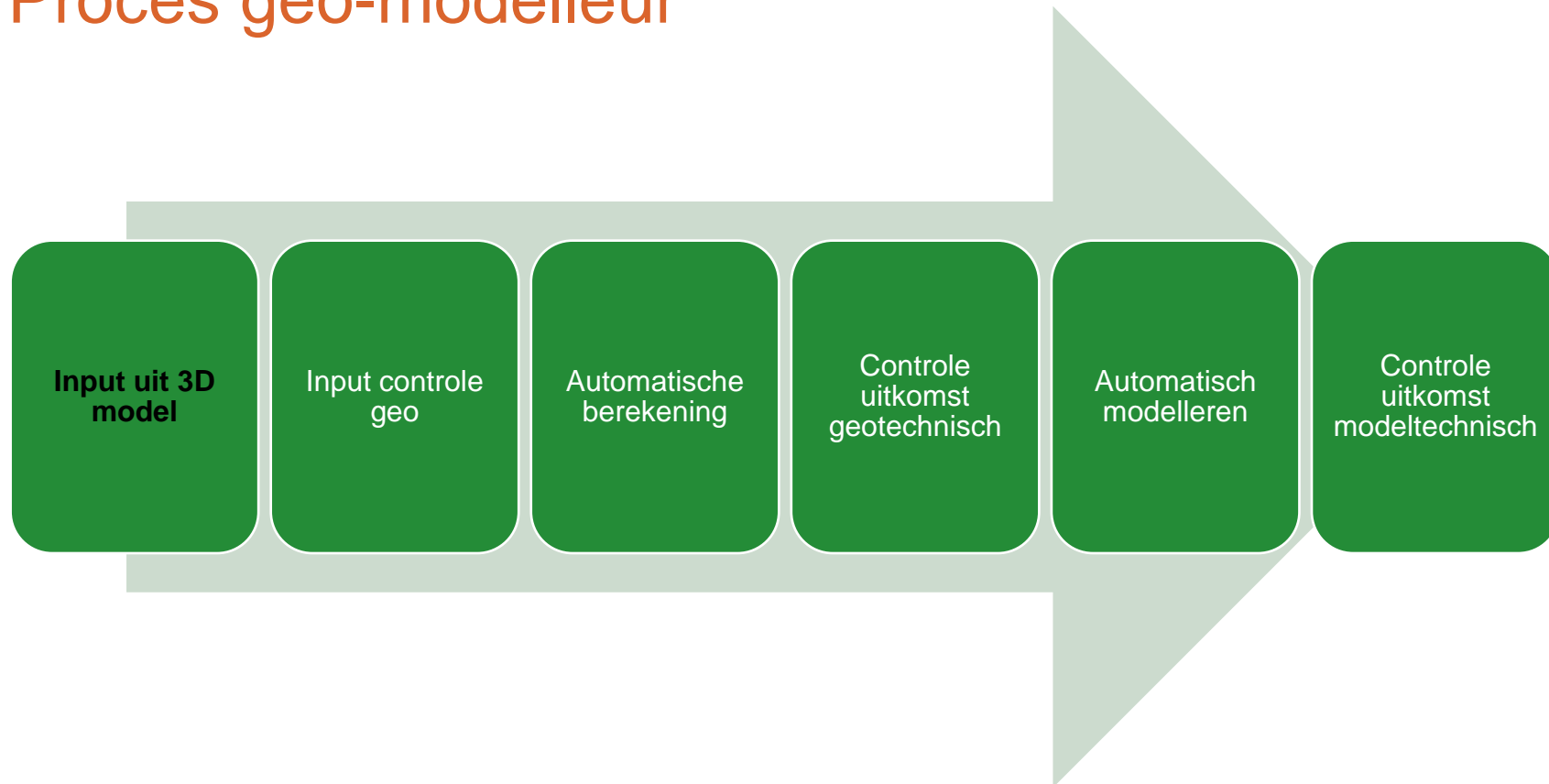
# Geluidswallen A1A28

## Proces geo-constructief



# Geluidswallen A1A28

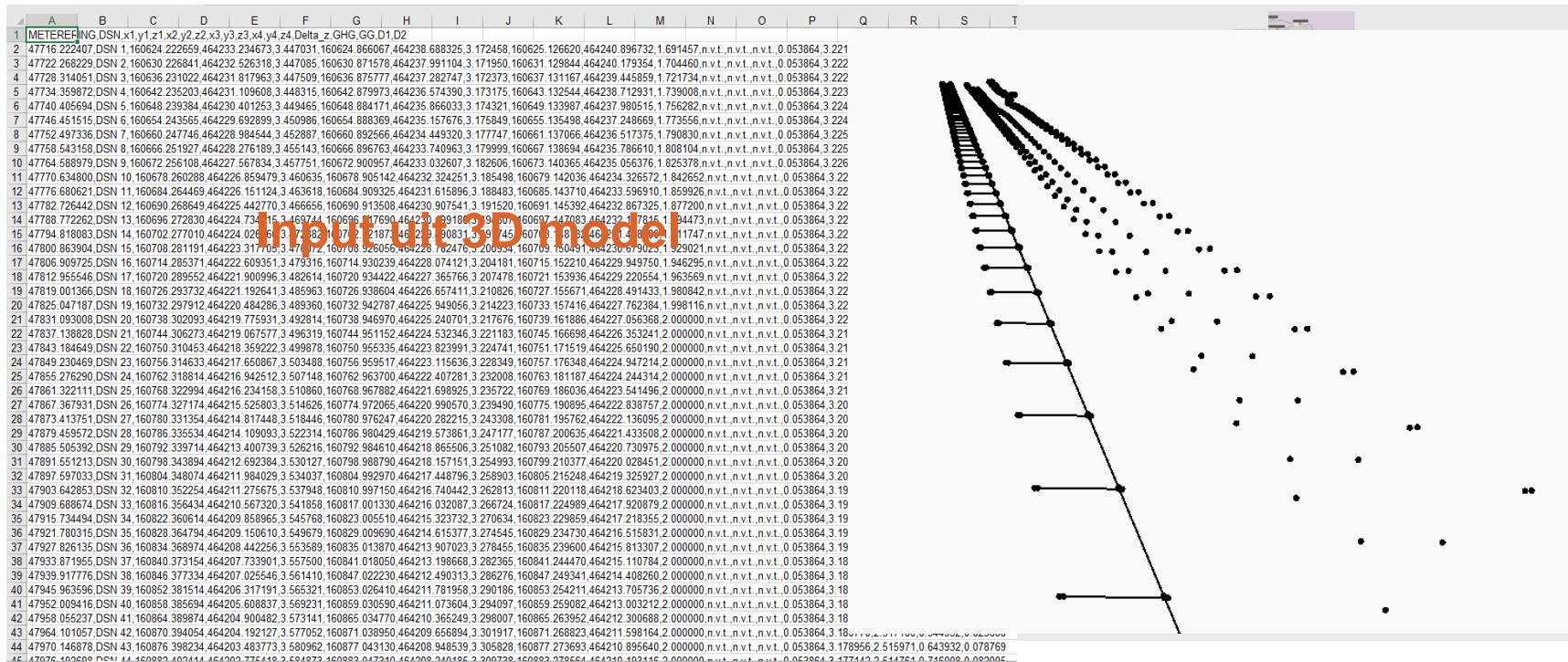
## Proces geo-modelleur



# Geluidswallen A1A28

## Proces geo-modelleur

### Input uit 3D model

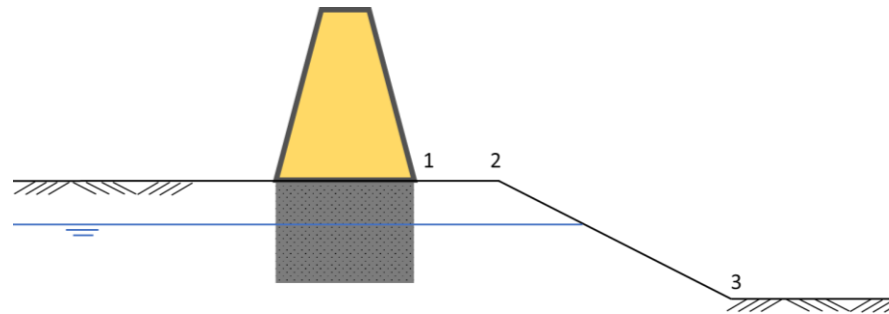


# Geluidswallen A1A28

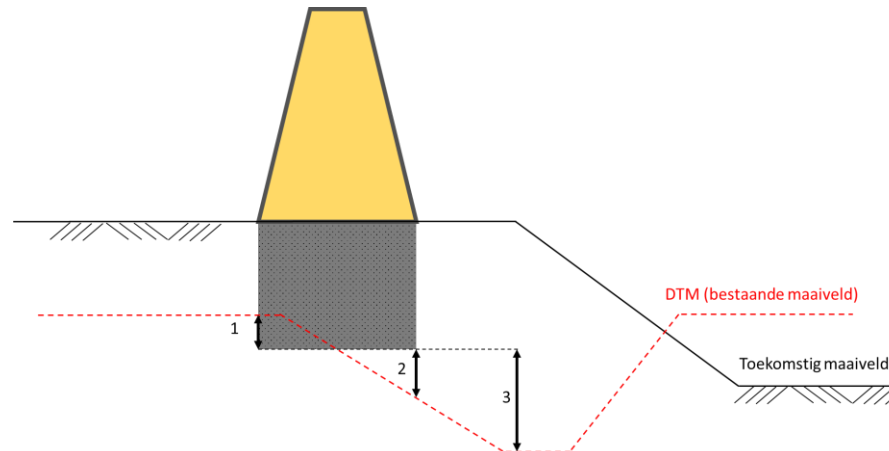
## Proces geo-modelleur

Input uit 3D model

Coördinaten talud  
GWS

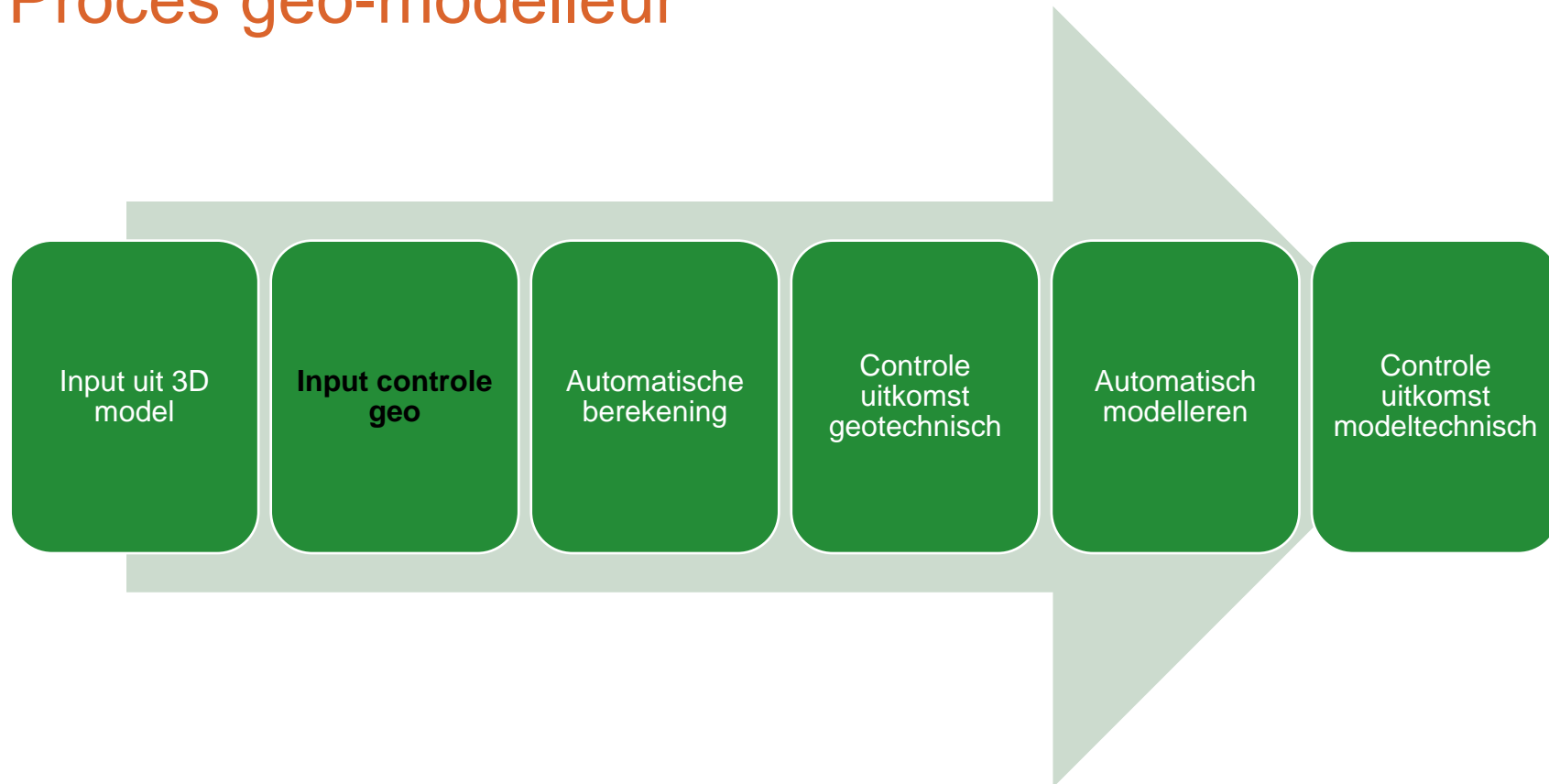


Dikte aanvulling



# Geluidswallen A1A28

## Proces geo-modelleur

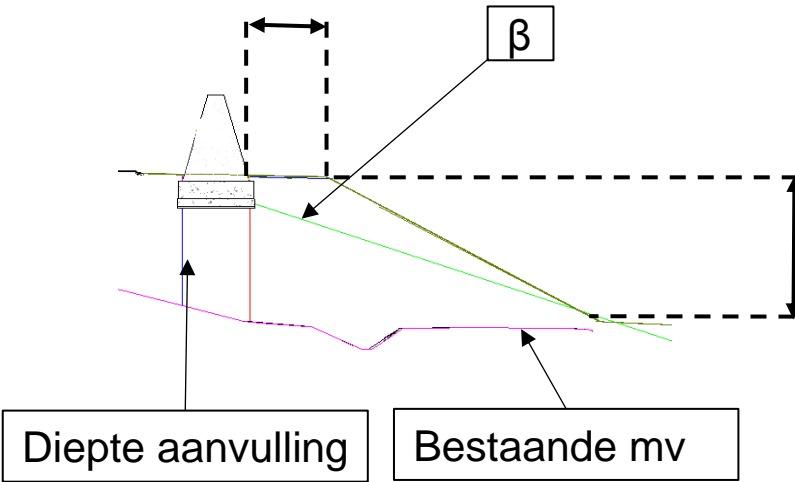


# Geluidswallen A1A28

## Proces geo-modelleur

### Input uit 3D model

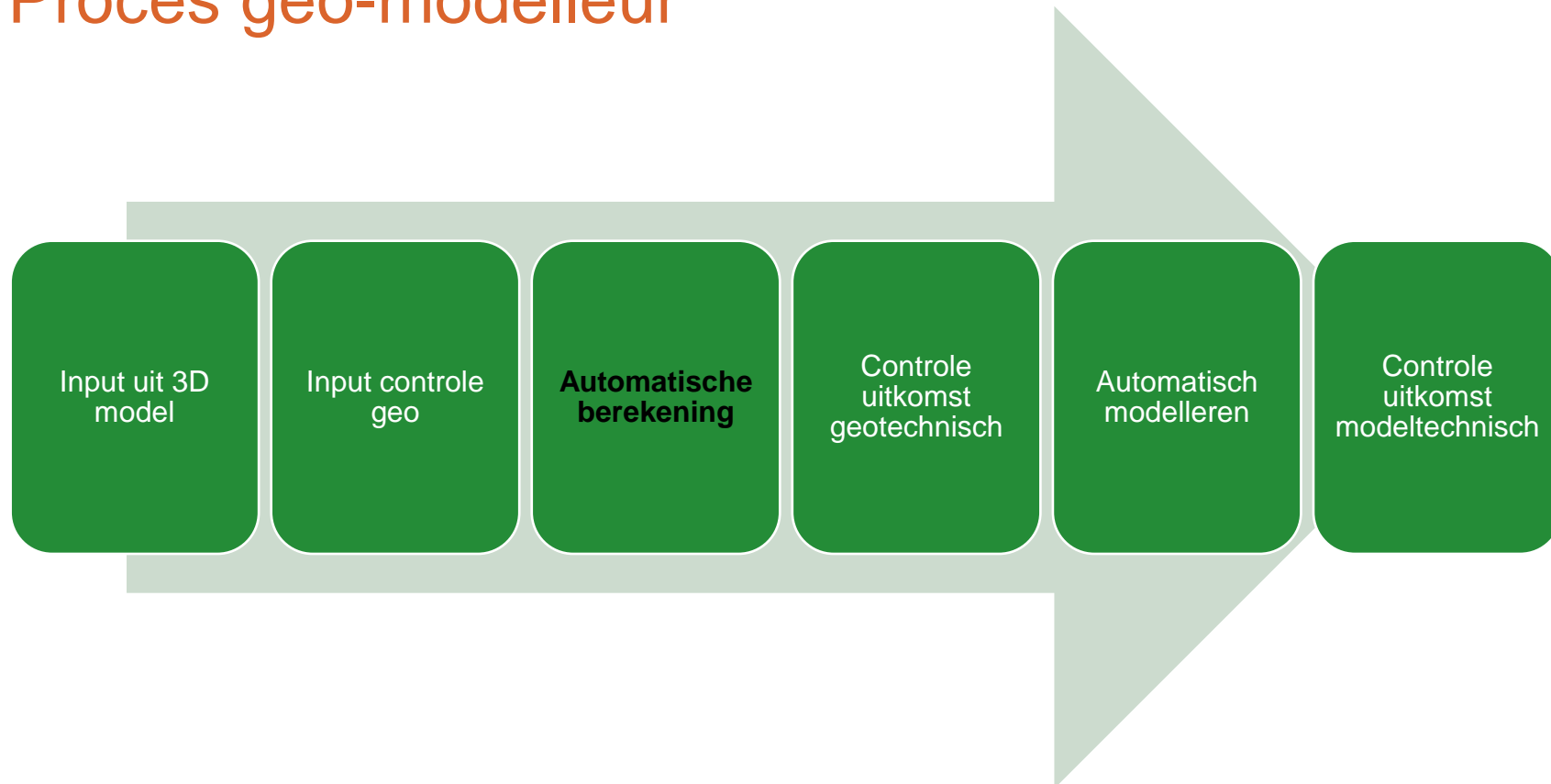
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	METER	RES	NO	DN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	47776	222407	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	47722	286229	DSN	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	47720	34691	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	47734	359872	DSN	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	47740	405894	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	47744	451515	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	47752	497336	DSN	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	47758	543158	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	47764	589778	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	47770	634800	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	47776	679442	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	47782	724622	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	47788	770262	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	47794	816062	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	47800	861904	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	47806	907826	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	47812	953848	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	47818	100000	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	47824	104560	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	47830	109120	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	47836	113680	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	47842	118240	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	47848	122800	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	47854	127360	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	47860	131920	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27	47866	136480	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
28	47872	141040	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29	47878	145600	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
30	47884	150160	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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35	47914	172960	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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37	47926	182080	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
38	47932	186640	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	47938	191200	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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43	47962	209440	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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45	47974	218560	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
46	47980	223120	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
47	47986	227680	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
48	47992	232240	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
49	47998	236800	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
50	48004	241360	DSN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1





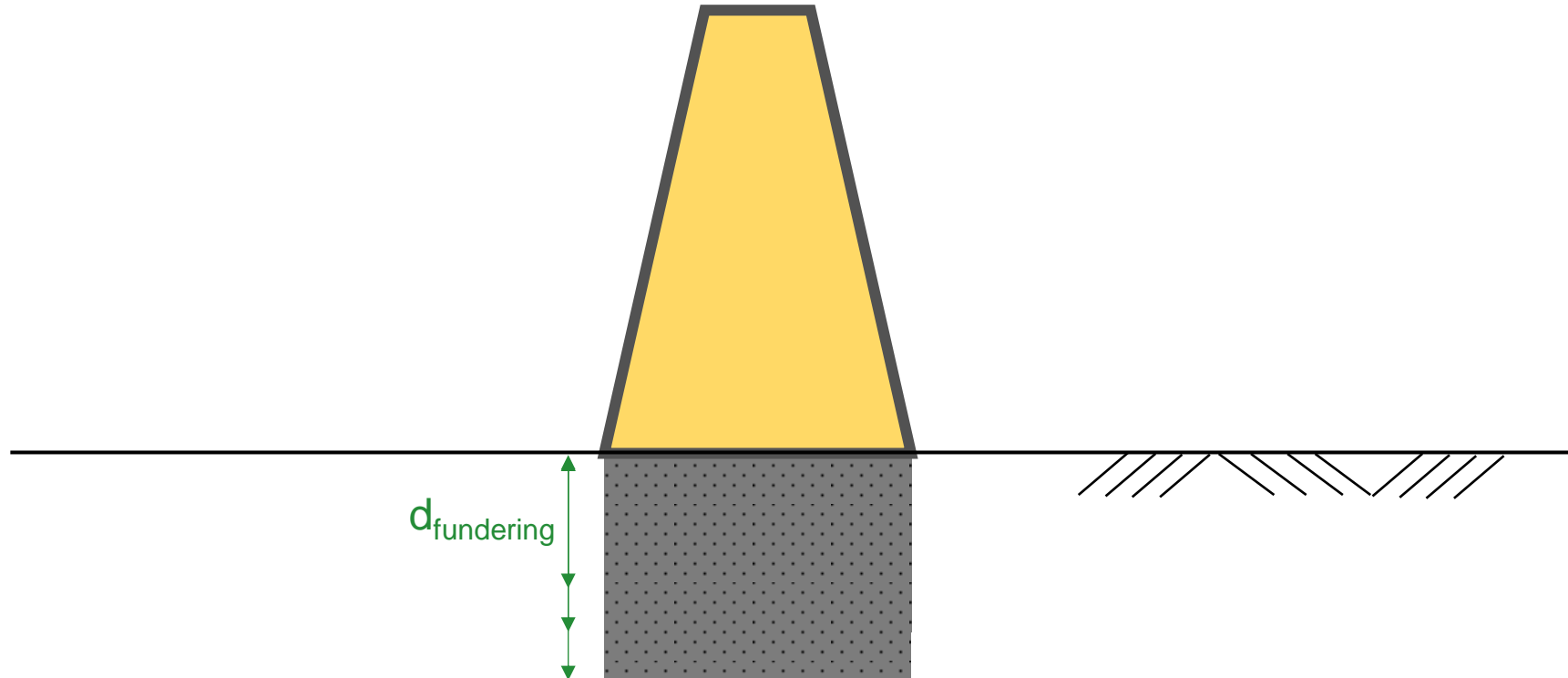
# Geluidswallen A1A28

## Proces geo-modelleur



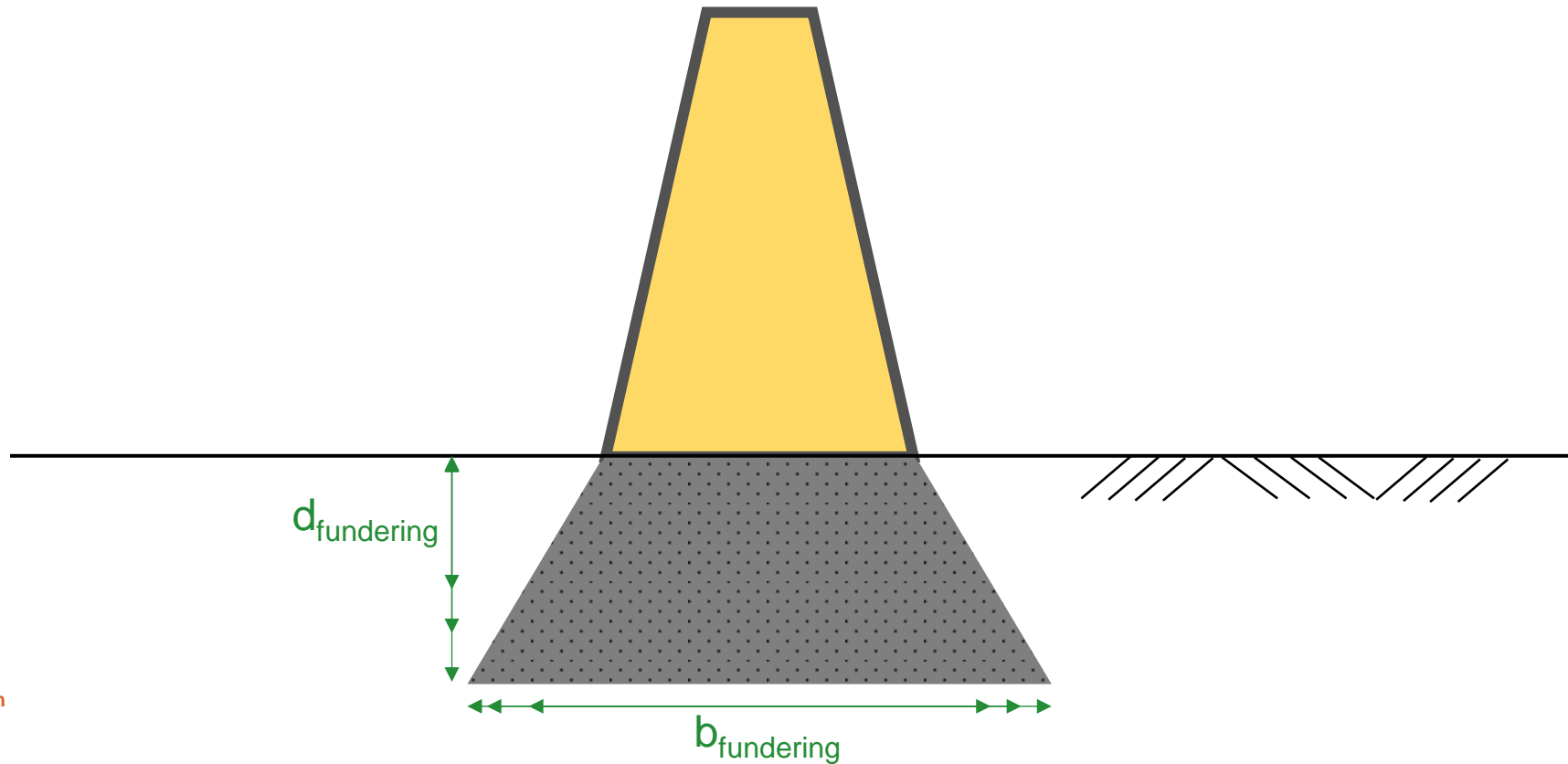
# Geluidswallen A1A28

## Proces geo-constructief



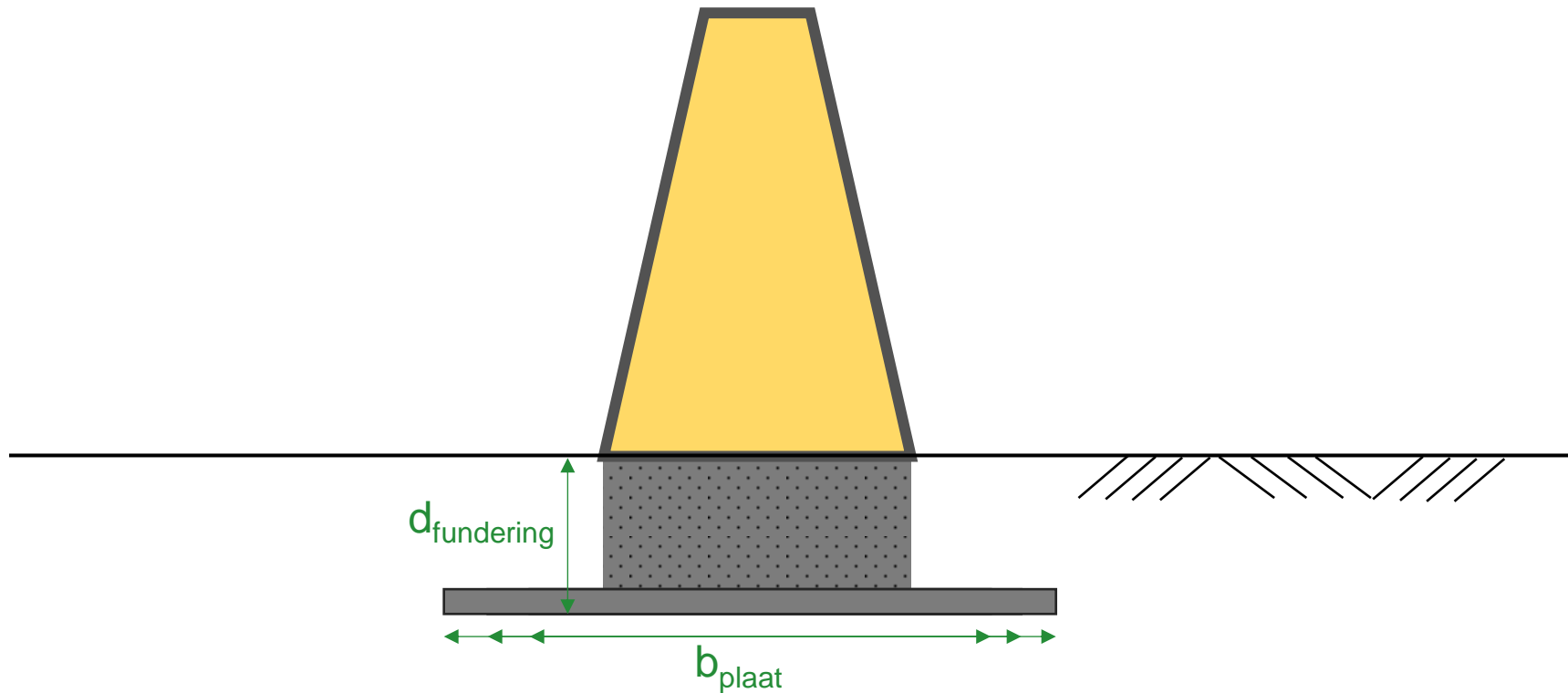
# Geluidswallen A1A28

## Proces geo-constructief



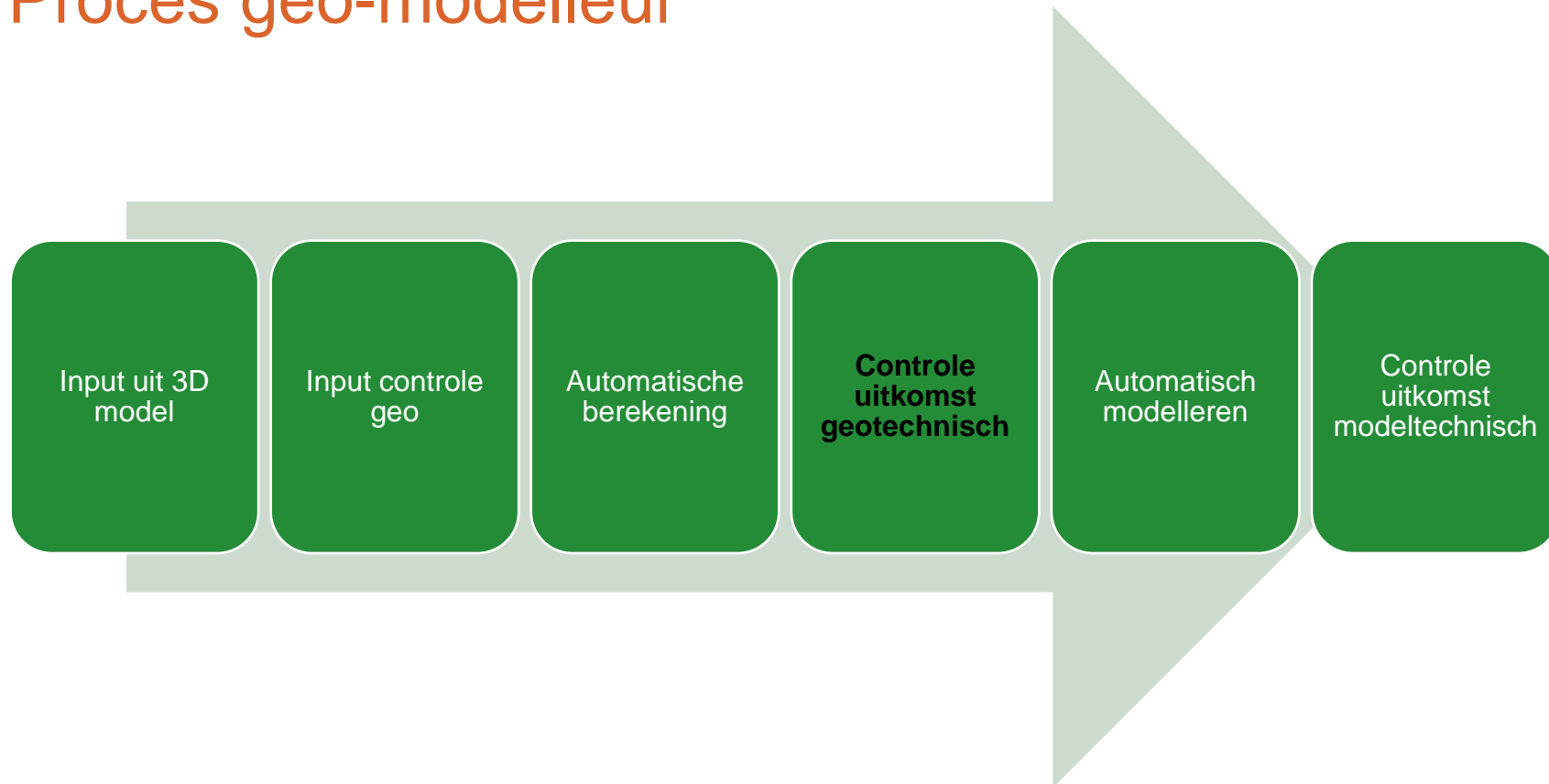
# Geluidswallen A1A28

## Proces geo-constructief



# Geluidswallen A1A28

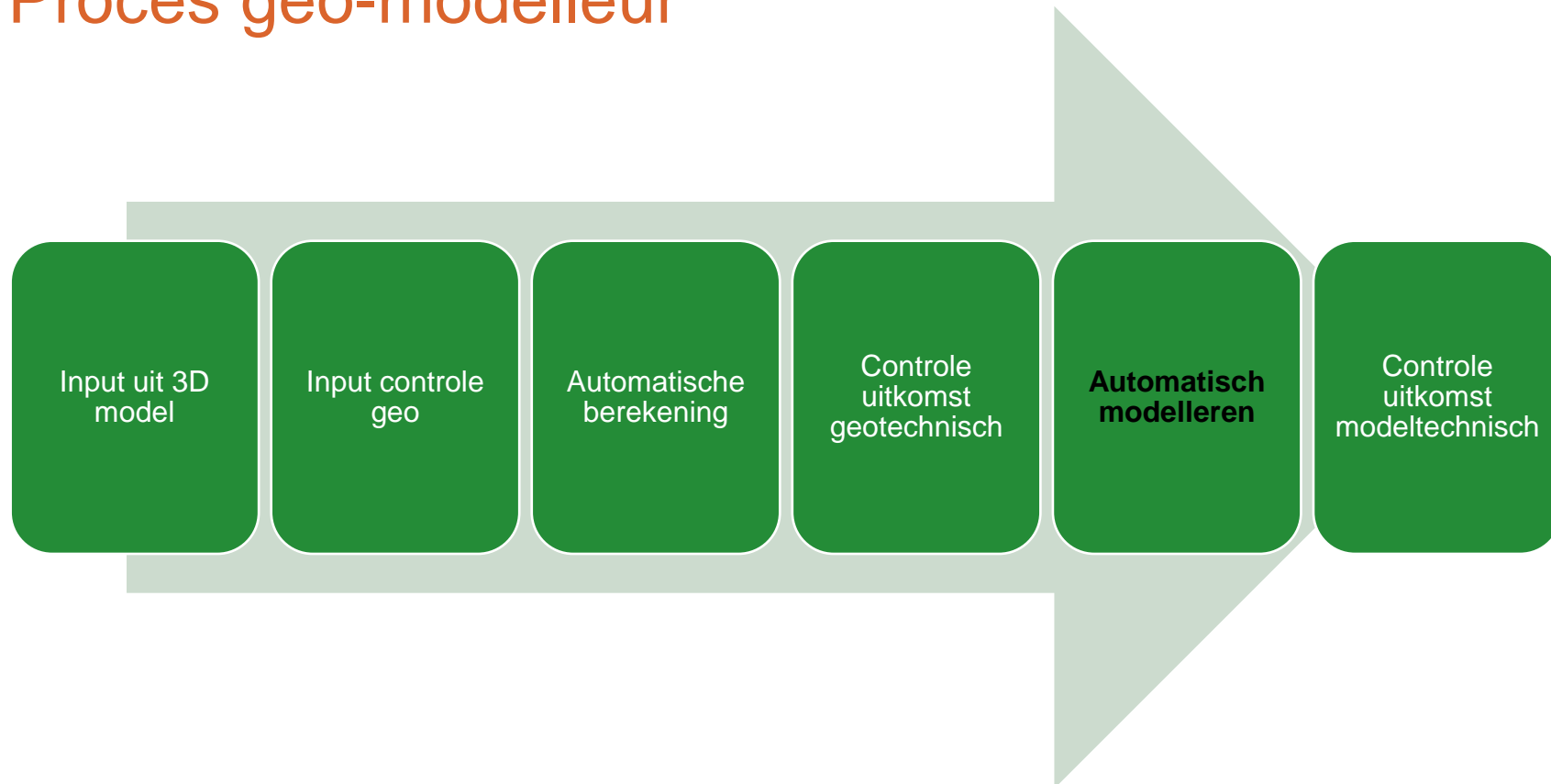
## Proces geo-modelleur





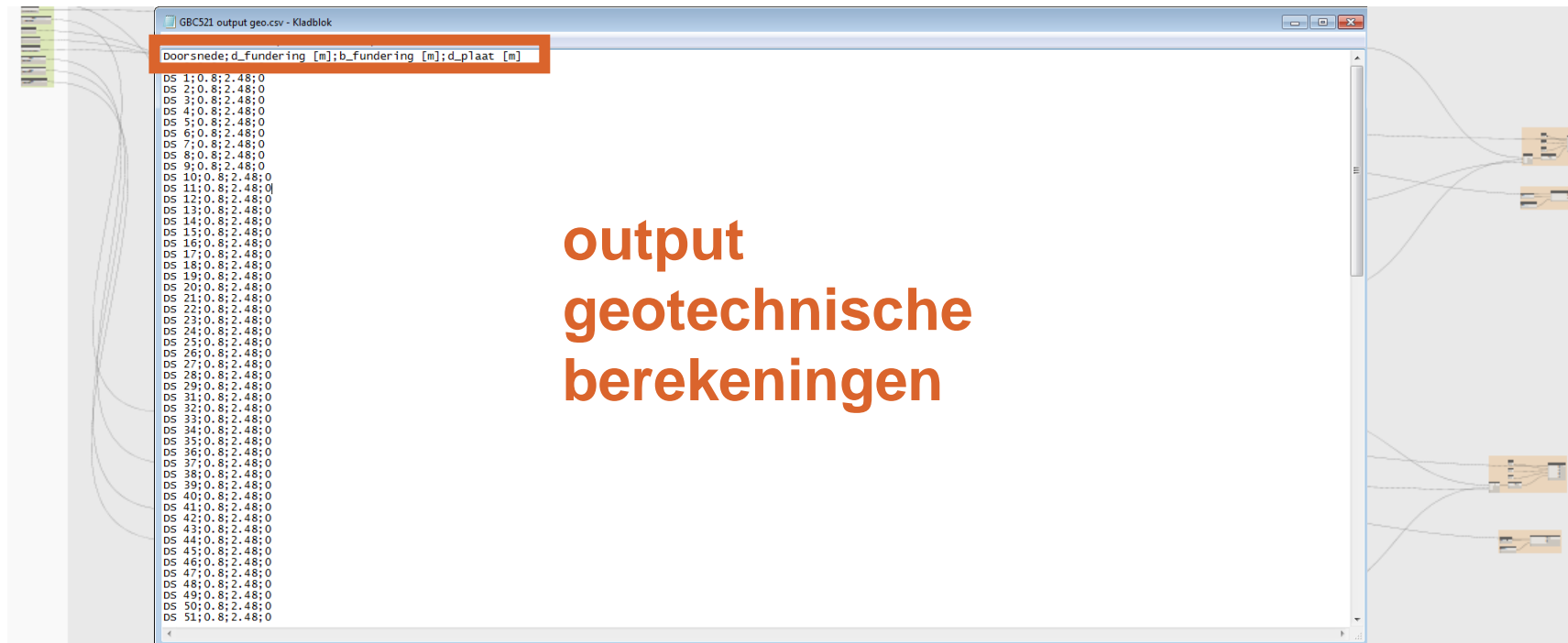
# Geluidswallen A1A28

## Proces geo-modelleur



# Geluidswallen A1A28

## Proces geo-modelleur

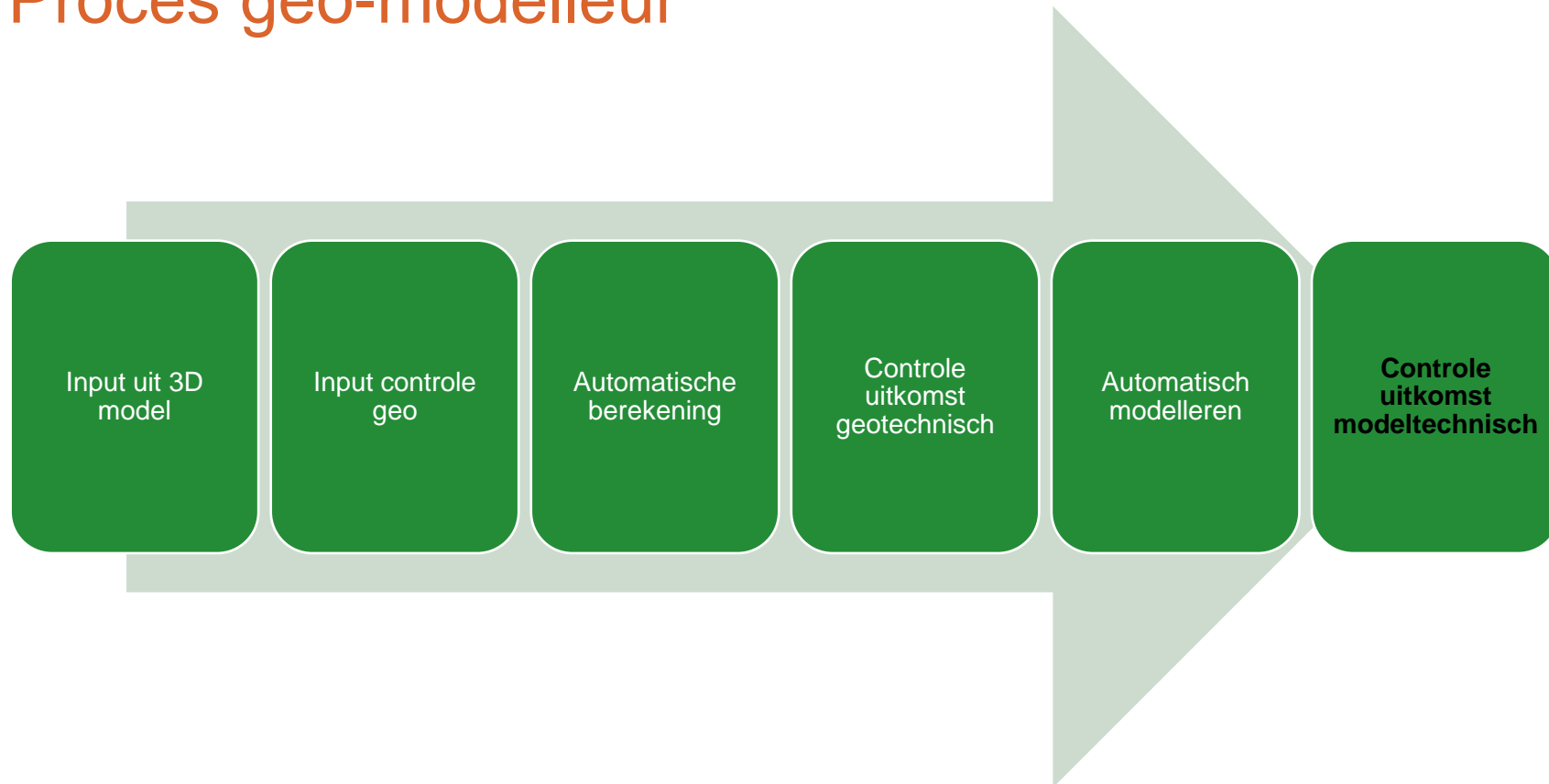


output  
geotechnische  
berekeningen



# Geluidswallen A1A28

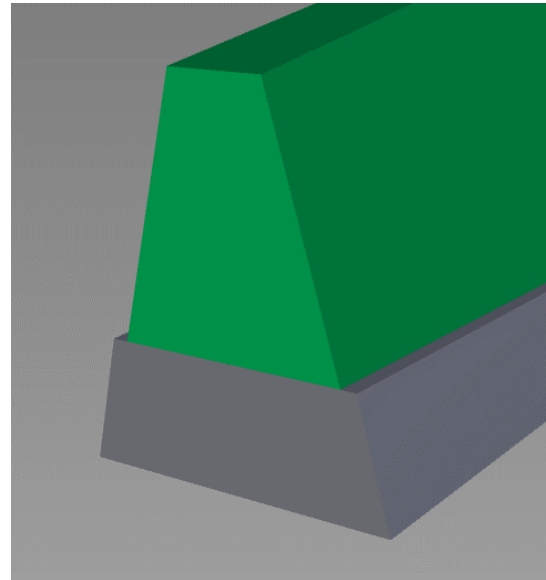
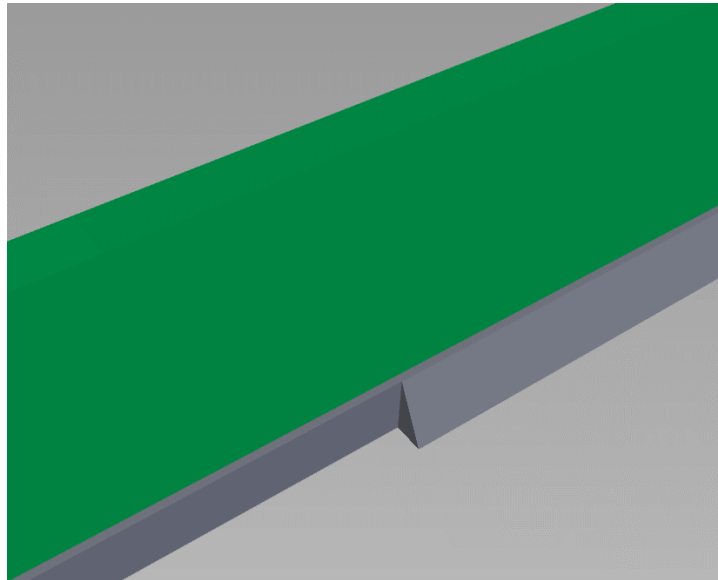
## Proces geo-modelleur



# Geluidswallen A1A28

## Proces geo-modelleur

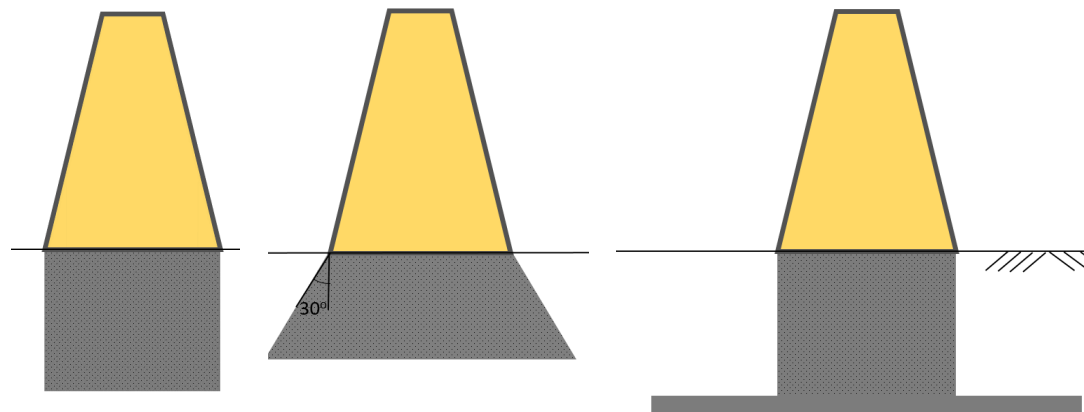
### Visuele controle



# Geluidswallen A1A28

## Keuze fundering: raakvlakken

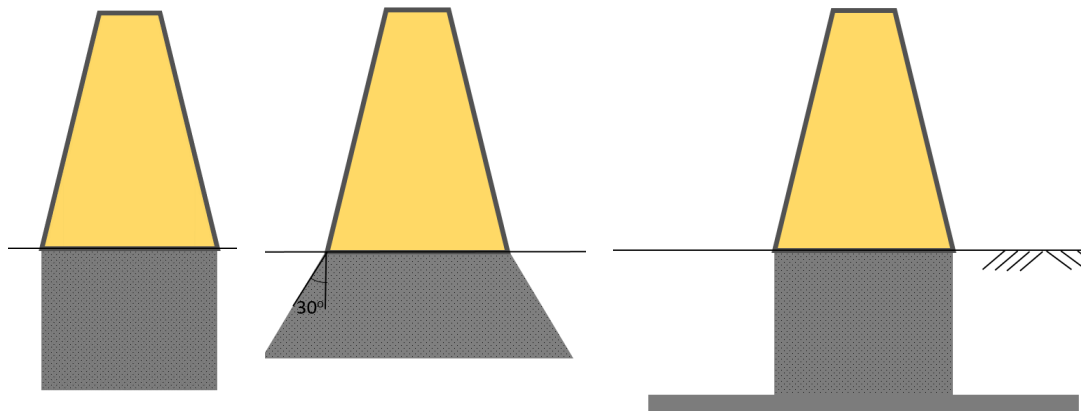
- Water, K&L, DVM, ...
- kabels of leidingen verleggen?
- andere funderingsvariant kiezen?



# Geluidswallen A1A28

## Keuze fundering: uitvoering

- $d_{\text{fundering}}$  vs  $B_{\text{fundering}}$  : bemaling nodig?
- $d_{\text{fundering}}$  vs  $B_{\text{fundering}}$  : sleufkist nodig?
- fasering: waar, wanneer, tijd en plek?

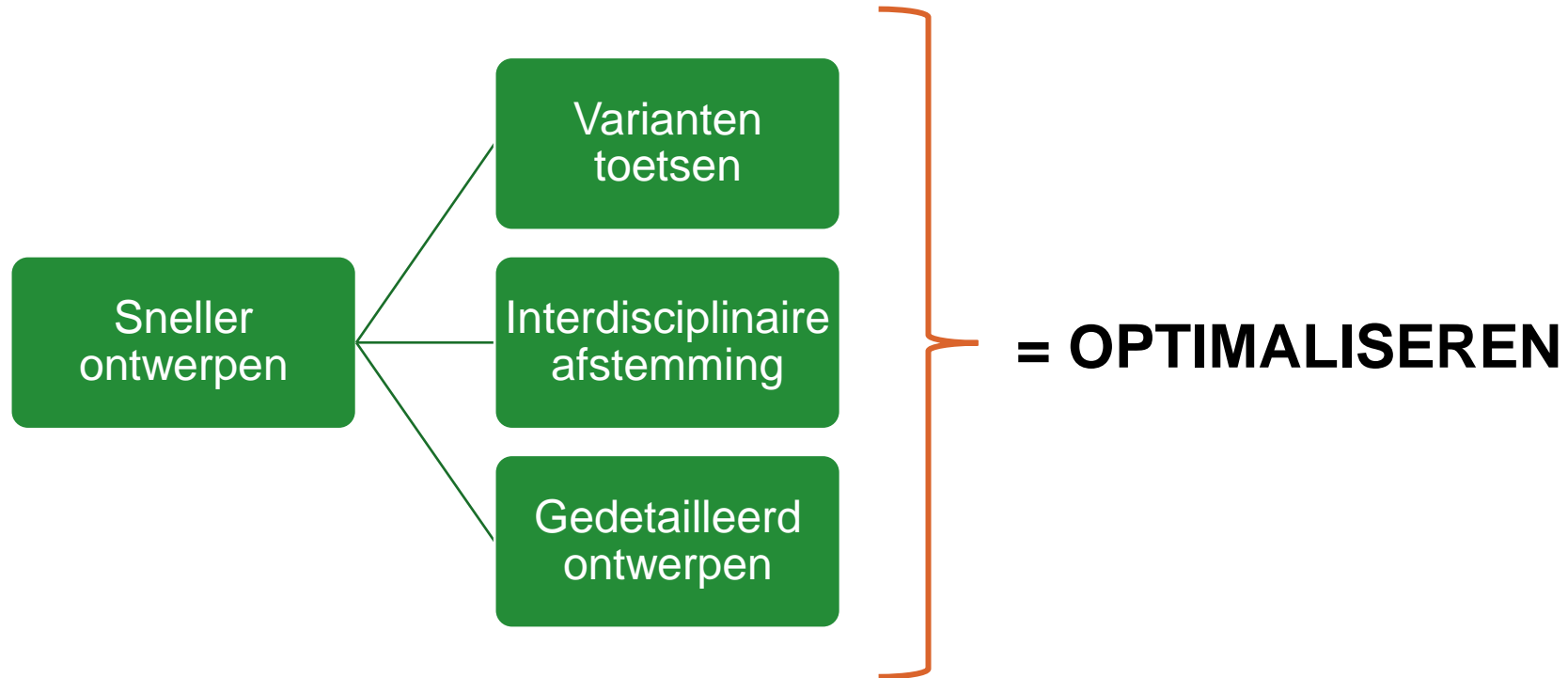


# Geluidswallen A1A28

## Keuze fundering: uitvoering

- sterkte aanvul materiaal
- $\gamma_{\text{vulmateriaal}}$

# Waarom parametrisch ontwerpen?





## Contact

Gino Koolman (BIM)  
Tom Laumen (GEO)  
Roland Oldenkamp (BIM)  
BAM Infraconsult

# Geluidswallen A1A28

## Proces geotechniek

### Grondonderzoek

- Semi-automatisch
- Locatie t.o.v. snede
- Grondopbouw
- Bestaand vs toekomstig maaiveld

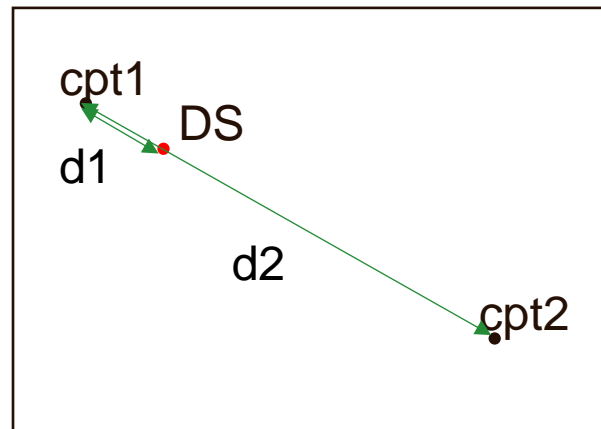


# Geluidswallen A1A28

## Proces geotechniek

### Automatische selectie grondonderzoek

1.



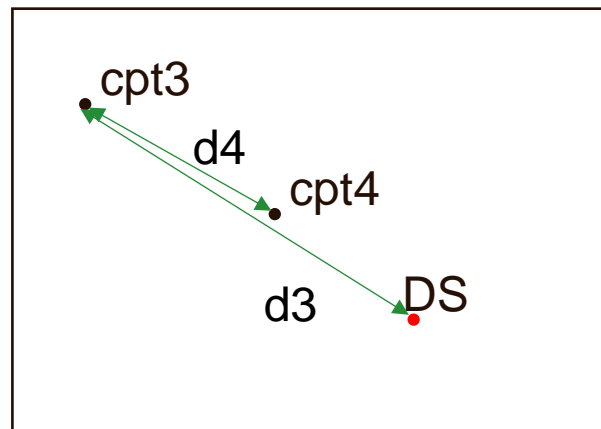
$d1 < 1/3 * d2$   
cpt1 = maatgevend

# Geluidswallen A1A28

## Proces geotechniek

### Automatische selectie grondonderzoek

2.

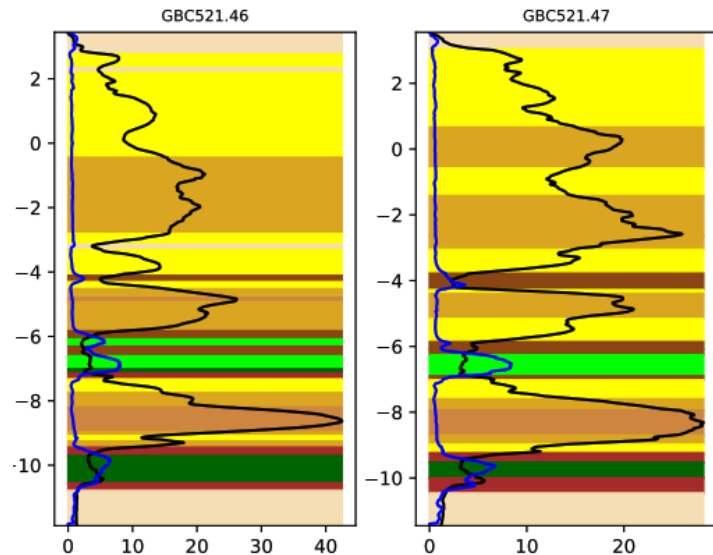
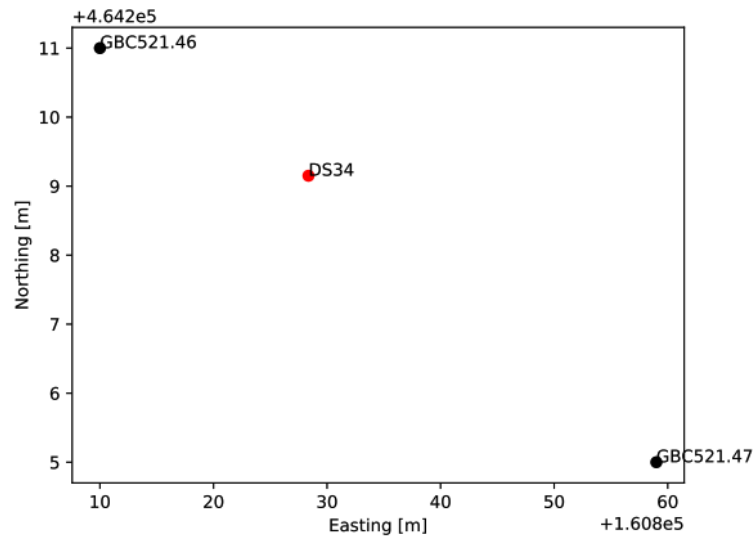


$d3 > d4$   
cpt4 = maatgevend

# Geluidswallen A1A28

## Proces geotechniek

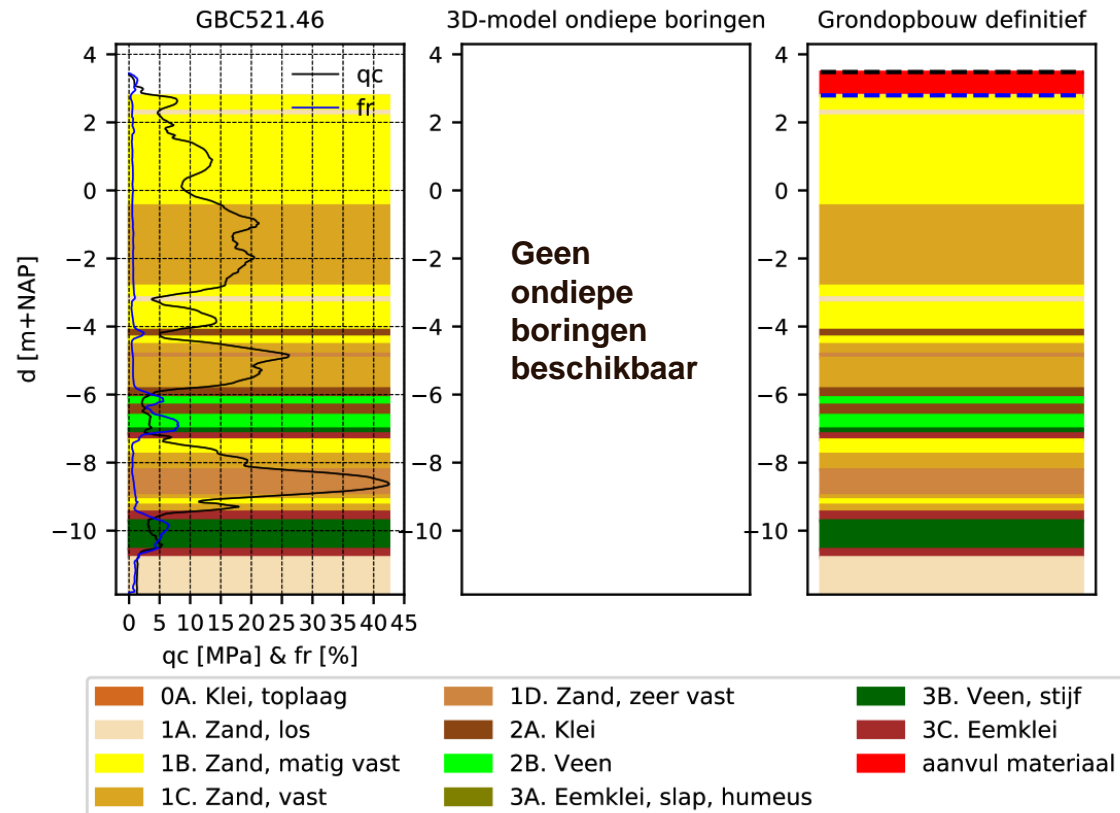
### Handmatige selectie grondonderzoek



```
De dichtstbijzijnde sonderingen zijn {cpt, afstand [m]} {'GBC521.46': 18.46, 'GBC521.47': 30.92}
x_cpts = [160810.0, 160859.0]
y_cpts = [464211.0, 464205.0]
afstand_cpts = 49.36598018878993
```

# Geluidswallen A1A28

## Proces geotechniek



## Parametrisch ontwerpen

- Informatie gecentraliseerd
- Input & output afstemmen
- Automatisering
- Controle mechanismen