

Advanced Modeling in the Stratigraphy Program

Program: Stratigraphy

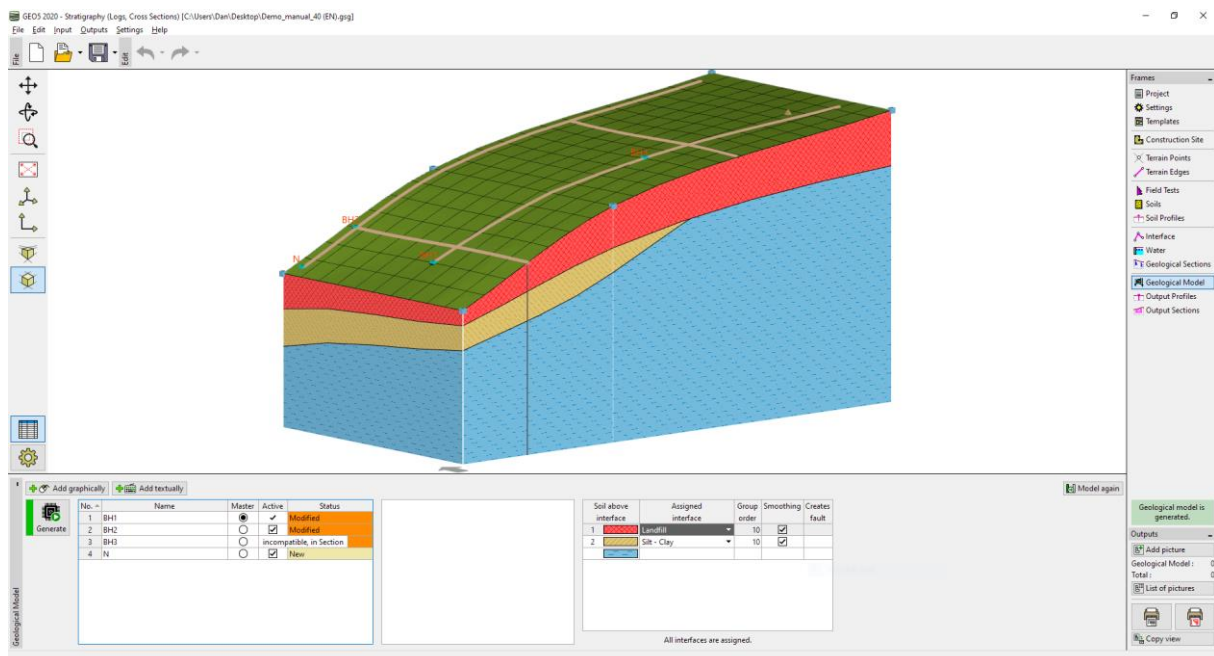
File: Demo_manual_41.gsg

In this engineering manual, we will show you some advanced modeling options. We will do:

- Creation of a geological fault
- Modification of the model by changing the layer generation order
- Modification of the model using a new geological section

Assignment:

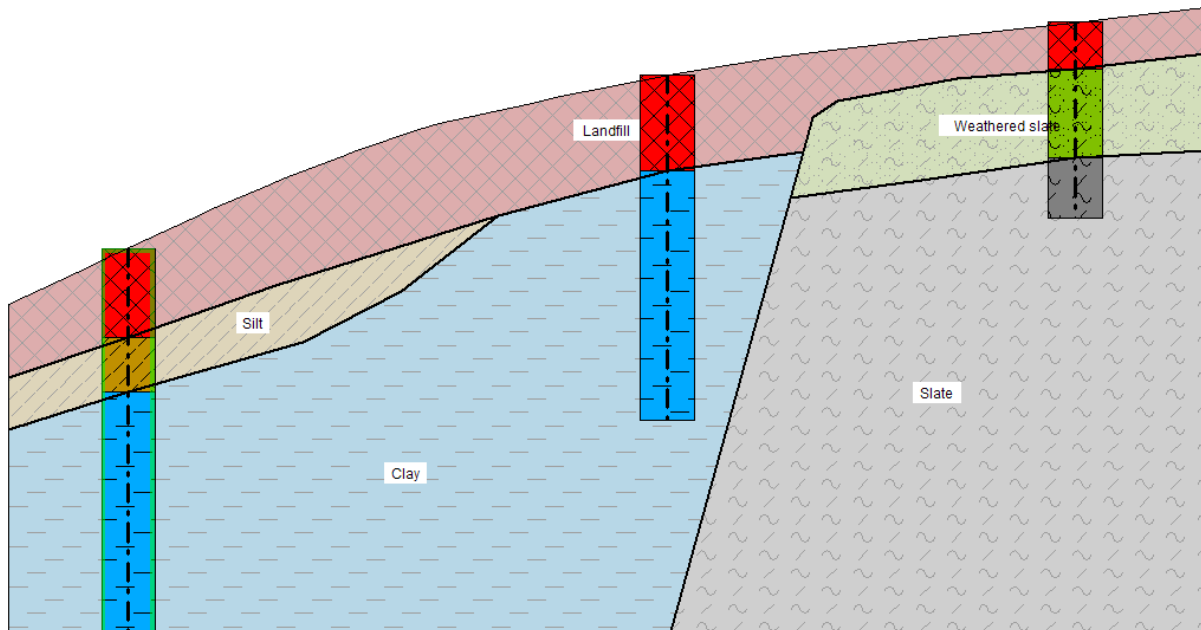
The example is based on the geological model from the previous engineering manual No. 40 - Basic Work using the Stratigraphy Program.



During an additional geological survey, a borehole C1 was carried out at the [18,4]. The borehole found a layer of backfill 0.8 m thick, then a 1.5 m thick layer of weathered slate, and was ended in a strong slate. The task is to adjust the model so that it respects the findings and also fully corresponds to our ideas of geology in the area.

Solution:

The bedrock was discovered at the top of the slope. We assume, that it goes straight down. This can be modeled the best by faults.



We will add a C1 borehole in the field test frame.

New field test (borehole)

Test parameters

Test name:

C1

Coordinate : x =

18,00 [m]

y =

4,00 [m]

Height :

automatically on terrain

z =

4,77 [m]

Depth of 1. point :

d₁ =

0,00 [m]

Overall depth :

d_{tot} =

3,30 [m]

☒ Field test generates soil profile

Layers

Samples

Table GWT

Data - Protocol

Data - Test

Attachments

No.▲	Thickness t [m]	Depth d [m]	Soil name	Soil pattern	Layer description	+
1	0,80	0,00 .. 0,80	Landfill			Add (to the end)
2	1,50	0,80 .. 2,30	Weathered Slate			
3	1,00	2,30 .. 3,30	Slate			

Soil profile

0,0

0,2

0,4

0,6

0,8

1,0

1,2

1,4

1,6

1,8

2,0

2,2

2,4

2,6

2,8

3,0

3,2

3,3

Landfill

Weathered Slate

Slate

Print log

Import

Add + Close

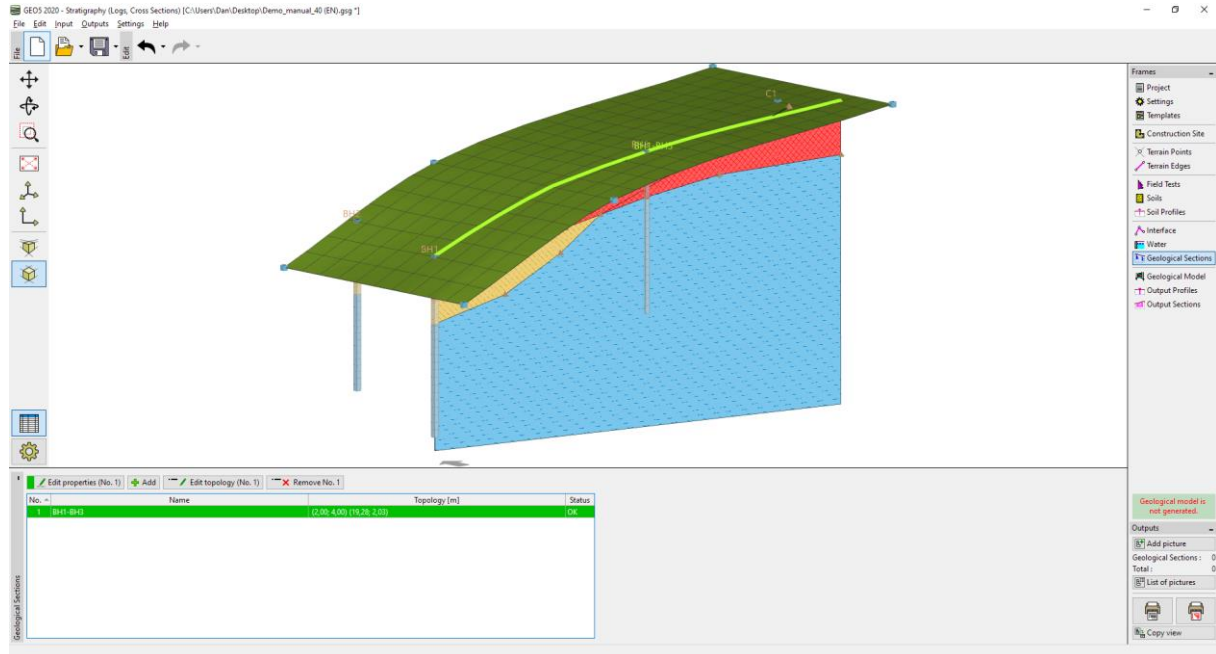
Add

Cancel

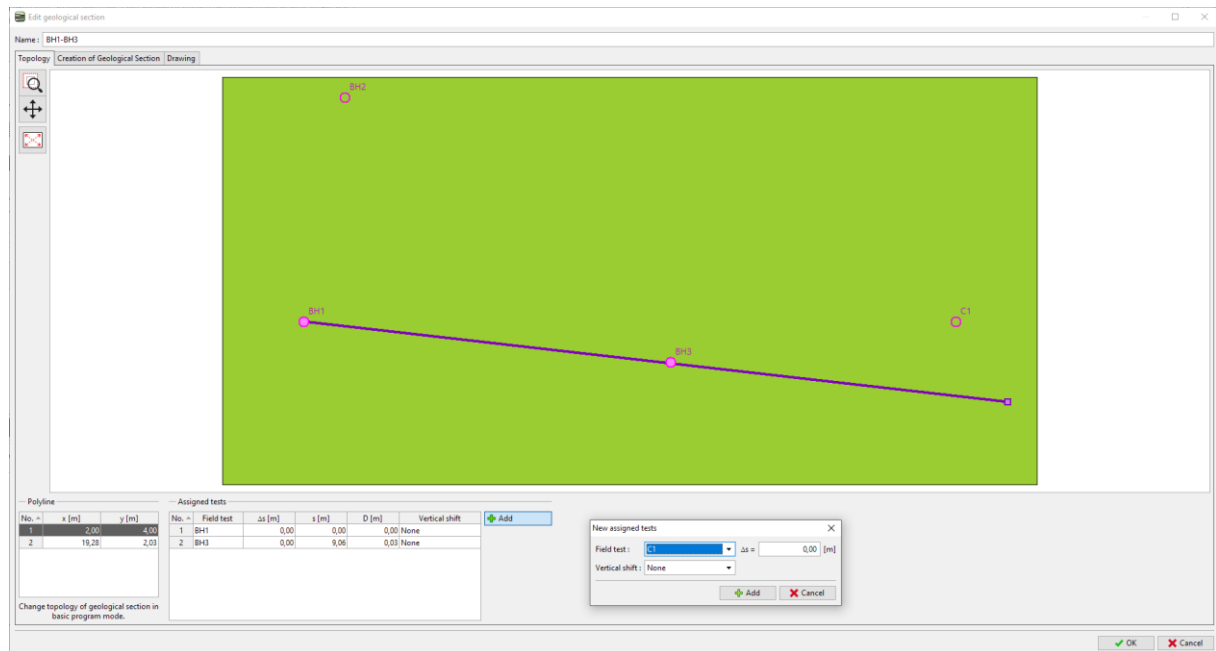
We will go to the “Soils” frame and copy the soils from field tests.

Then we will go to the “Earth profiles” frame where the soil profile C1 is automatically generated.

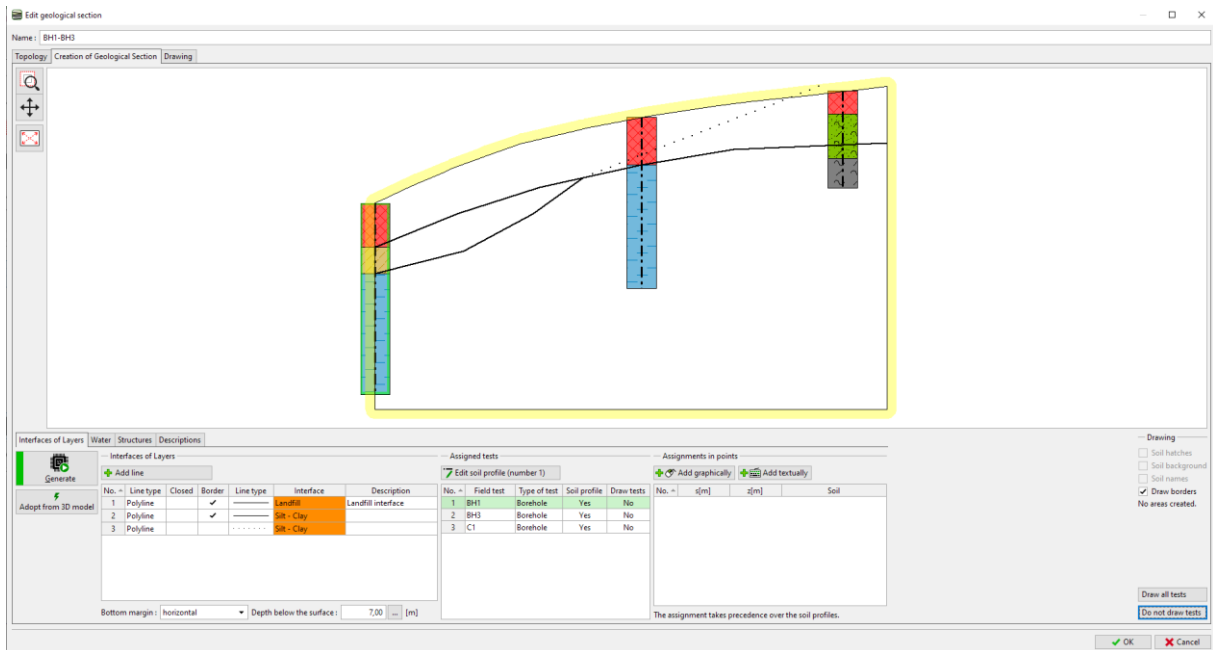
Now in the geological section frame, we will modify the entered geological section BH1-BH3.



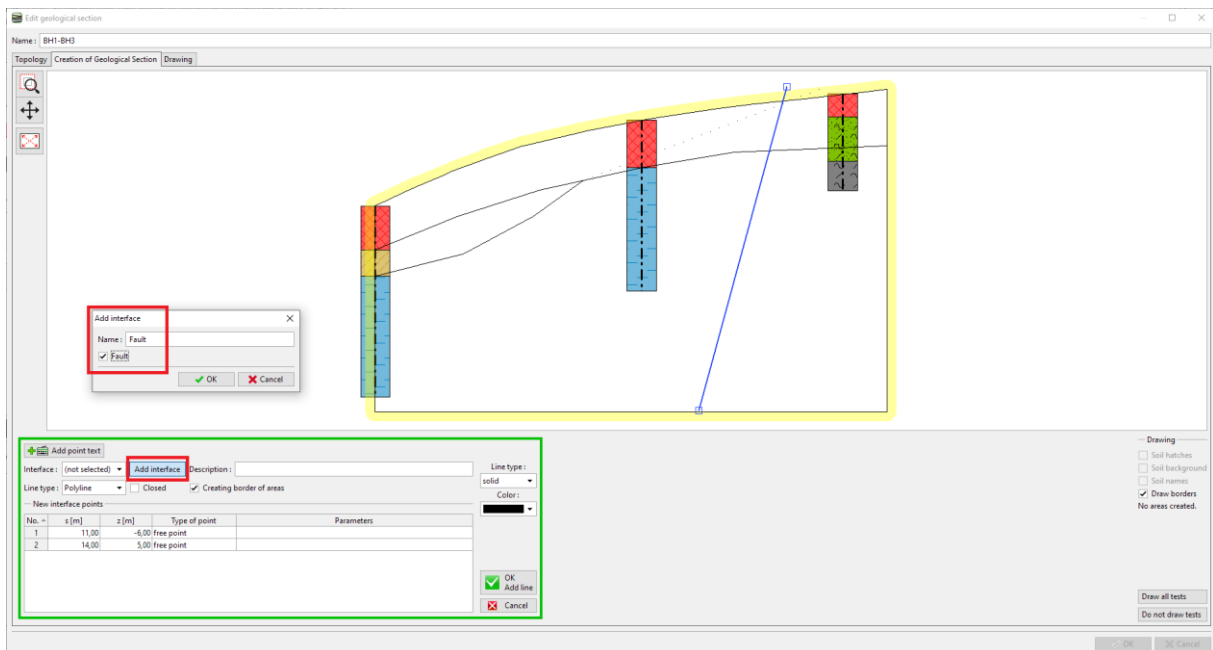
We will add the C1 borehole to the geological section.



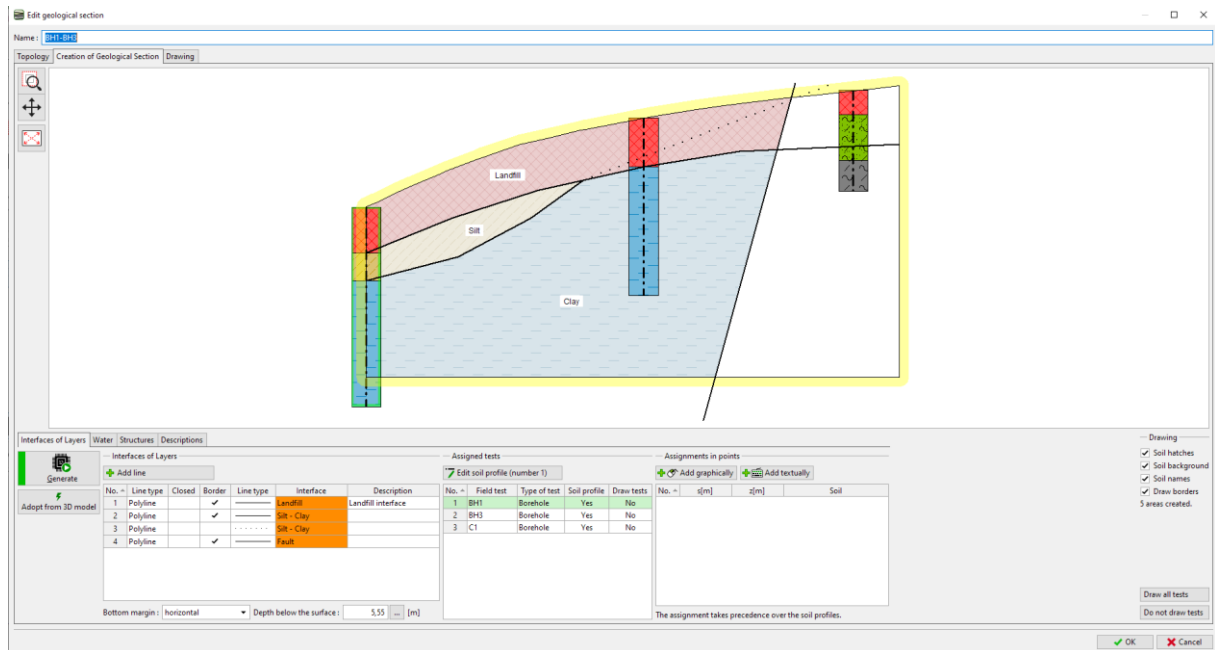
We will switch to editing of geological section. The borehole is now shown in the geological section.



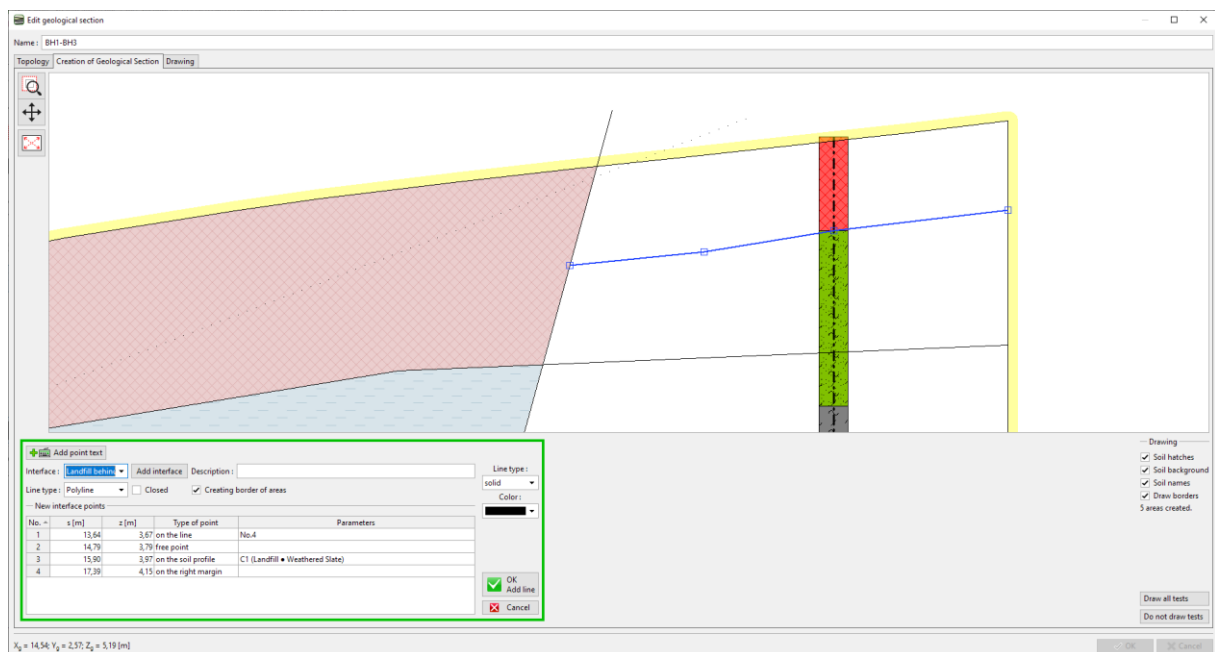
We will enter a fault – add a new interface and check the Fault checkbox.



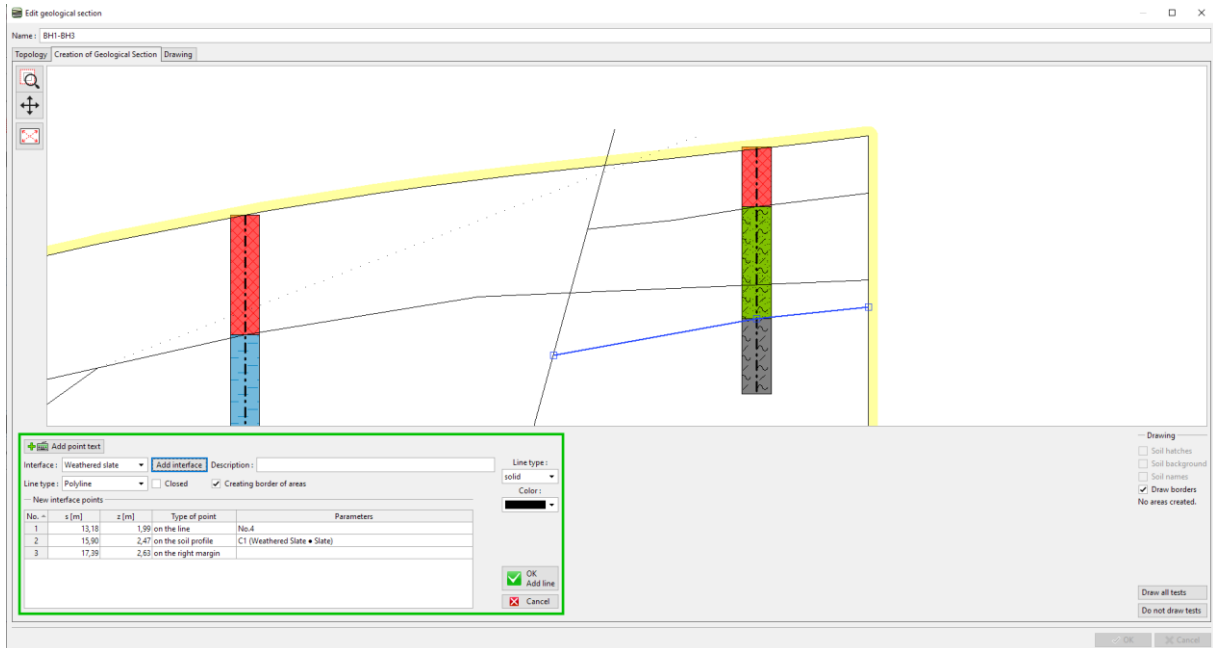
After the generation of sections, only the soils located to the left of the fault are assigned.



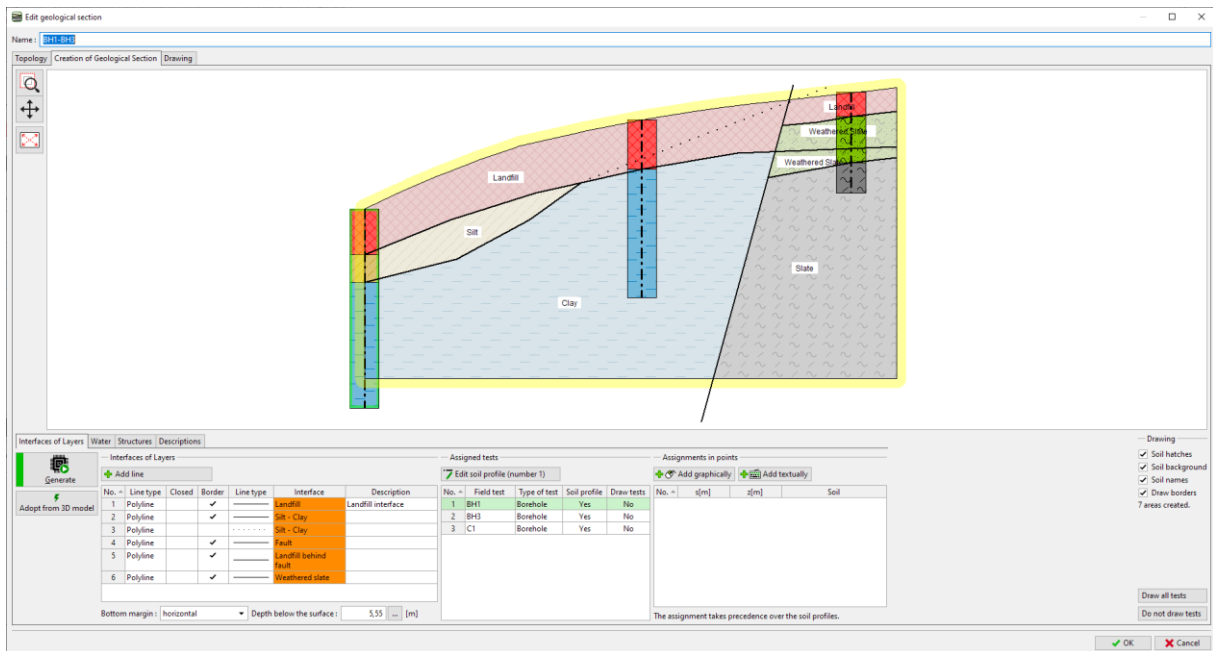
We enter the interface behind the fault and assign it a new interface (Landfill behind fault)



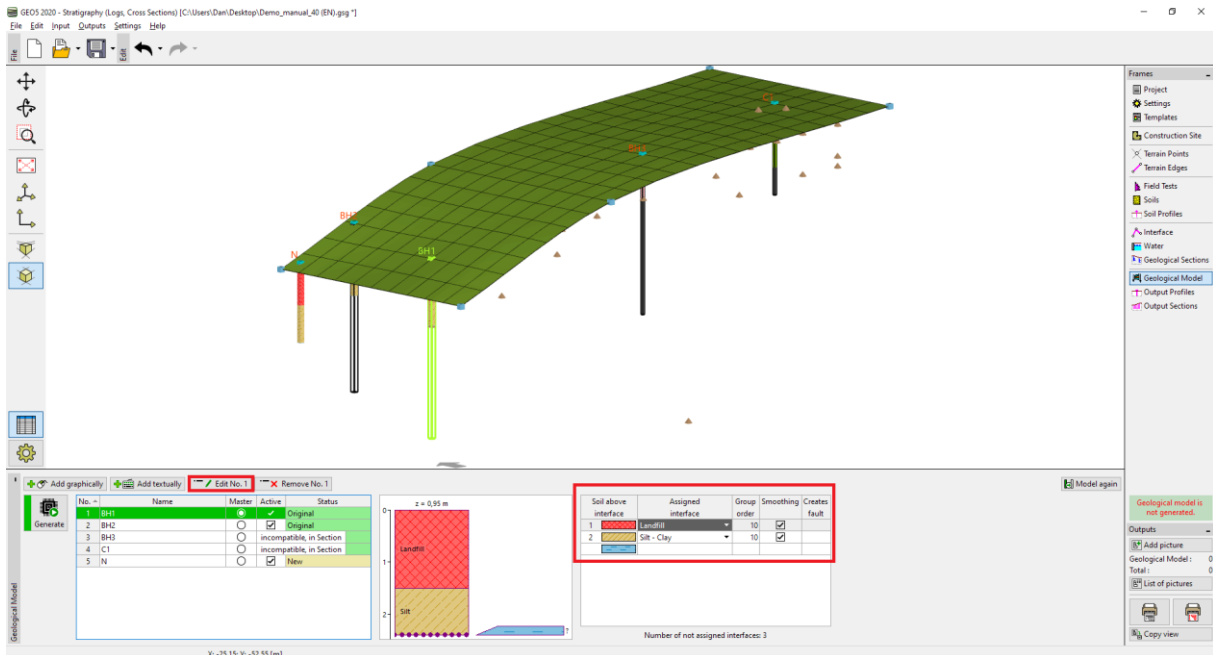
Next, enter the assumed location of the weathered slate.



This completes the section. Although the landfill interface divides the weathered slate layer, the model generation will not be affected by it.



We will go to the geological model frame. The number of soils, resp. interfaces between the soils remains the same as in the previous example. It is necessary to add new soils to the master borehole. The number of soils and their layers is always given by the master borehole.



We will open the window for editing the master borehole and add new soil behind the fault (from top to bottom). As we do not know the position of the layer interface in the borehole (or there is no interface at all), we will leave the location type as “not defined”

Edit master borehole

Name: BH1

Coordinate: x = 2,00 [m] y = 4,00 [m] z = 0,95 [m]

GWT depth: h_{GWT} = (no water) [m] ☒ Borehole is active

Master borehole







No.	Thickness [m]	Depth [m]	Soil name
1	1,50	0,00 .. 1,50	Landfill
2	0,90	1,50 .. 2,40	Silt
3		not defined	Clay
4		not defined	Landfill
5		not defined	Weathered Slate
6		not defined	Slate

Master and compatible
No: 3
Add (to the end)

0
1
2
Landfill
Silt

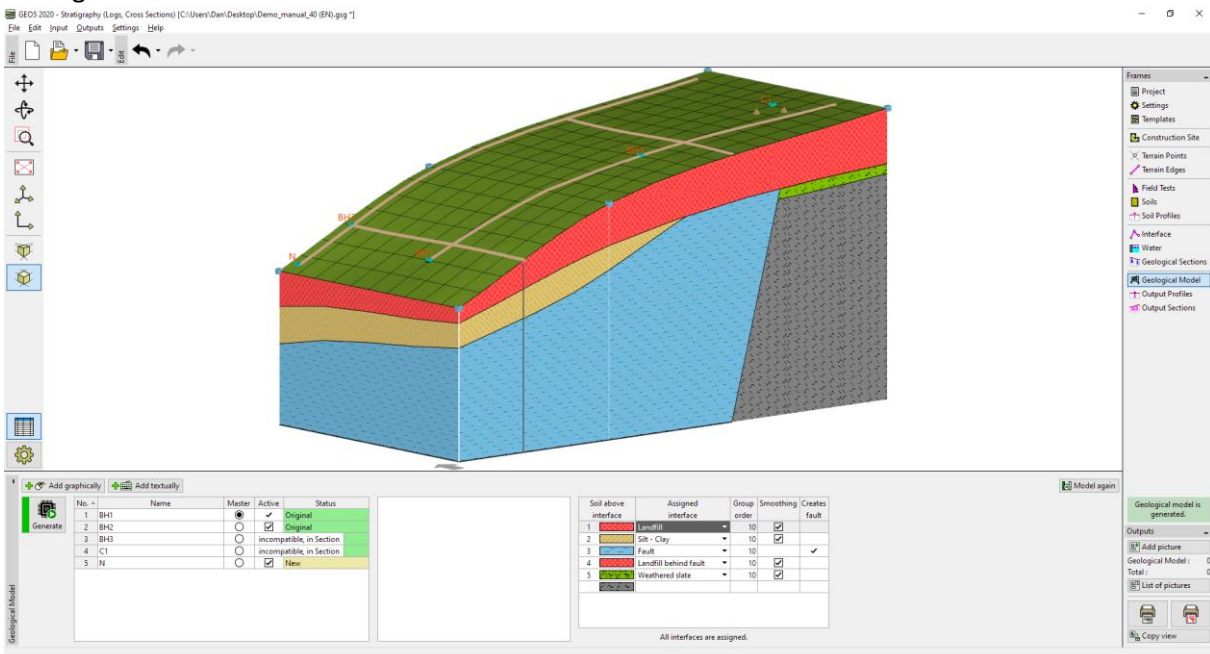
OK Cancel

The layer table has now changed. We will assign the fault interface and other soil interfaces behind the fault.







Soil above interface	Assigned interface	Group order	Smoothing	Creates fault
1 	Landfill	10	<input checked="" type="checkbox"/>	
2 	Silt - Clay	10	<input checked="" type="checkbox"/>	
3 	Fault	10		<input checked="" type="checkbox"/>
4 	Landfill behind fault	10	<input checked="" type="checkbox"/>	
5 	Weathered slate	10	<input checked="" type="checkbox"/>	
				

All interfaces are assigned.

After generating the model, we can see that the layer of landfill passes through the fault and that the model is not generated properly. This is due to the order, in which the layers are generated. The layers are generated sequentially from top to bottom. Meaning that the landfill interface is generated the first, then Silt-clay and only then the fault. It is therefore cut by the interfaces, that were generated earlier.

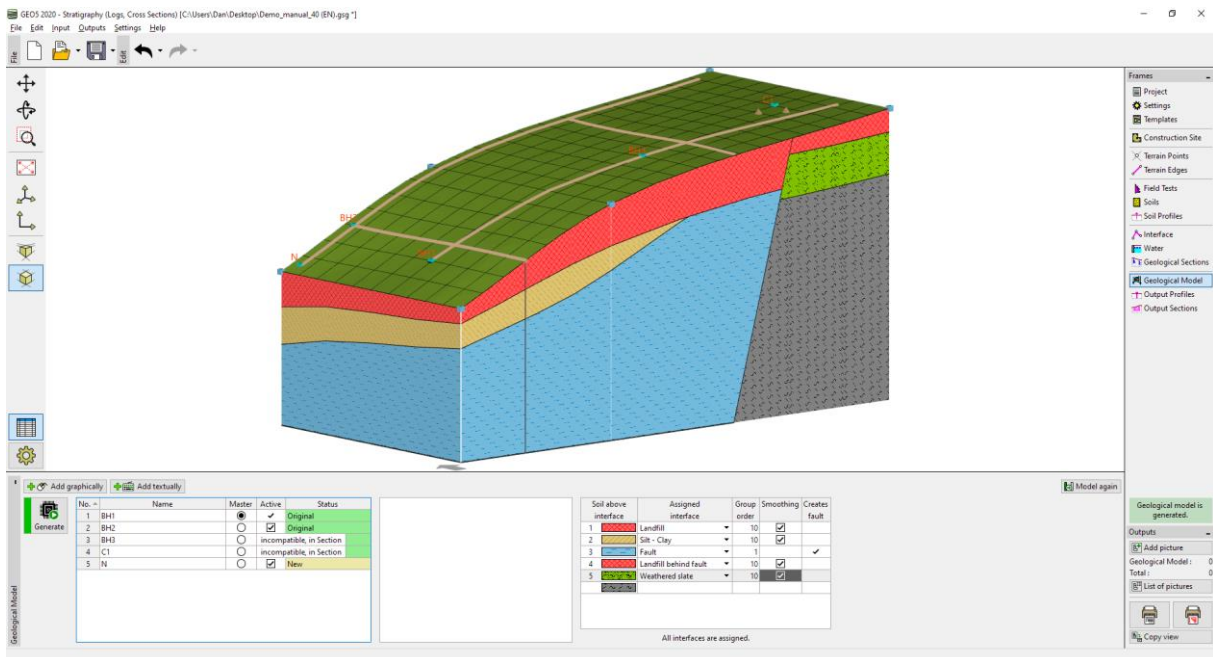


We will, therefore, adjust the order of layer generation. First, we will generate the fault, that will divide the model into two areas.

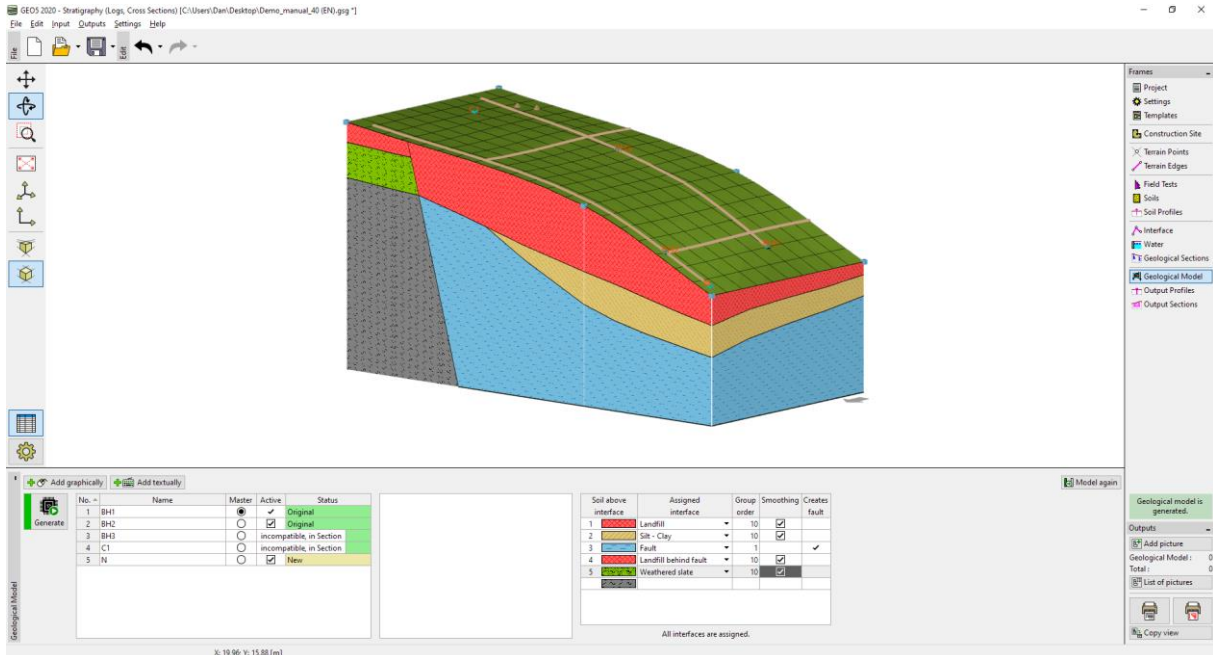
Soil above interface	Assigned interface	Group order	Smoothing	Creates fault
1 	Landfill	10	<input checked="" type="checkbox"/>	
2 	Silt - Clay	10	<input checked="" type="checkbox"/>	
3 	Fault	1		<input checked="" type="checkbox"/>
4 	Landfill behind fault	10	<input checked="" type="checkbox"/>	
5 	Weathered slate	10	<input checked="" type="checkbox"/>	
				

All interfaces are assigned.

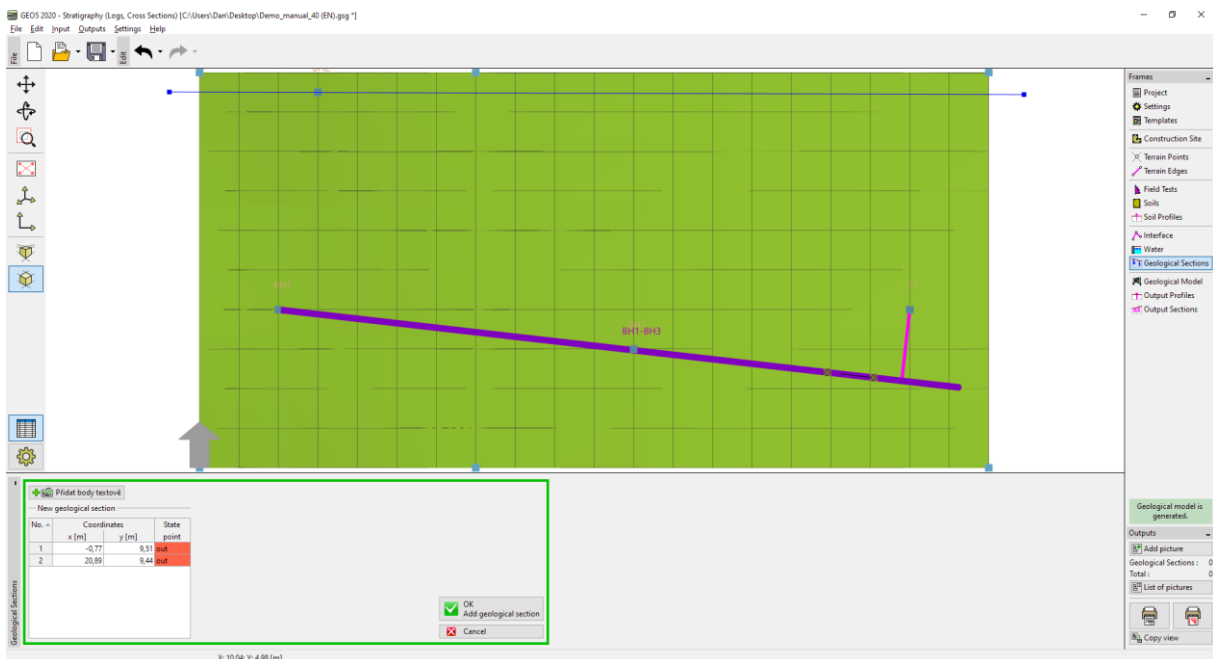
After generating, the model is now created correctly

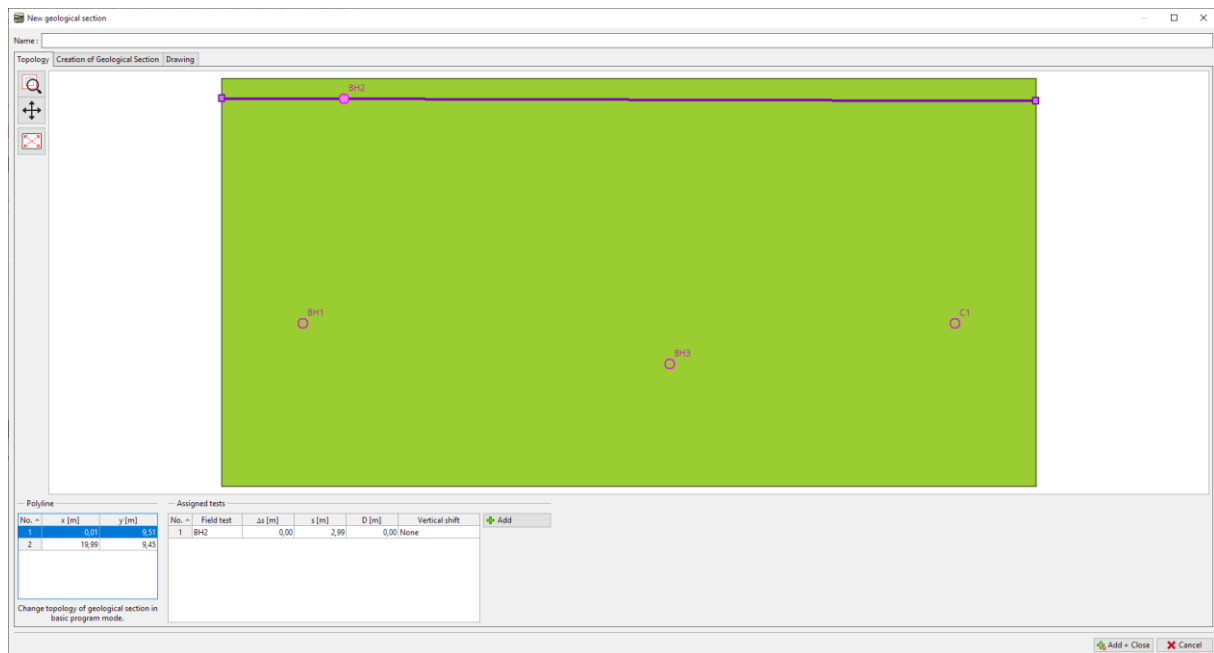


We will look at the model from the other side as well.

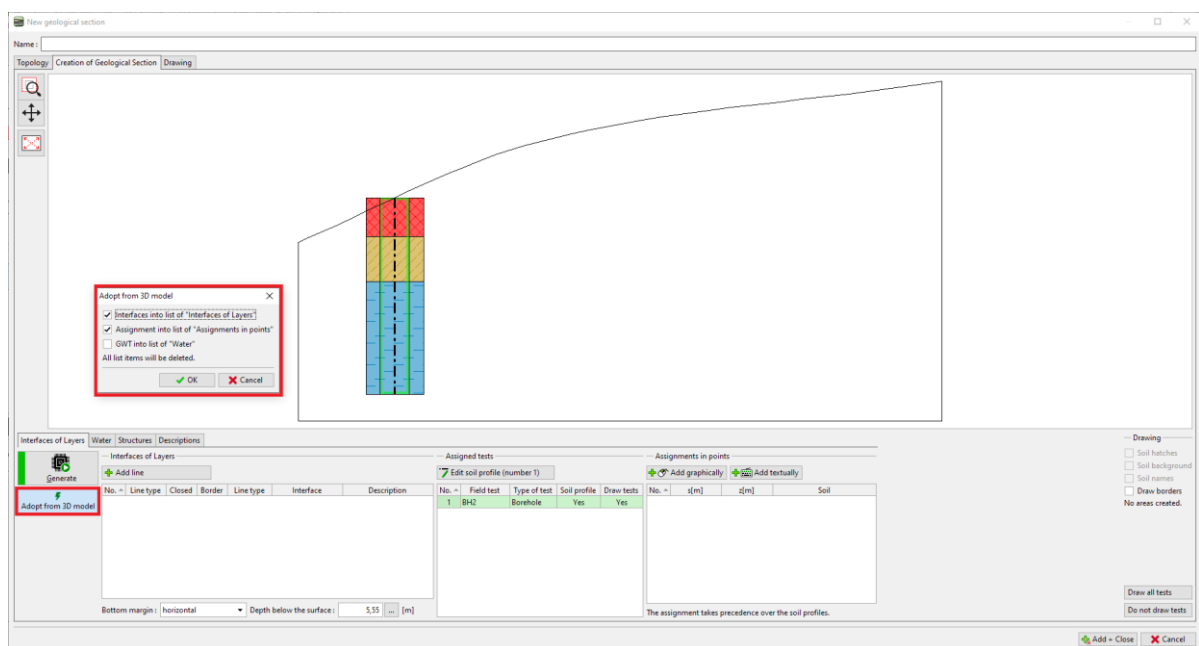


We decided to modify the model, to better suit our ideas. We will adjust it by adding a new Geological section. We will add a new section, close to the edited region, preferably so it passes through the BH2 borehole.

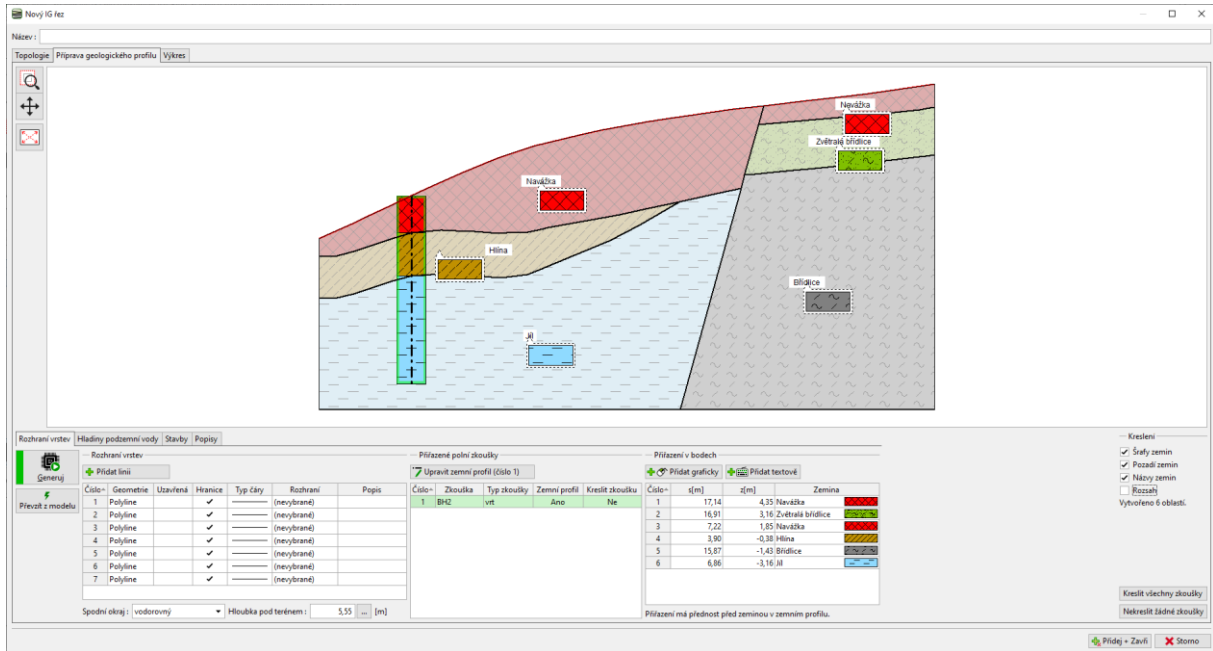




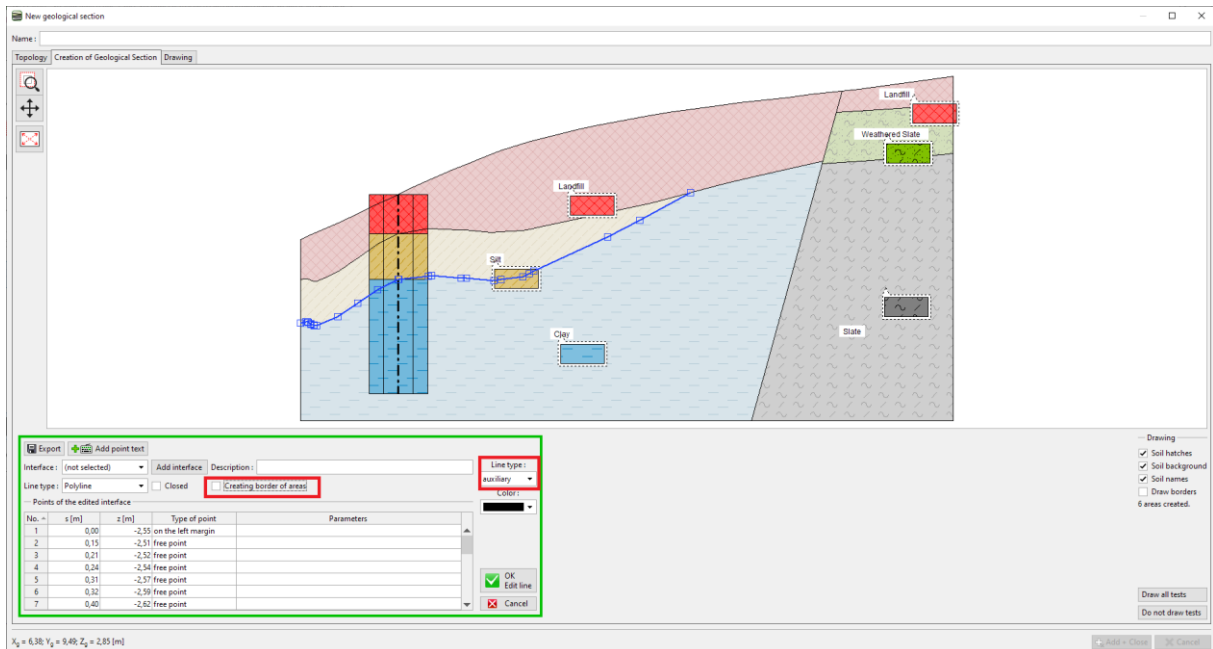
We will switch to the profile editing and use the “Adopt from 3D model” button to transfer it to the geological section.



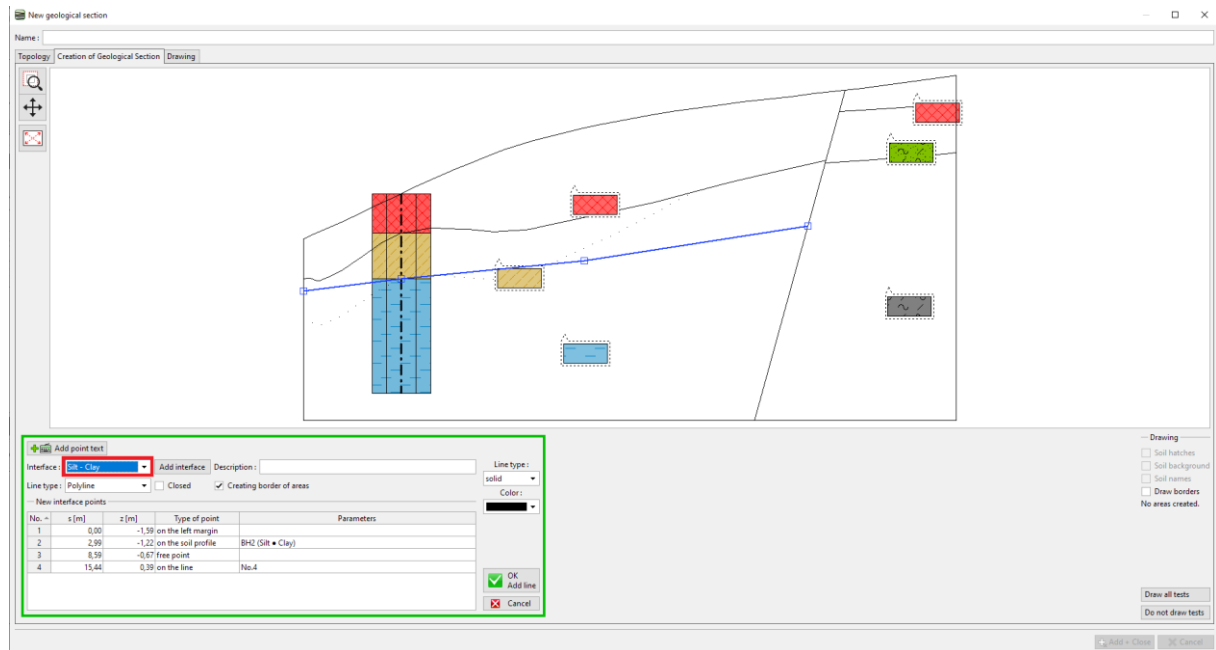
Soils are now assigned by using points in each area. Interfaces are not assigned to the individual lines so that they do not create additional points in the interfaces of the 3D model.



We will adjust the interface between the silt and clay. Select the line, and mark it as auxiliary (it will appear dotted) and turn off the “Creating border of areas” checkbox. We could delete this line too, but we want to see it when constructing a new one.



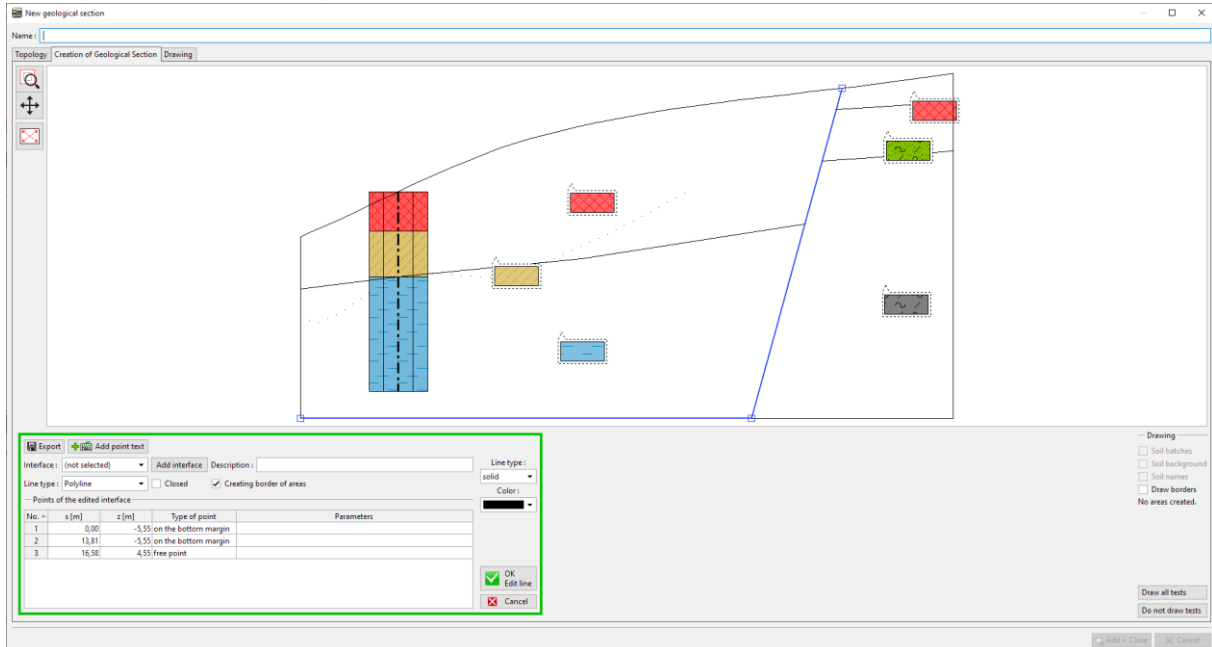
We will enter a new shape of the interface and assign it the “Silt-clay” interface



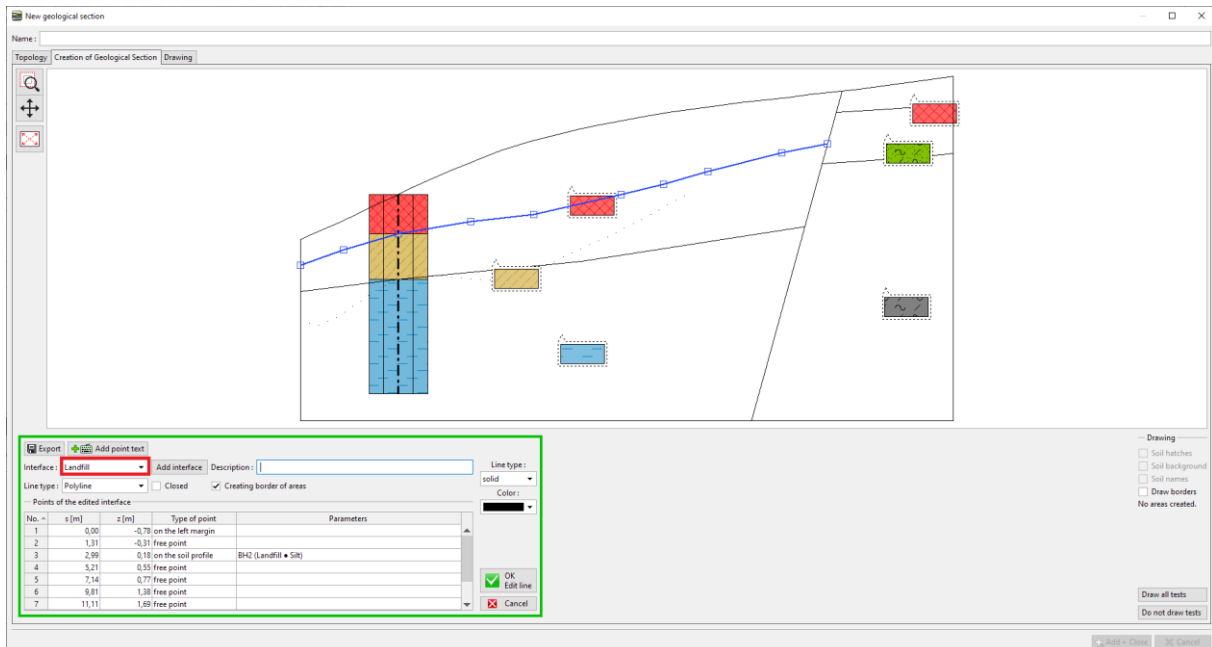
After generating, we can see the newly created areas and the original shape of the interface.



We will also adjust the landfill interface. This time, we will delete the old interface and create a new one. This procedure is simpler, but we will lose the information about the original shape. In this case, after deleting the interface, we will also need to extend the line, which creates the fault so that the areas are closed.

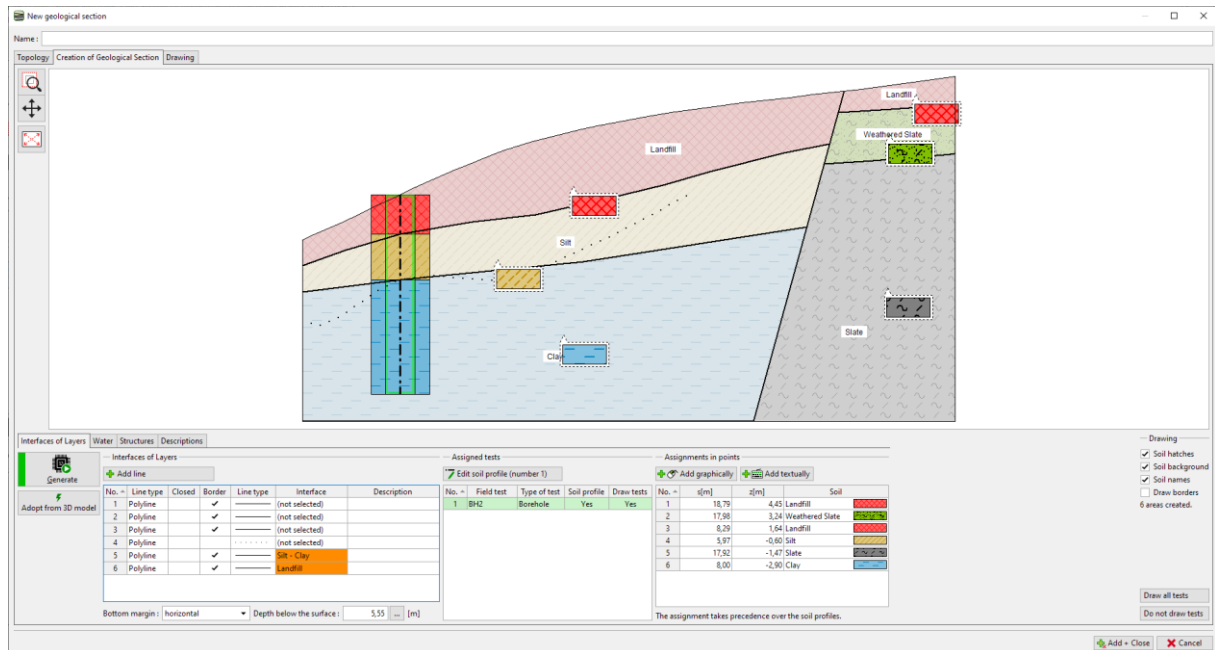


We will add a new landfill interface.



Note; The 3D model is only affected by points that have assigned interfaces. If we want to keep the exact shape of the interface in the 3D model, we might need to model the interface by more points – even if the section is straight.

Now the section is modified. The orange-colored lines are creating interfaces and will adjust the appearance of the 3D model.



We will now generate the model. By doing so, the modifications are finished.

