

# 9

## Excavation and dewatering [ADV]

In this tutorial lowering the groundwater level and the flow around a sheetpile wall will be analysed. The geometry model of the tutorial [Dry excavation using a tie back wall \[ADV\]](#) (on page 94) will be used. The **Well** feature is introduced in this example.

### 9.1 Create and assign material data set

The material parameters remain unchanged from the original project. The used groundwater parameters are shown in the table below.

**Table 21: Flow parameters**

Parameter	Name	Silt	Sand	Loam	Unit
<i>Groundwater</i>					
Data set	-	USDA	USDA	USDA	-
Model	-	Van Genuchten	Van Genuchten	Van Genuchten	-
Soil - Type	-	Silt	Sand	Loam	-
< 2µm	-	6	4	20	%
2µm - 50µm	-	87	4	40	%
50µm - 2mm	-	7	92	40	%
Flow parameters - Use defaults	-	From data set	From data set	From data set	-
Permeability in horizontal direction	$k_x$	0.5996	7.128	0.2497	m/day
Permeability in vertical direction	$k_y$	0.5996	7.128	0.2497	m/day

To create the project:

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Define the structural elements

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1. Open the project defined in the tutorial [Dry excavation using a tie back wall \[ADV\]](#) (on page 94).
2. Save the project under a different name (e.g. 'Flow around a sheet pile wall').

### 9.2 Define the structural elements

1. In the **Structures** mode click the **Create hydraulic conditions** button  in the side toolbar.
2. Select the **Create well** option  in the appearing menu.
3. Draw the first well by clicking on (42 20) and (42 17).
4. Draw the second well by clicking on (58 20) and (58 17).

### 9.3 Generate the mesh

1. Proceed to the **Mesh** mode.
2. Select the cluster and two wells as shown in the figure below. In **Selection Explorer** specify a **Coarseness factor** of 0.25.

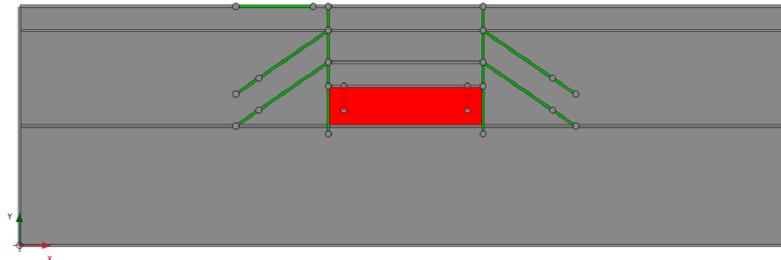


Figure 112: Indication of the local refinement of the mesh in the model

3. Click the **Generate mesh** button  to generate the mesh. Use the default option for the **Element distribution** parameter (Medium).
4. Click the **View mesh** button  to view the mesh.

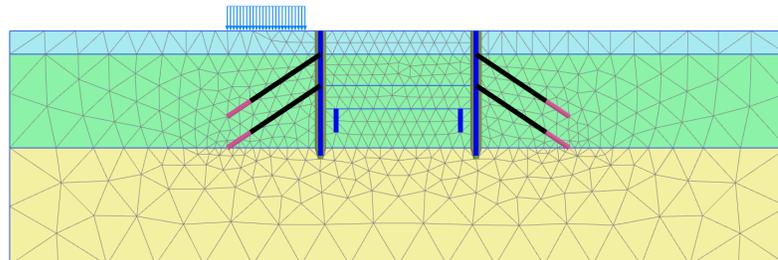


Figure 113: The generated mesh

5. Click the **Close** tab to close the Output program.

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Define and perform the calculation

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### 9.4 Define and perform the calculation

- Proceed to the **Staged construction** mode. The groundwater flow analysis performed in phase 6 has to be modified.

#### 9.4.1 Phase 6: Dewatering

In this phase the wells will be used to lower the phreatic level in the excavation down to  $y = 17$  m. This corresponds to 3 m below the final excavation level.

1. Multi-select the wells in the model and activate them.
2. In the **Selection explorer** the behaviour of the wells is by default set to **Extraction**.
3. Set the discharge value to  $1.5 \text{ m}^3/\text{day}/\text{m}$ .
4. Set the  $h_{\min}$  value to 17 m. This means that water will be extracted as long as the groundwater head at the wall location is at least 17 m.

The figure below shows the parameters assigned to the wells in the **Selection explorer**

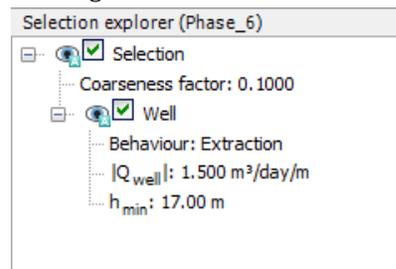


Figure 114: Well properties

#### 9.4.2 Execute the calculation

The definition of the calculation process is complete.

1. Click the **Calculate** button  to calculate the project.
2.  Save the project after the calculation has finished.

### 9.5 Results

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### Results

To display the flow field:

1. Select the Phase 6 in the drop down menu.
2. Click the menu **Stresses > Groundwater flow > |q|**.

A scaled representation of the results (scale factor = 5.0) is shown:

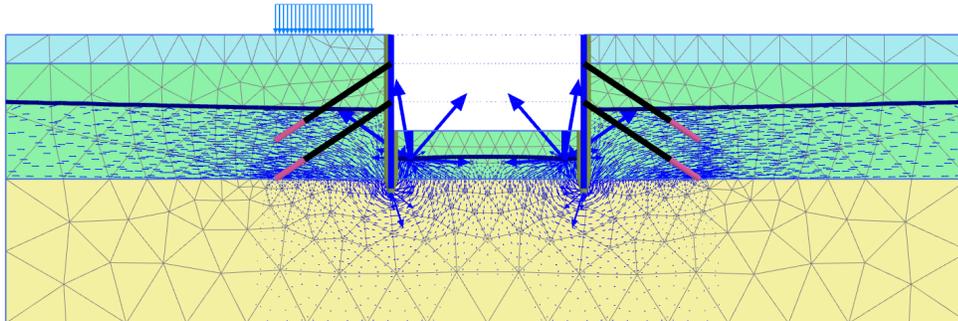


Figure 115: The resulting flow field at the end of Phase 6

Click the menu **Stresses > Pore pressures > Groundwater head**. Compare the results with the ones of the Phase 6 of the project defined in the tutorial [Dry excavation using a tie back wall \[ADV\]](#) (on page 94).

In the following figure, the resulting groundwater head with and without the wells are displayed.

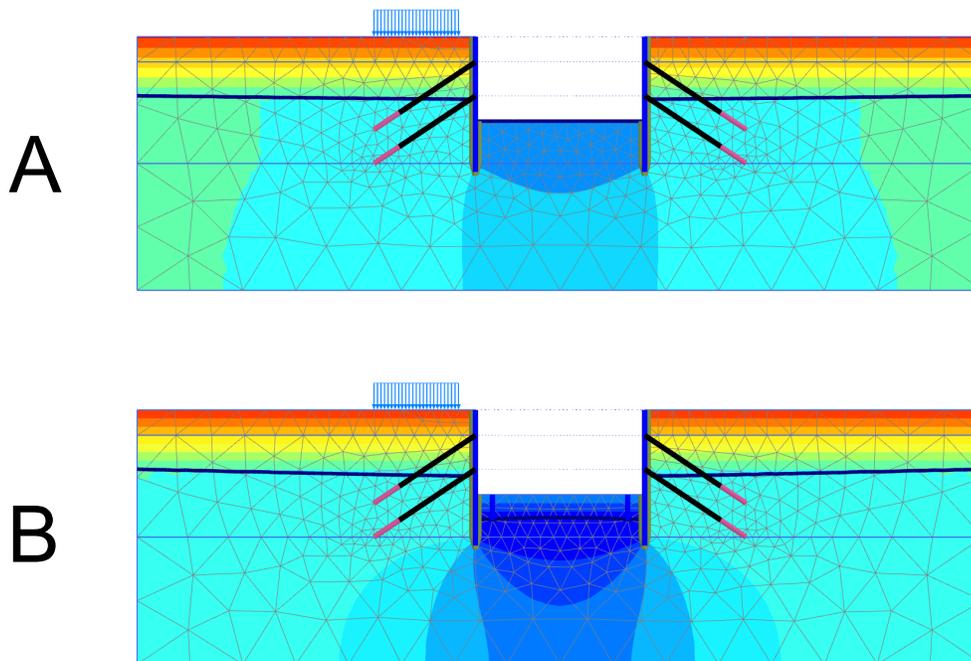


Figure 116: Comparison of the resulting groundwater head

A: Groundwater head (Phase 6 in the tutorial [Dry excavation using a tie back wall \[ADV\]](#) (on page 94))

B: Groundwater head (Phase 6 in the current project)