Plateia

by CGS Labs

HIGHWAY DESIGN

Tutorial

CGS LABS

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Highway design

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Table of Contents

4. INTRODUCTION

Open a new drawing.

Click on the CGS Labs tab and select the Plateia option.

1. Terrain

Plateia offers a very wide range of options for inserting points and creating terrain. It supports different surface types such as CGS Labs surface, BricsCAD surface, AutoCAD Civil 3D and 3D faces.

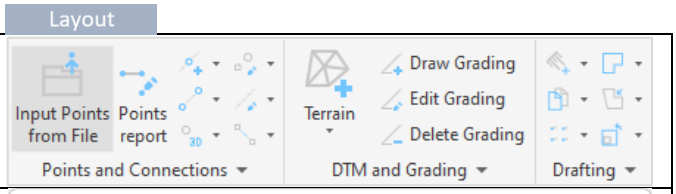
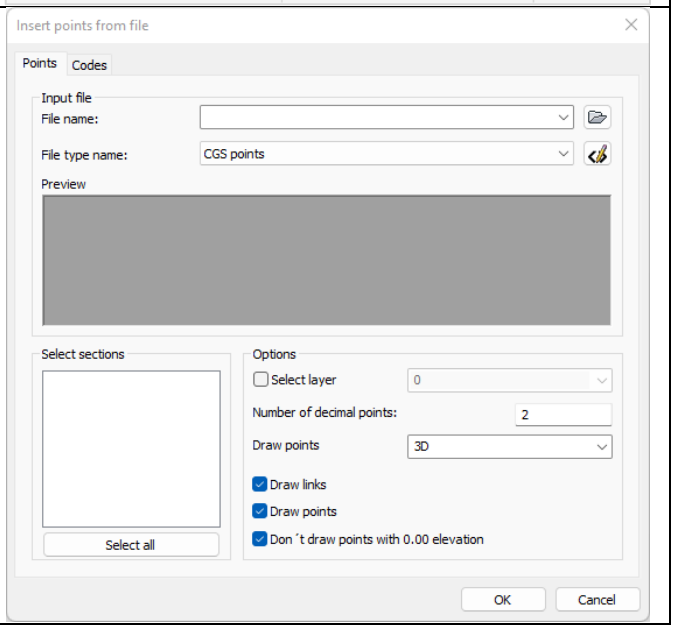
There is only one limitation, which depends on which platform you have the Plateia program installed on. If you install it on the Civil 3D platform, then Plateia will not support the BricsCAD surface. However, if it is installed on BricsCAD, it will not support the Civil 3D surface.

Plateia also enables Externals Surfaces. This means that you can have your surface in a separate drawing. The biggest advantage of this is that there is a smaller amount of data in the project drawing and thus better manageability.

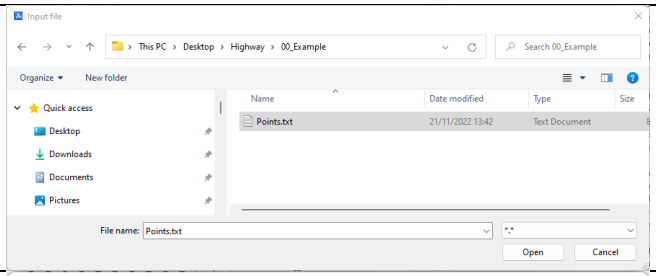
In this tutorial two options will be shown:

- **input points from file** and
- **import from Google Maps**.

1.1 Input points from file

1. Click on the Layout tab and run the Input Points from File command.	
2. It opens a new dialogue box, where you define the file with points and set which data should be imported into the drawing.	

3. Click on the Folder ( ) icon and find the Points.txt file. Select it and press Open.



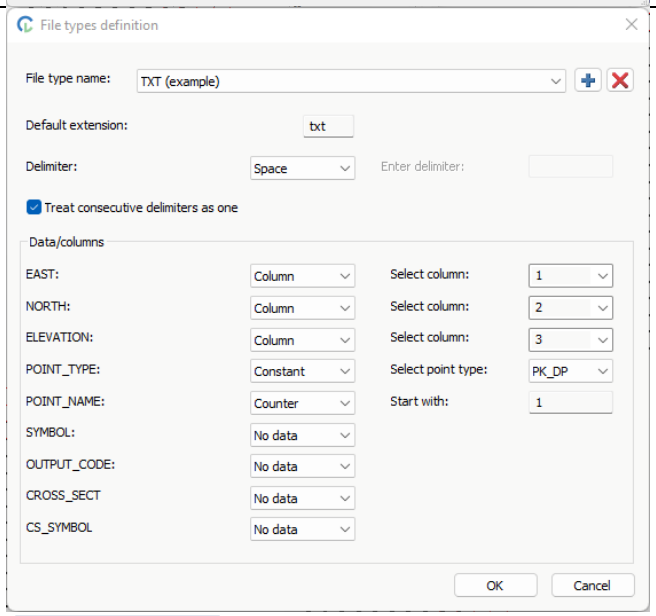
4. Then click on the Pencil ( ) icon. It opens a new dialogue box, where you set which columns contain which data.

5. Press on the Plus button ( )to define a new file type name.

6. Then define the extension.

7. For the delimiter select the **space** from the drop-down menu and check the box at Treat consecutive delimiters as one.

8. Then it is necessary to define which column in the txt file represents which data. When you have finished, press the OK button. (*NOTE! Point_name is optional. You can select the No data option and command will still insert all the points in the drawing, but the name of all points will be 0.*)



EAST	NORTH	ELEVATION
222988.833	1930183.595	564.787
222661.302	1930158.489	564.594
222631.564	1930158.896	564.577
222691.040	1930158.083	564.332
222750.516	1930157.270	561.086

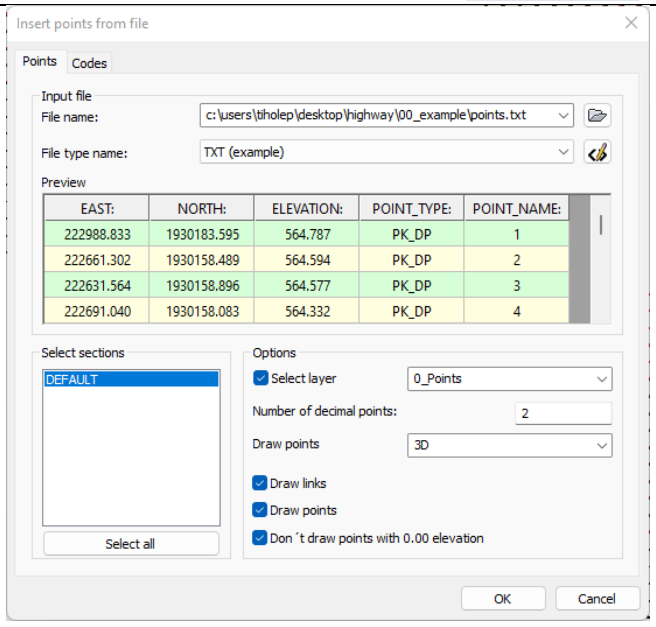
9. Select the newly defined file type name from the drop-down menu and if you have defined everything correctly, the data from the file will be automatically displayed in the table.

10. Check the box at the Select Layer and type 0_Points. You can also select a pre-defined layer from the drop-down menu.

11. Type 2 for the number of decimal points.

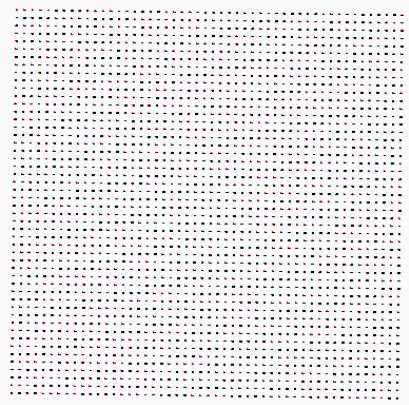
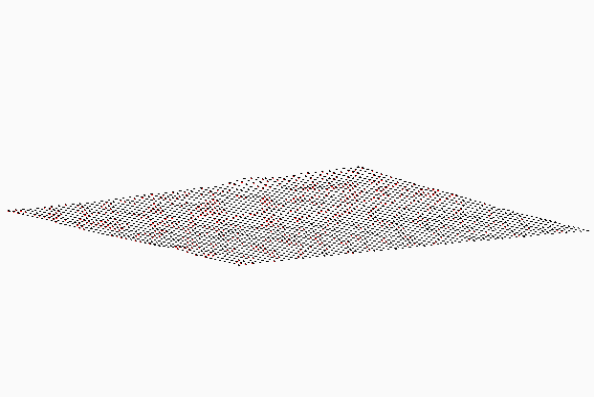
12. In the draw points option, select 3D from the drop-down menu.

13. Uncheck the box at the Draw links option and check Draw points and Don't draw points with 0.00 elevation boxes.

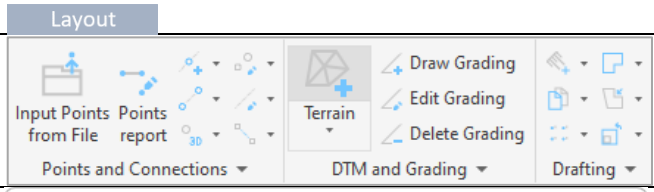
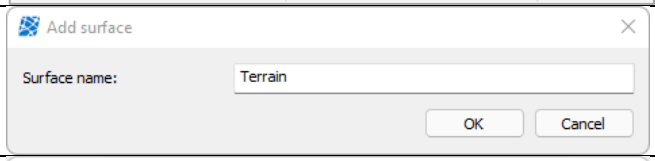
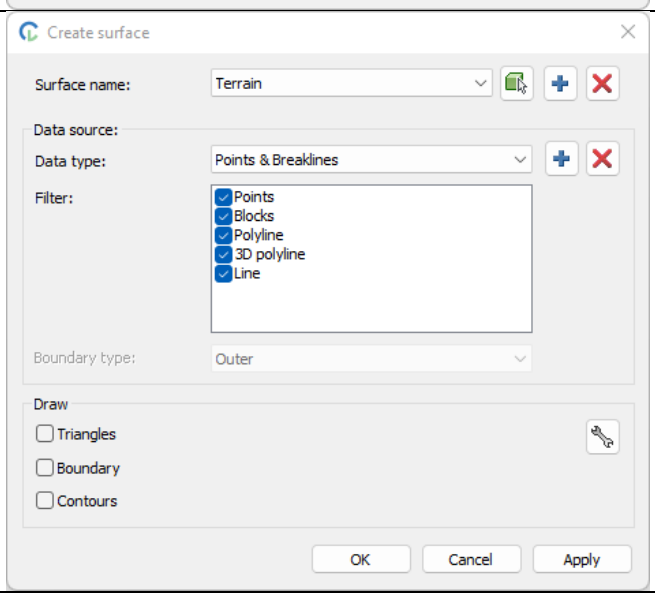


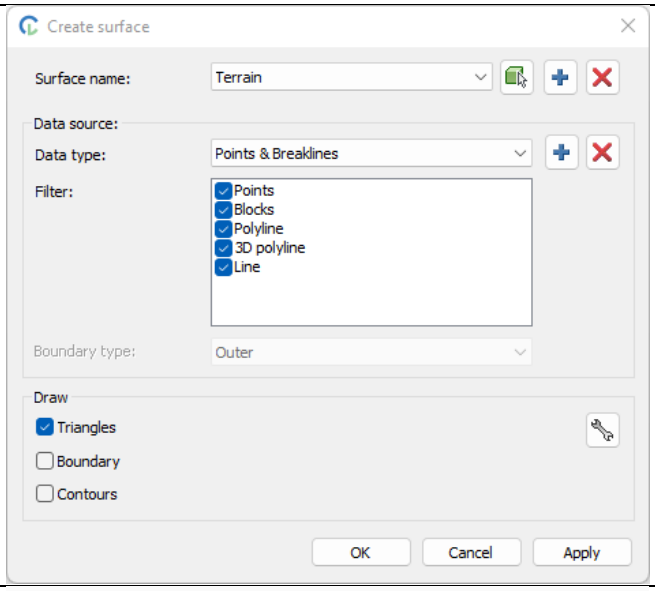
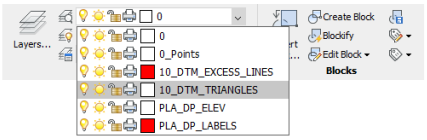
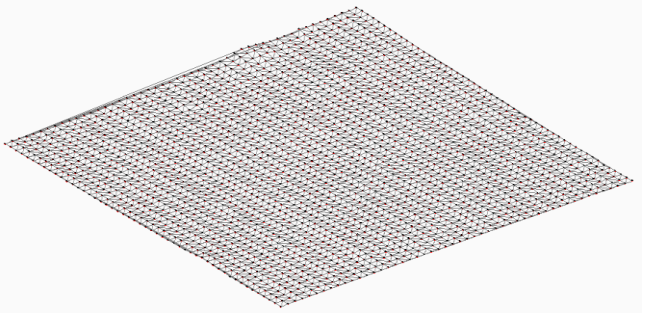
14. Confirm parameters by clicking the OK button.	

The points are now inserted in the drawing. These points are defined as blocks. Based on those inserted points, we will create the terrain in the next step.

Top View	3D View
	

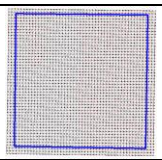
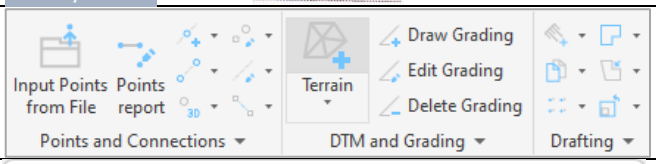
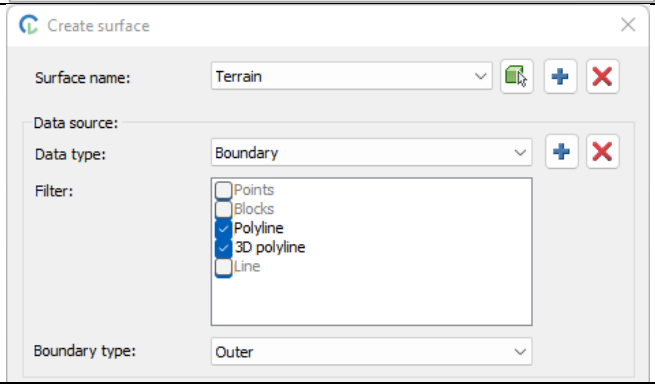
4.1 1.2 Create terrain

1. Click on the Terrain icon.	
2. Define a surface name and press OK.	
3. As input data in the drawing are elevation points, you select "Points & Breaklines" option from the drop down-menu. Then click on the Plus button ( ), select all the points in the drawing and press Enter. 4. After that you need to choose the way the terrain will be shown in the drawing. There are several different ways available. If you do not check any of the options and confirm by clicking OK, the drawing won't change, but the software will remember the terrain and use it for drawing the profile and cross-sections.	

5. To show the terrain as triangulated irregular network click again on the Terrain icon. Check the Triangles box at the bottom of the dialog and press OK.	
If you want you can then simply change the colour of the terrain by changing the colour of the layer. 	

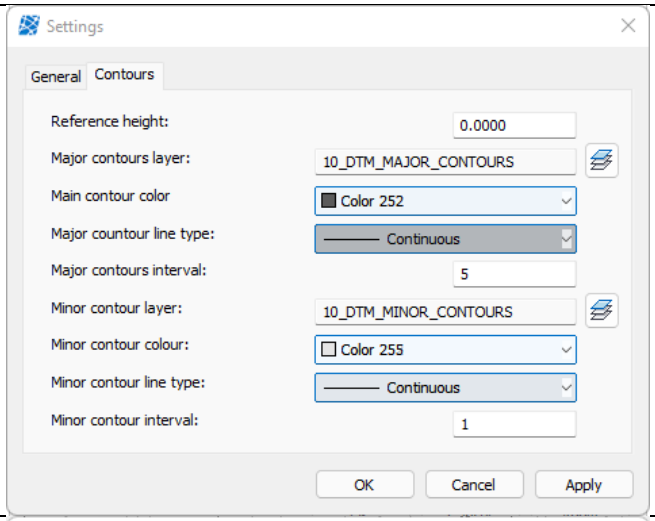
4.1.1 1.2.1 Edit terrain

To edit terrain run the Terrain command again and select terrain you want to edit from the drop-down menu.

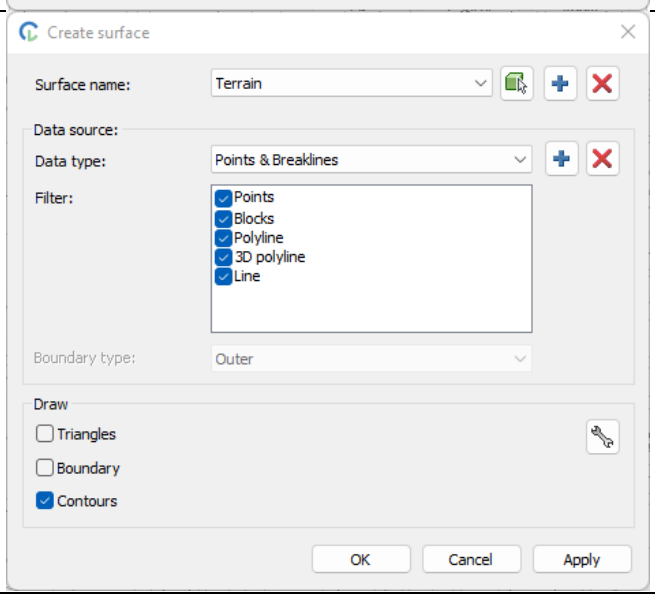
1. First, type a PLINE in the command bar and draw a 2D polyline that represents a boundary. (*NOTE! You can also draw a 3D polyline.)*	
2. After that run the Terrain command.	
3. Select the boundary option from the drop-down menu, and then select Outer for the boundary type. Press Plus ( ), select boundary directly in the drawing and press Enter. 4. Press apply and terrain and the terrain will be reduced to the boundary area.	

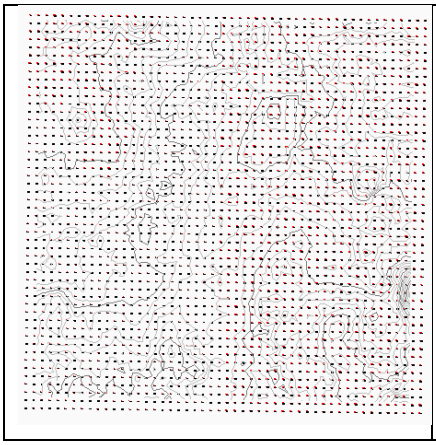
If you want, you can also display terrain with contours.

5. Click on the settings ( ) button and select contours on the top of the dialog. Then define major contour colour and major contour interval. You also have to define minor contour colour and minor contour interval and then confirm clicking OK.



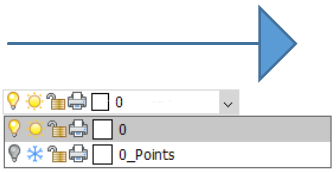
6. Uncheck the triangles box and check boundary and contours boxes. Confirm by pressing the OK button and your terrain is ready.





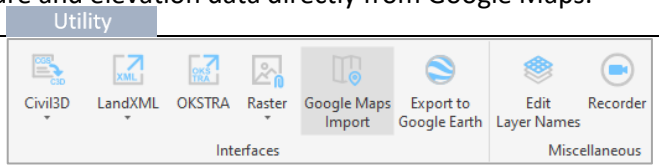
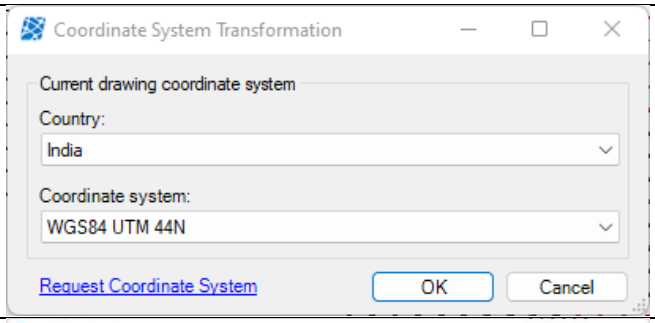
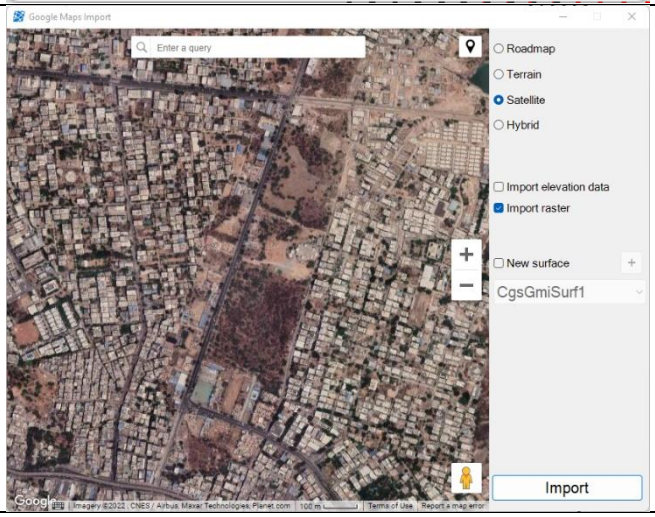
HIDE POINTS

You can hide points by hiding the layer they are on.



4.2 1.3 Import raster picture from Google Maps

The user has the option to import raster picture and elevation data directly from Google Maps.

1. Click the Utility tab and run the Google Maps Import command. 2. Click this icon .	
3. Select country and coordinate system from the drop-down menu: - country: India. - coordinate system: WGS84 UTM 44N	
4. Check the boxes at the Satellite and the Import raster options. 5. Uncheck the box at the Import elevation data and New surface option, because we have already inserted points and created terrain. 6. Click Import. We now have a raster image inserted into the drawing, which serves as a background.	

4.3 1.4 Export points

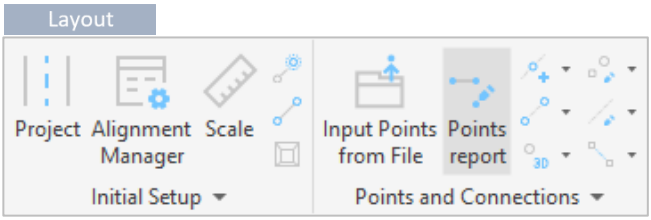
4.3.1 1.4.1 Export points directly to Excel file

The user can also export the points from the drawing to an Excel file. This newly generated csv file can then be opened in the **Auto Plotter** software.

1. Click on the Points report icon.

2. Select CGS points in the drawing and press Enter.

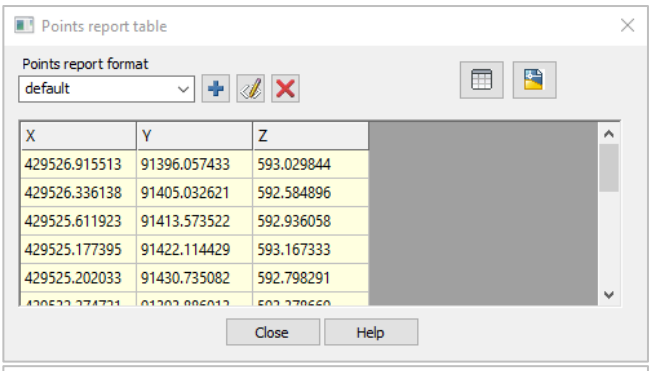
3. The Points Report Table dialogue box opens.

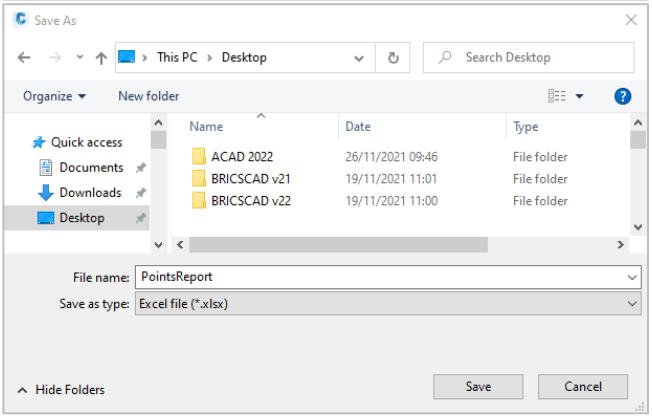


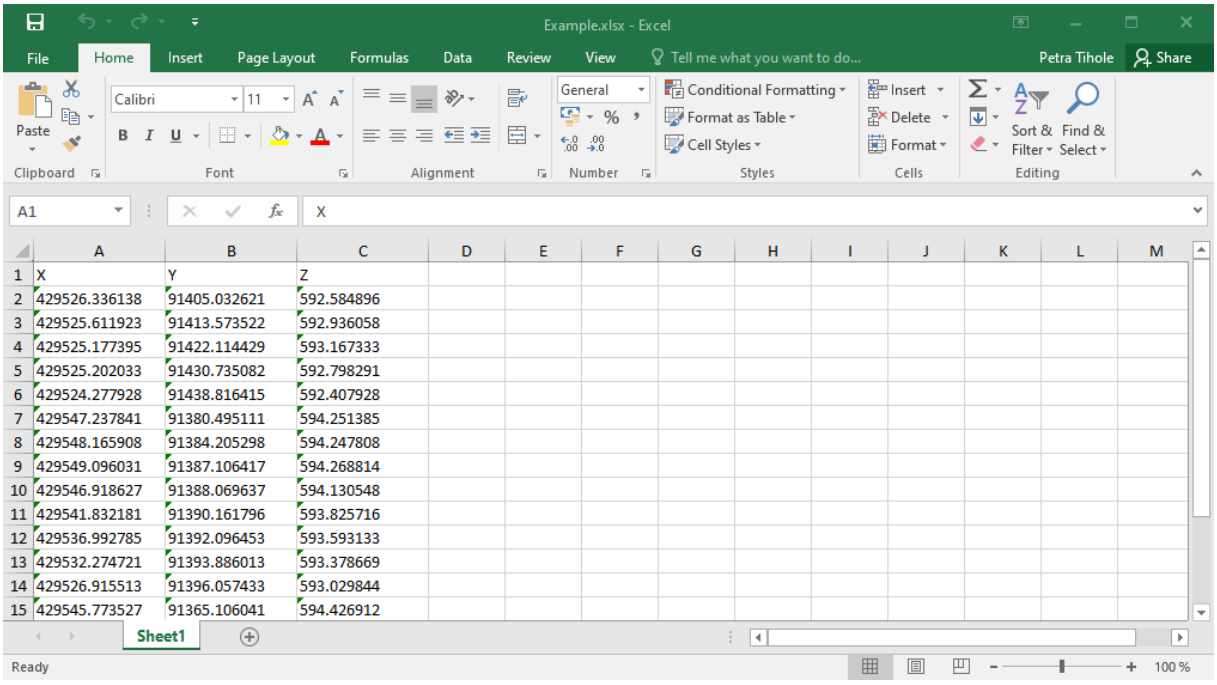
4. Click on this  button to export the points report to the xls file.

5. Specify the location of the file and confirm by pressing the Save button.

6. Then a new Excel file with the data of the selected points opens.



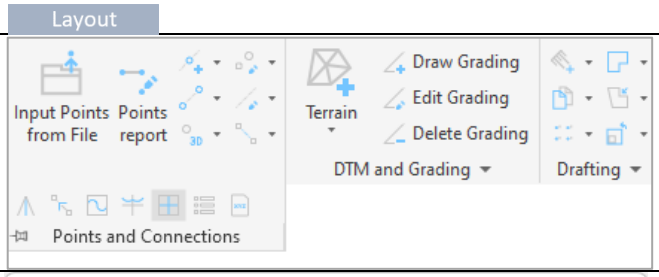
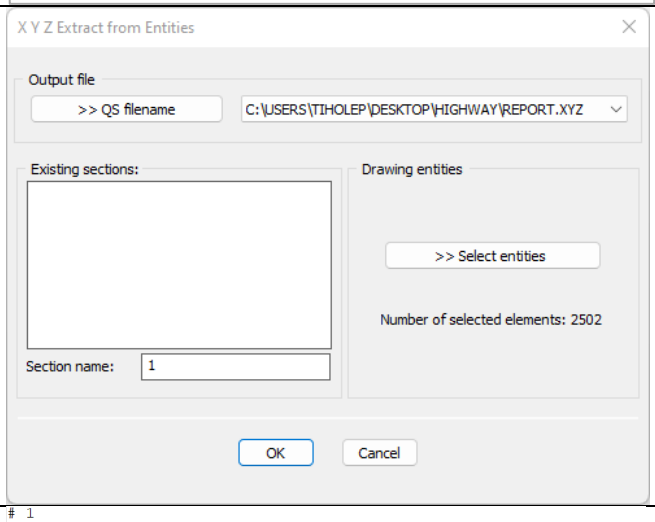
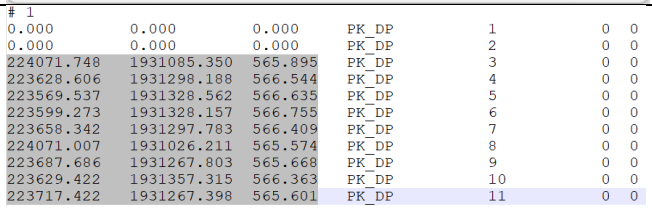




	A	B	C
1	X	Y	Z
2	429526.336138	91405.032621	592.584896
3	429525.611923	91413.573522	592.936058
4	429525.177395	91422.114429	593.167333
5	429525.202033	91430.735082	592.798291
6	429524.277928	91438.816415	592.407928
7	429547.237841	91380.495111	594.251385
8	429548.165908	91384.205298	594.247808
9	429549.096031	91387.106417	594.268814
10	429546.918627	91388.069637	594.130548
11	429541.832181	91390.161796	593.825716
12	429536.992785	91392.096453	593.593133
13	429532.274721	91393.886013	593.378669
14	429526.915513	91396.057433	593.029844
15	429545.773527	91365.106041	594.426912

4.3.2 1.4.2 Export points directly XYZ file

The user has also an option to export points to XYZ file. This command also enables to export CAD points.

1. Run the XYZ Extract from Entities -> XYZ command.	
2. Click >>QS filename and define the location and the name of the output file. 3. Then click on the >> Select entities button and select all the points in the drawing. 4. Press OK.	
5. Find the newly created file and open it with the Notepad (default software in Windows) or with Notepad++. Notepad++ is a free software, which enables you more options. For example, to copy only certain columns. Download free software here: https://notepad-plus-plus.org/downloads/	

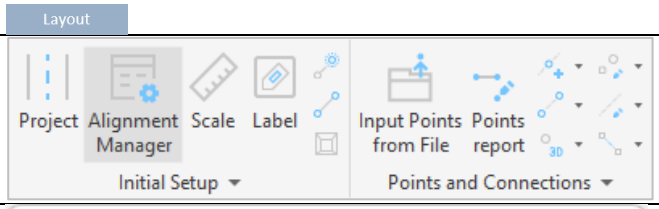
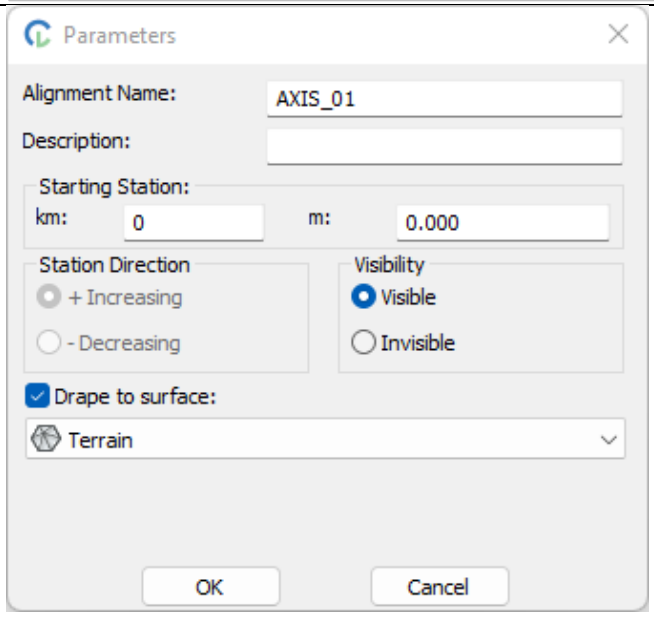
2. Horizontal alignment

First, you define the name of the alignment and its basic parameters (design speed). After that you draw an alignment. There are several different methods available in Platea for drawing axes. In this tutorial, the tangent polygon method will be used. But in the Plateia software you can find the following methods:

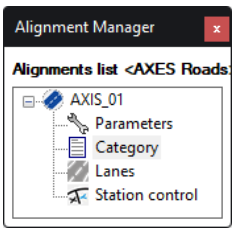
- Draw with floating elements: https://cgs-labs.zendesk.com/hc/en-us/articles/1500000555961-Draw-with-Floating-Elements
- Draw with stick method: https://cgs-labs.zendesk.com/hc/en-us/articles/360060888513-Draw-with-Stick-Method
- Convert PLINE to alignment: https://cgs-labs.zendesk.com/hc/en-us/articles/360059061454-Convert-Pline-to-Alignment
- Create Best Fit Alignment: https://cgs-labs.zendesk.com/hc/en-us/articles/360060888893-Create-Best-Fit-Alignment

It will be easier if you watch the video. Please click on the button on the right.	

4.4 2.1 Define a new alignment

1. Click on the Layout tab and run the Alignment manager command.	
2. Define the Alignment Name. 3. Check the box at the Drape to surface and select the existing surface Terrain. 4. When you have finished, confirm parameters by clicking the OK button. After that, a new dialogue box named Alignment Manager opens. This is intended for the management of alignments present in the drawing. In this dialogue box, you can then edit axis parameters, category and station. You can also add new or delete the existing axis directly in this dialogue with the right click anywhere in the window.	

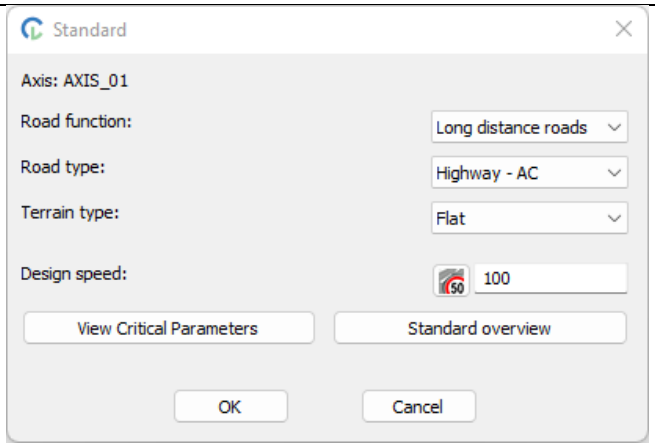
5. In the Alignment Manager dialogue box double-click on the Category.



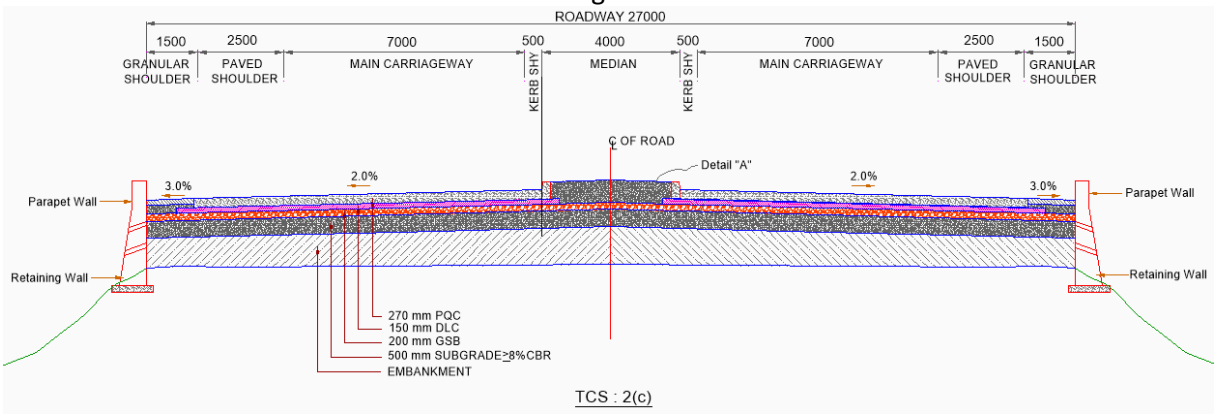
In Standard dialogue box define the following:

- Road function: Long distance roads
- Road type: Highway - AC
- Terrain type: Flat
- Design speed: 100 km/h

6. Confirm by pressing OK.



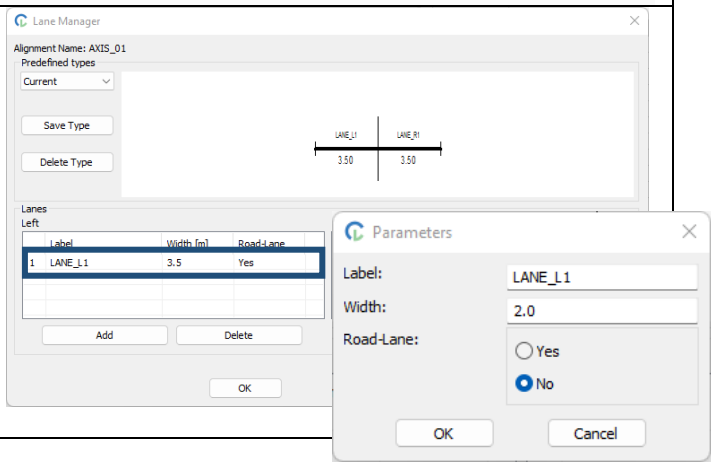
7. We will now define lanes based on the following characteristic cross-section:

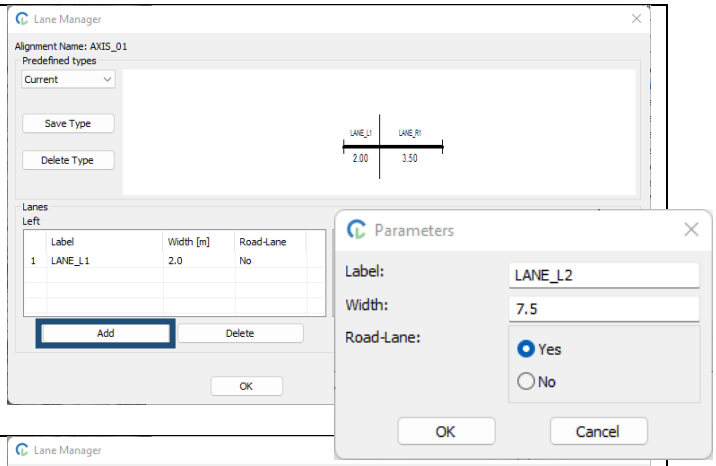
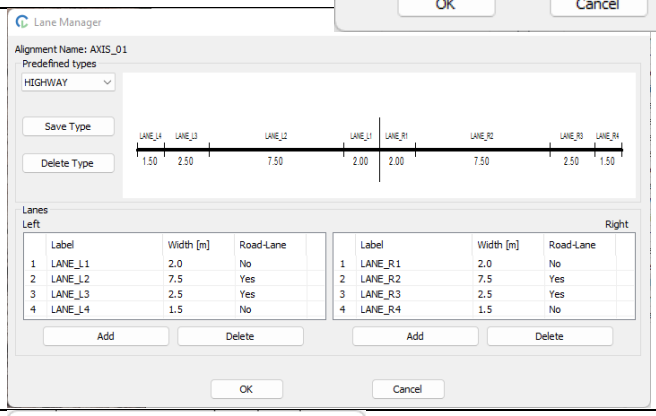
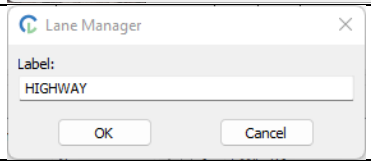


TCS : 2(c)

8. In Alignment Manager then double-click on the Lanes. At the top of the dialogue box, you have a list of predefined types of lanes. Select Default.

9. Double-click on the LANE_L1, change the width to 2.0 meters and check the box at the NO option. This means that this is not a lane on which vehicles will drive. This lane will always be a constant width. But if you chose Yes, the lane width would change (extend) in curves.

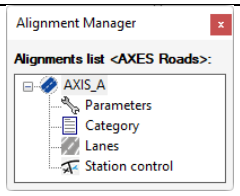


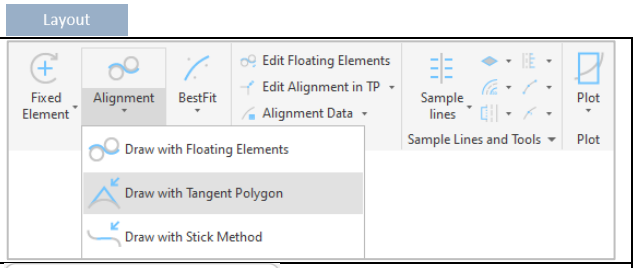
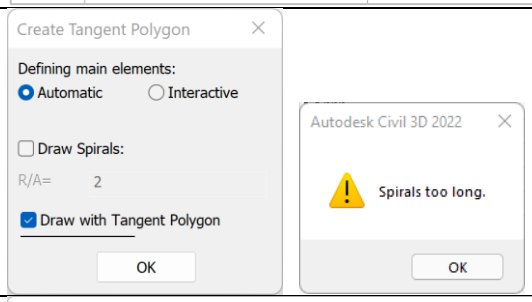
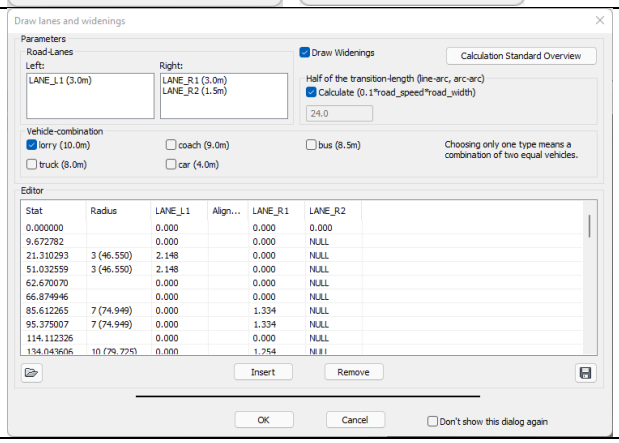
10. Then click Add and define the second lane on the left side. Define the width and check the box at the Yes option, because this is the lane on which the vehicles will drive.	
11. After that you add the rest lanes. Following the same procedure, you then add the lanes on the right. In the image on the right, you can verify if you have entered all the parameters correctly. If you find any differences simply double-click on that lane and correct it.	
12. Customized lane type can be saved under its own name in the predefined types rubric for later use. You can then use them in a new project. Click Save Type button and define the name.	
In the following folder, you can find cgsa_lanes.sqlite file, where all the predefined types are saved. You can also send this folder to your co-worker: C:\Users**tiholep**\AppData\Roaming\CGSA**CGSApps 2023 ENG**	
13. When finished, confirm by pressing the OK button.	

4.5 2.2 Design Alignment – Draw with Tangent Polygon

As it was written earlier, you can use different methods to draw alignments. In this tutorial, the tangent polygon method will be used.

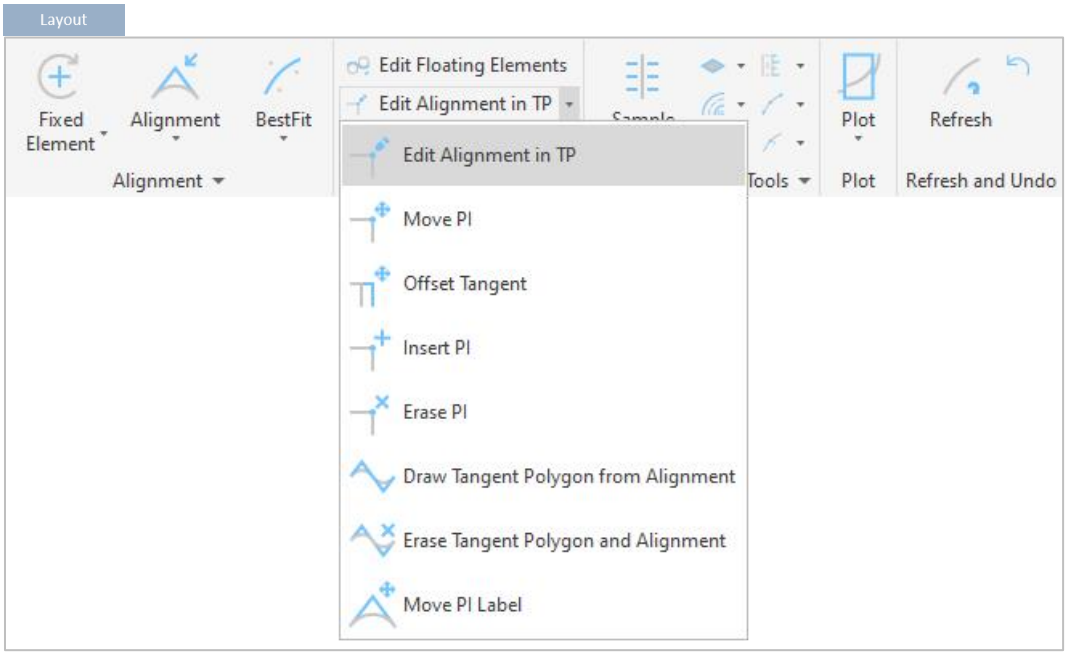
Using a method *Tangent polygon*, you can describe any combination of main elements. You can interactively insert a tangent polygon across which the main elements are drawn.

IMPORTANT! Before you start drawing an alignment you have to always check that this alignment is set as active (the icon next to the alignment name is coloured blue). If it is not, double click on the axis in the Alignment Manager.	

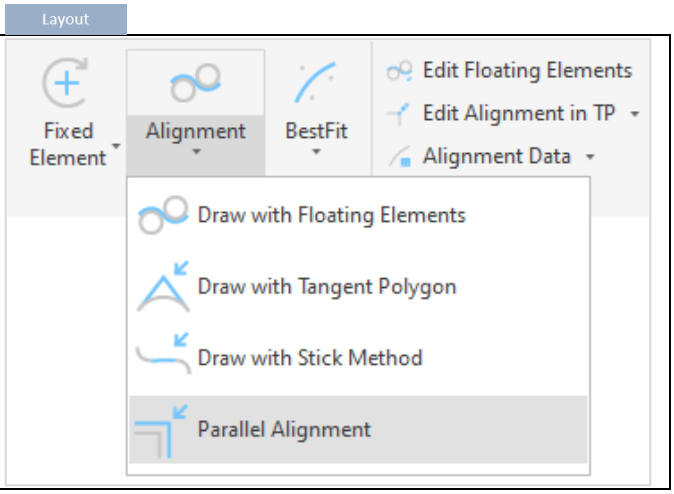
1. Run the Draw with Tangent Polygon command.	
2. In Create Tangent Polygon dialogue box, parameters are set to default. Confirm by clicking OK. Select the first point of the tangent polygon in the drawing. Continue inserting a tangent polygon interactively. The main elements are drawn across it. Finish by pressing Enter.	
3. The Draw lanes and widening dialogue box opens. The program calculates individual lane widening. You can change parameters, import or save widenings in a file or check a calculation standard. 4. Confirm by clicking the OK button.	

4.5.1 2.2.1 Edit the Alignment

Using the tools from the alignment section you can easily edit the Alignment any time.



4.5.2 2.2.2 Parallel or copied alignment

When we create a conceptual design, we normally make several alignment variants. We usually make a basic variant, but then we create other solutions by changing the basic one. To avoid having to draw each alignment again, you can use the Parallel alignment command. After running the command, you define reference alignment, parallel alignment name and offset. If you define 0 for the offset, this command will create a copy of the alignment.	

4.5.3 2.2.3 Join two alignments from different drawings

Sometimes two designers design their own part of the road, which they then want to combine into a single one. In the Plateia software, you have several options for combining two or more parts of the road into one.

One way is to copy, for example, the 2D polylines representing the alignment of the first and second part into a new drawing. Join these polylines with the Join command, then convert them into one alignment with the Convert Pline to Elements command.

Another way is to export the first and second axes to an AXS file. Then you open these two files. Copy the data from the second file into the first file and delete the name of the second axis. Save the file and import alignment into a new drawing.	

4.6 2.3 Sample lines

Continue with defining Sample lines on the alignment. Plateia offers a variety of tools for designing Sample lines.

NOTE! You can also create a profile view first and then define sample lines, before inserting cross-section view.

1. Click on Sample lines icon.

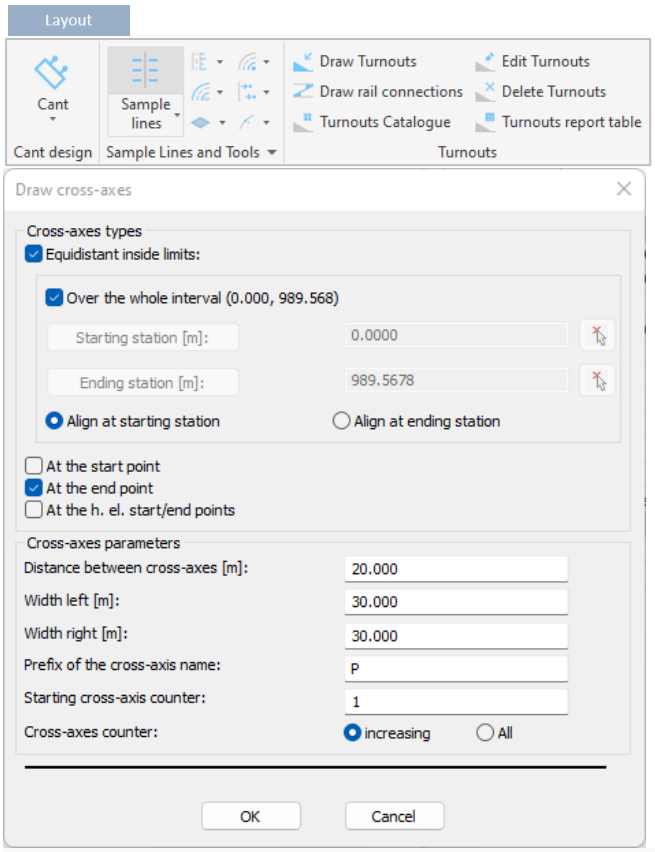
Draw cross-axes dialogue box appears. Sample lines are created equidistantly along the whole alignment (check Over the whole interval option).

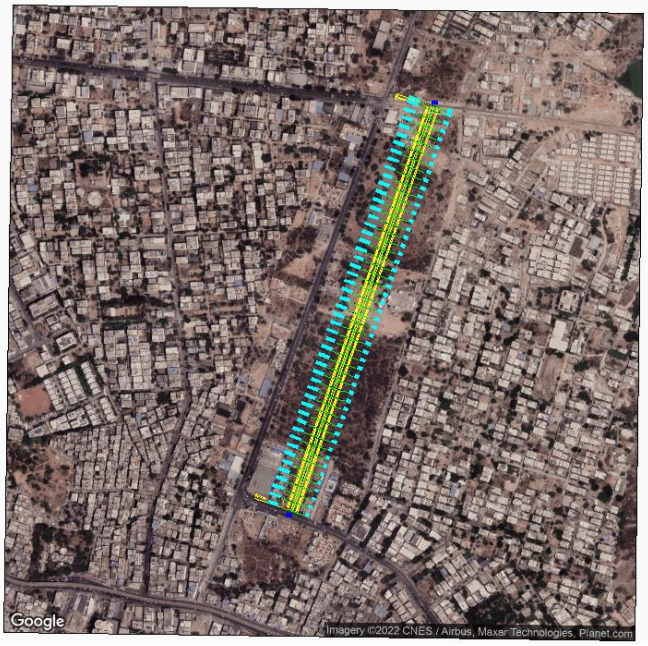
Specify whether sample line is created at the start/end station and in horizontal elements' start/end points.

2. Define Distance between sample lines and Width left/right.

3. Define Prefix of sample line name and Starting counter.

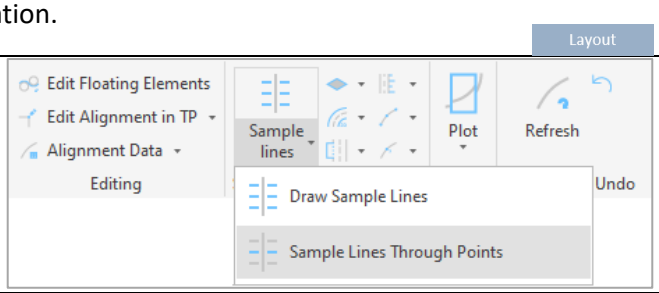
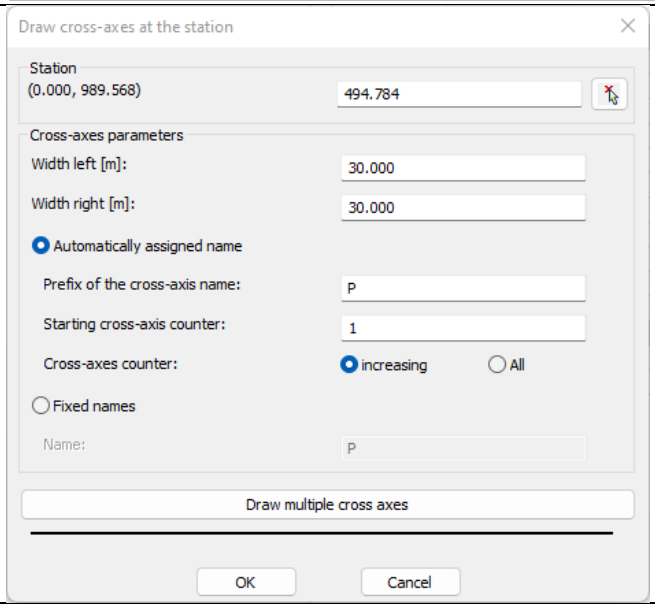
4. Confirm with OK.



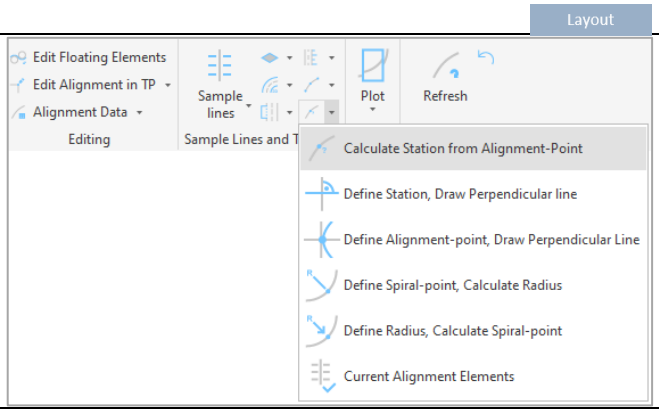


4.6.1 2.3.1 Sample line at the specific station (chainage)

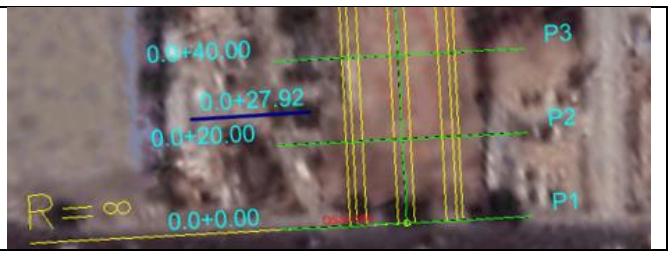
You can also add chainage at the specific location.

1. Run the Sample Lines Through Points command.	
2. You can now type the station (chainage) in the upper space or click this icon and define station directly in the drawing. If you want to specify several stations in the drawing at the same time, then click on the Draw multiple cross axes button, which is in the lower part of the dialogue box. 3. When you have finished, click OK.	

Information about the station (chainage)

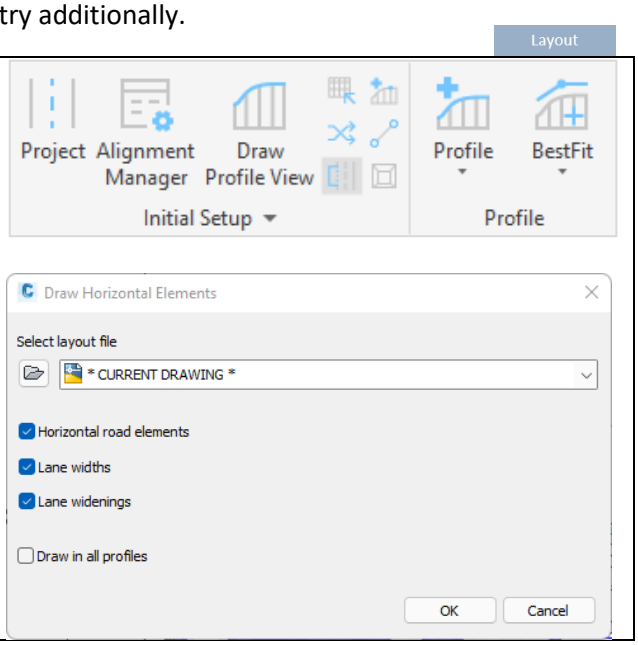
If you're just interested in the value of station at a specific point, you have several commands in Plateia. *NOTE! In order to run the Define station, Draw Perpendicular line and Define Alignment-point, Draw Perpendicular Line commands, you must also have a longitudinal profile in the drawing.*	

Calculate station from alignment-point

This command calculates the station, displays it on screen, and generates an appropriate station label.	

4.6.2 2.3.2 Draw alignment geometry

In case you did not check the option »Draw Horizontal Elements« when defining alignment parameters, you have to draw alignment geometry additionally.

1. Click on the Profile tab and run the Draw alignment geometry command. 2. In the dilaog box specify the layout file (input data) and check all the possible options. 3. Confirm by clicking OK.	

3. Vertical Alignment

3.1 3.1 Draw profile view

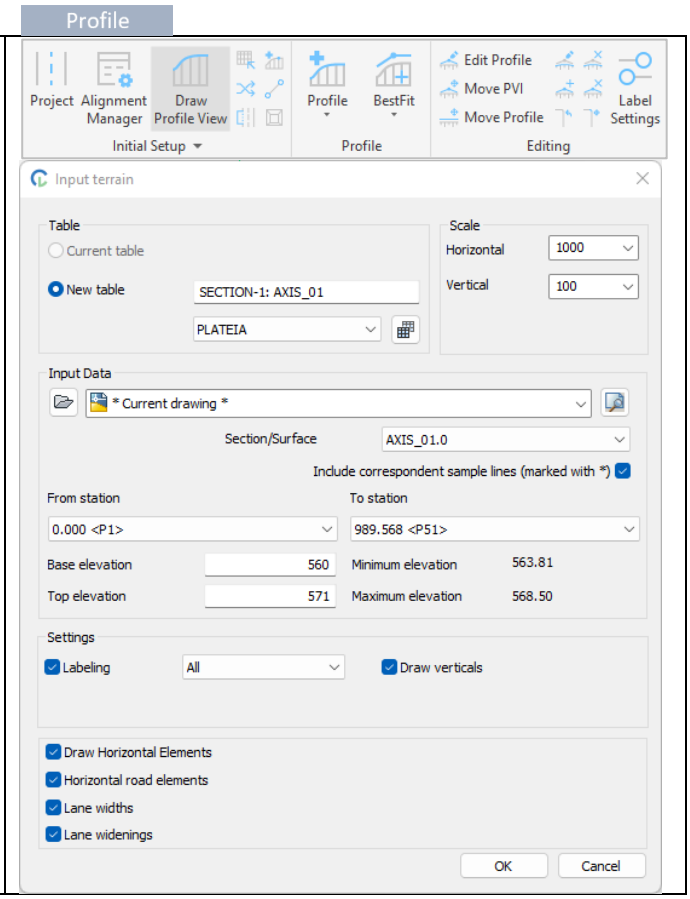
This command reads the data from the source DWG file or LON file, which contains the profile's terrain data and draws the appropriate terrain line. It also enables the user the schematic drawing of horizontal road elements to the active profile.

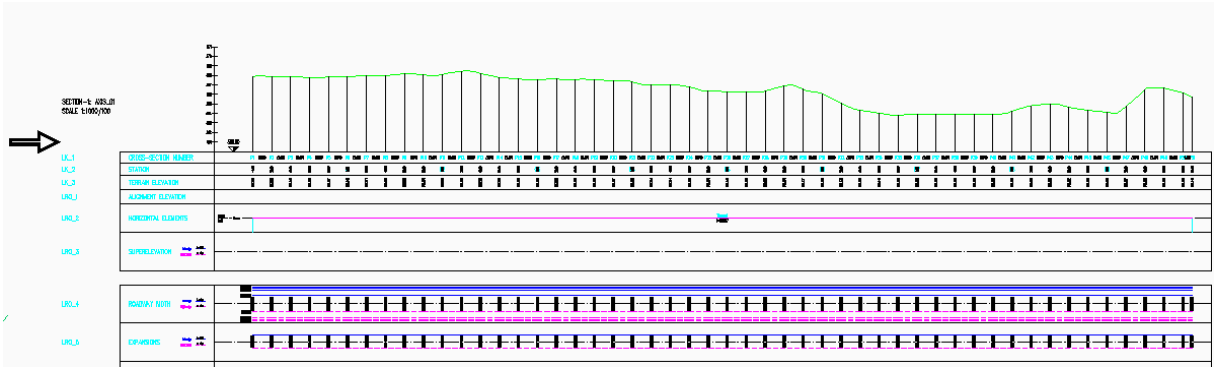
1. Click the Profile tab and run the Draw Profile View command.

2. In Input terrain dialog box specify:
   Scale: 1000:100
   Input Data: current drawing
   From Station: select the first sample line
   From station: select the last sample line
   Check: Labeling
   Draw verticals
   Draw horizontal elements
   Horizontal road elements
   Lane widths
   Lane widenings

3. Confirm by pressing OK.

4. Define the insertion point in the drawing.





3.2 3.2 Draw profile

In a profile view, you can insert tangents by selecting vertex points interactively. The other option is defining parameters in a dialogue box after selecting the first tangent point in the drawing.

1. Click on the Profile icon.

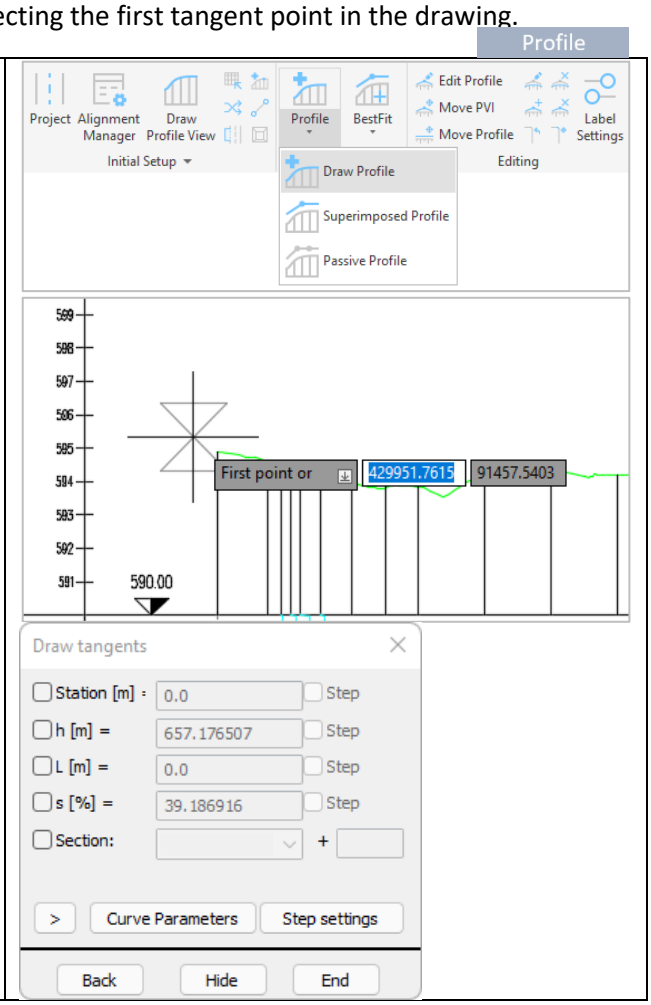
2. Select first tangent point in the drawing. Draw tangents dialogue box opens.

3. You can define vertex points interactively in the drawing, or you can specify tangent parameters in dialog box.

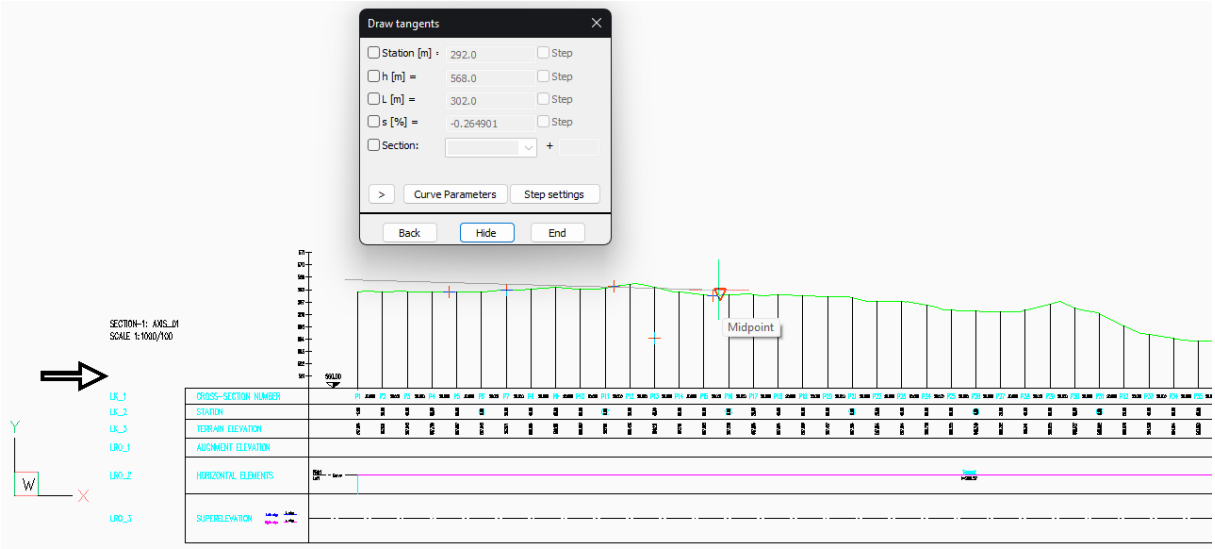
You can specify the following parameters:

- Station,
- Height,
- Tangent length,
- Slope and
- Section.

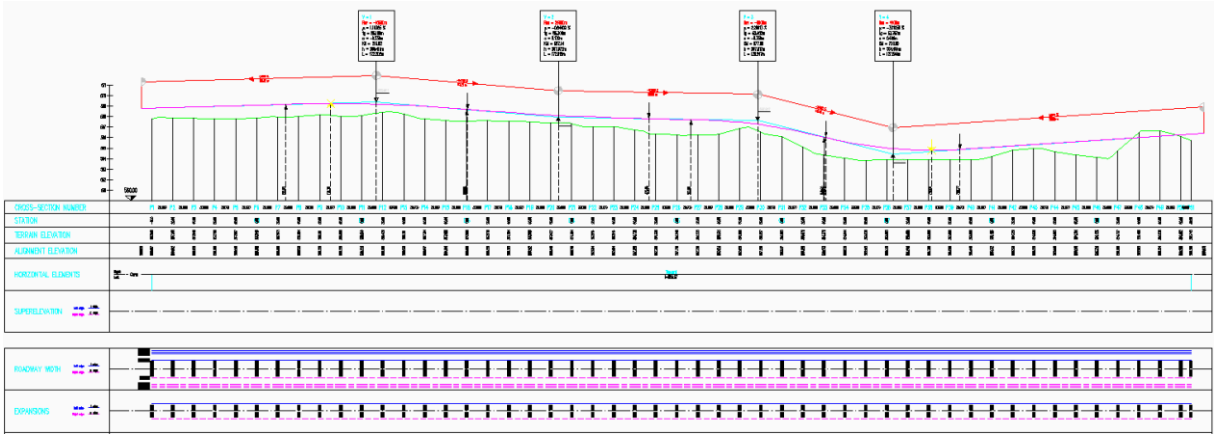
(You can specify two parameters at a time.)



When drawing tangents, a preview of vertical alignment is shown based on the next tangent point/parameters selected.

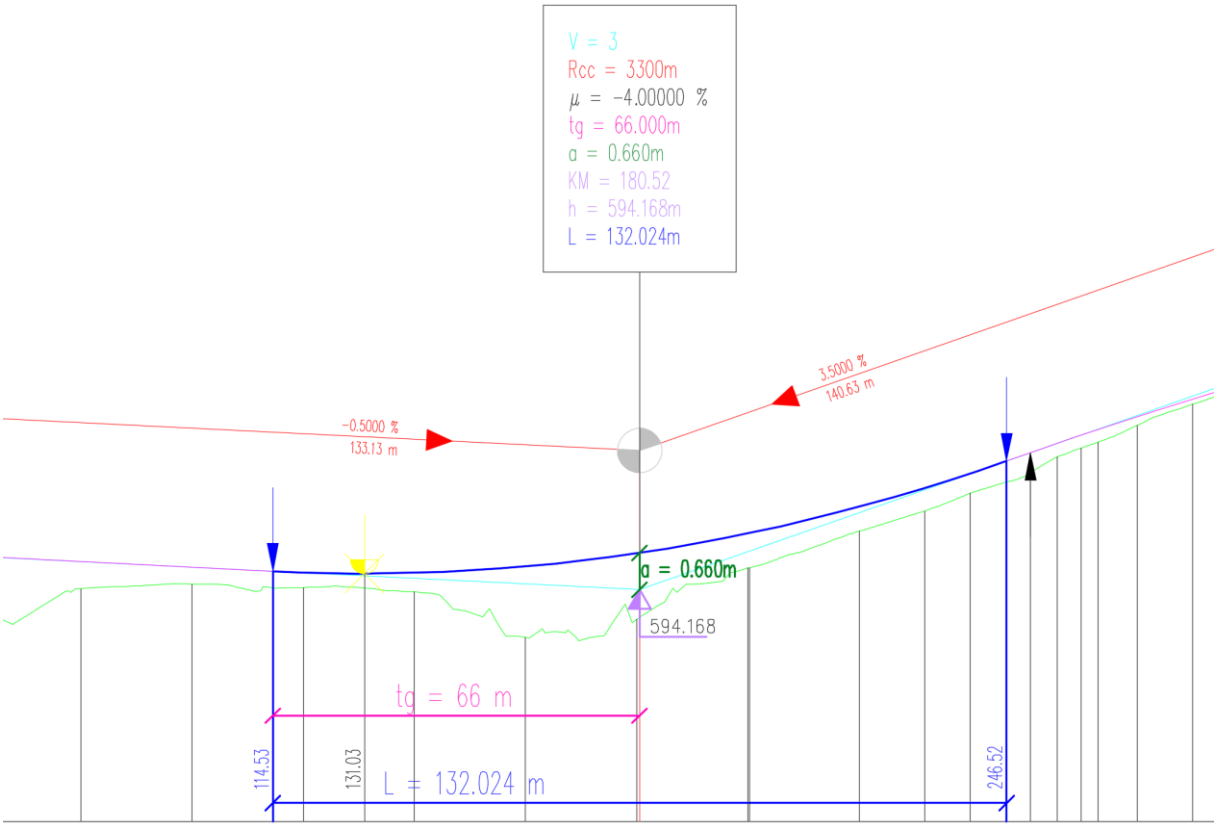


4. When finished, press Enter. Vertical alignment and tangents are drawn and labelled in the drawing.



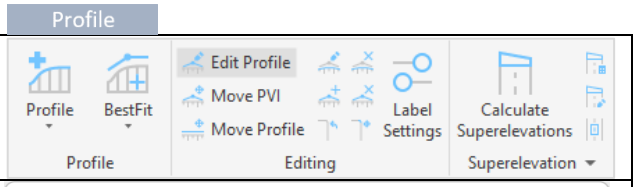
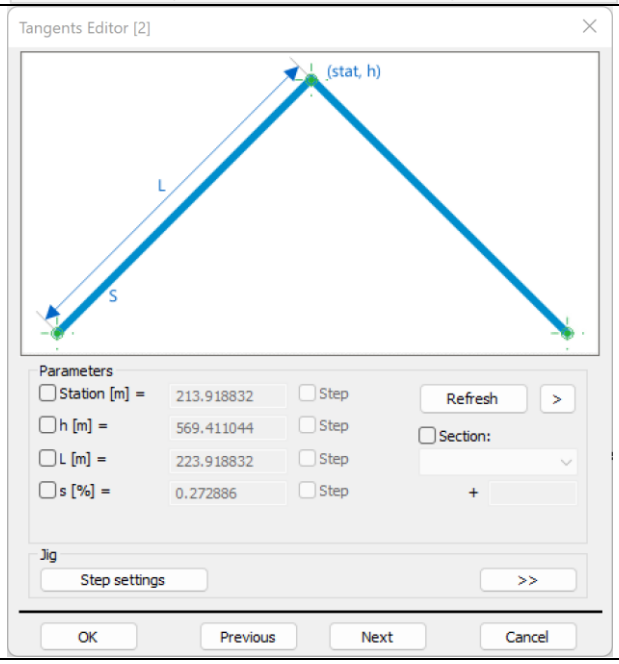
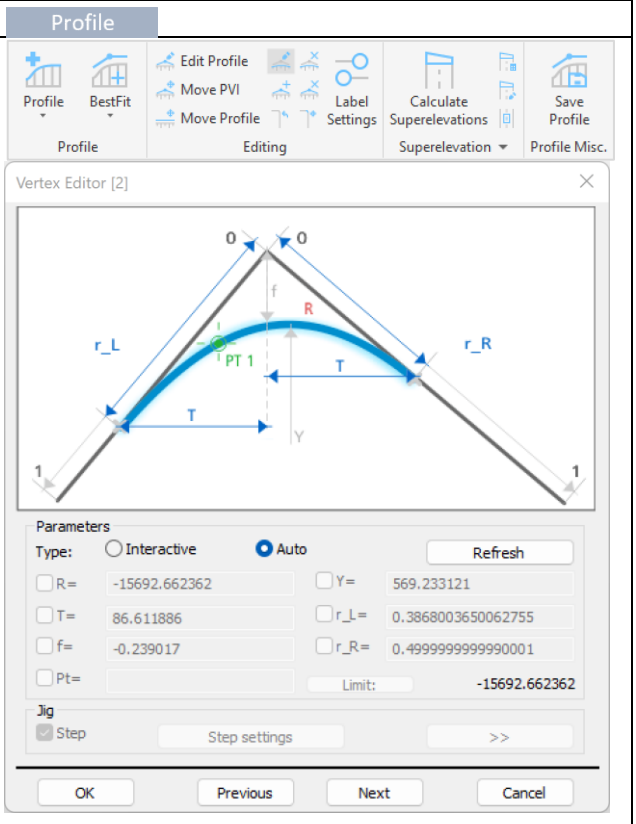
The following figure shows the meaning of the parameters that are displayed in the profile:

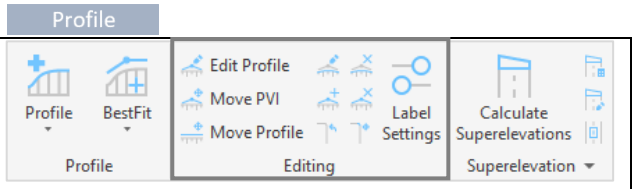
- Rcc/Rcv: the size of the radius of concave/convex vertical curve,
- μ: difference of grades of adjoining tangents,
- tg: tangent of curvature arc,
- a: Distance between vertical curvature and tangent,
- KM: the station of the apex point – refraction of tangents,
- h: the elevation of the apex point and
- L: the length of the vertical alignment curvature.



3.2 Profile editing

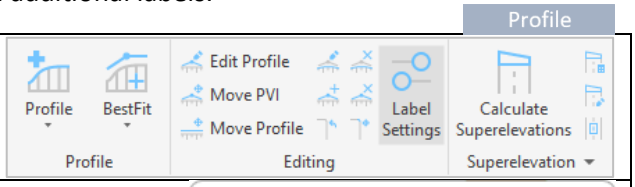
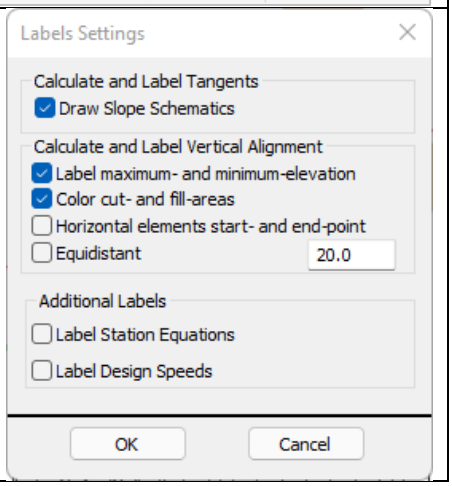
You have many commands for profile editing in the Editing tab. For example, you can edit geometry of the drawn tangents with the Edit Profile icon.

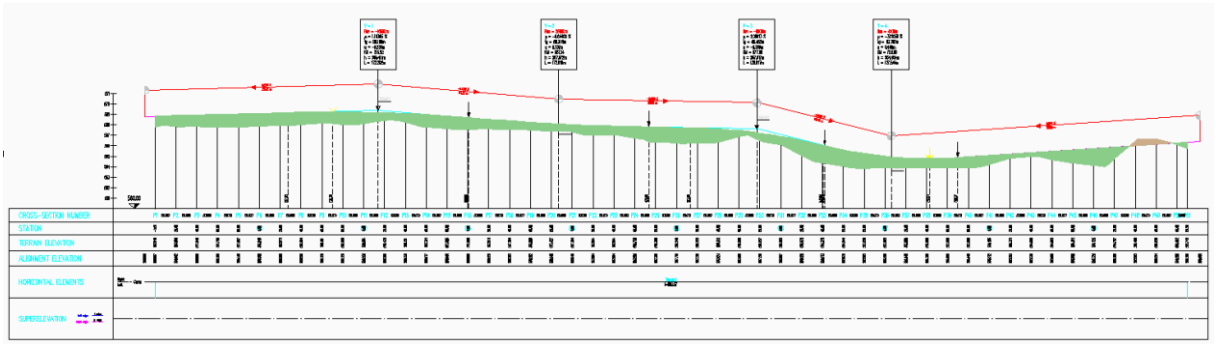
1. Click on the Edit profile icon.	
2. Select the tangent in the drawing you want to edit. 3. In Tangents Editor dialogue box, check the parameter you want to edit and define new value. 4. Move forward to the next tangent vertex with the button Next. 5. When finished, click OK.	
You can also edit vertical curves.	
1. Run the Edit Vertical Curve command and select the tangent. 2. Check the box at the Interactive option. 3. Then check the parameter you want to edit and define a new value. 4. Move forward to the next vertex with the button Next. 5. When finished, click OK.	

You can also edit geometry of the drawn tangent with the following commands: – *move PVI,* – *insert PVI,* – *delete PVI,* – *move profile,* – *rotate profile,* – *change vertical curve,* – *erase single vertical curve,* – *reposition vertical curve labels.*	

3.2.1 3.2.1 Labels

You can change labels settings, including slope schematics, labelling maximum and minimum elevation, colour cut and fill areas, horizontal elements and additional labels.

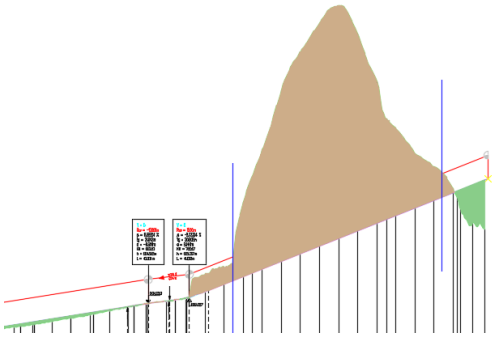
1. Run the Label Settings command.	
2. Check the box at the Color cut- and fill-areas. 3. Confirm by pressing the OK button. 4. Press Enter.	



The tunnel example

For example, if we have a tunnel, then we do not want the cut hatch to be drawn in this area.

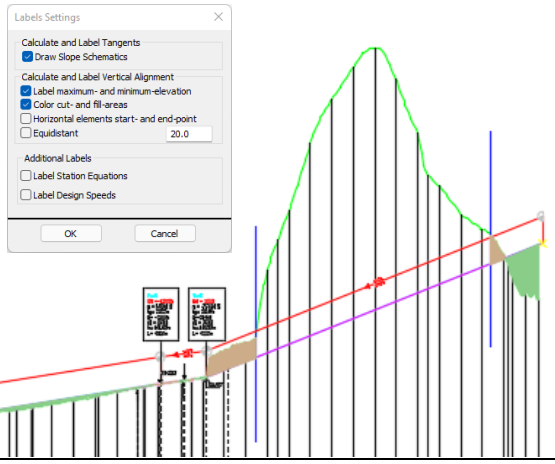
As you can see in the picture on the right, the tunnel area is hatched. You can change this quickly.



1. Draw two lines that represents the start and the end of the tunnel. Use the CAD's Line command to draw those two lines.

2. Run the Define Cut and Fill area (31G5) command, select polylines and press Enter. In the drawing, select lines element, which represents hatch-boundary. After selecting the line, press Enter.

3. Run the Label Settings command again and confirm by pressing OK. Make sure that the Color cut- and fill areas option is checked. Press Enter or define tangent-labels position in the drawing.

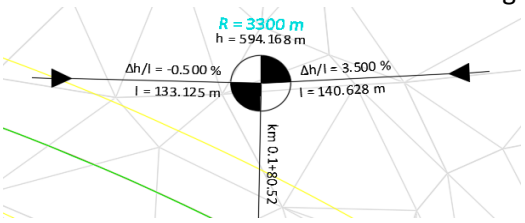


3.2.2 3.2.2 Draw Profile Labels command

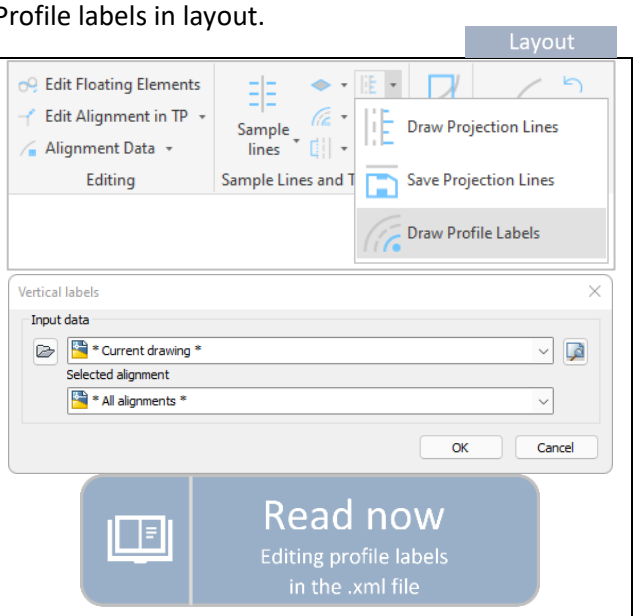
When you completed the profile, you can Draw Profile labels in layout.

1. Click on the Layout tab and run the Draw Profile Labels command.

A new dialog box opens, where the user defines input data. Confirm by pressing OK and the labels will be drawn in the drawing.

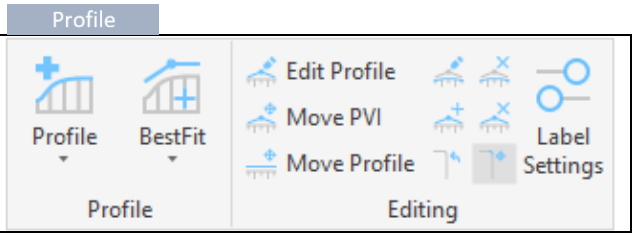


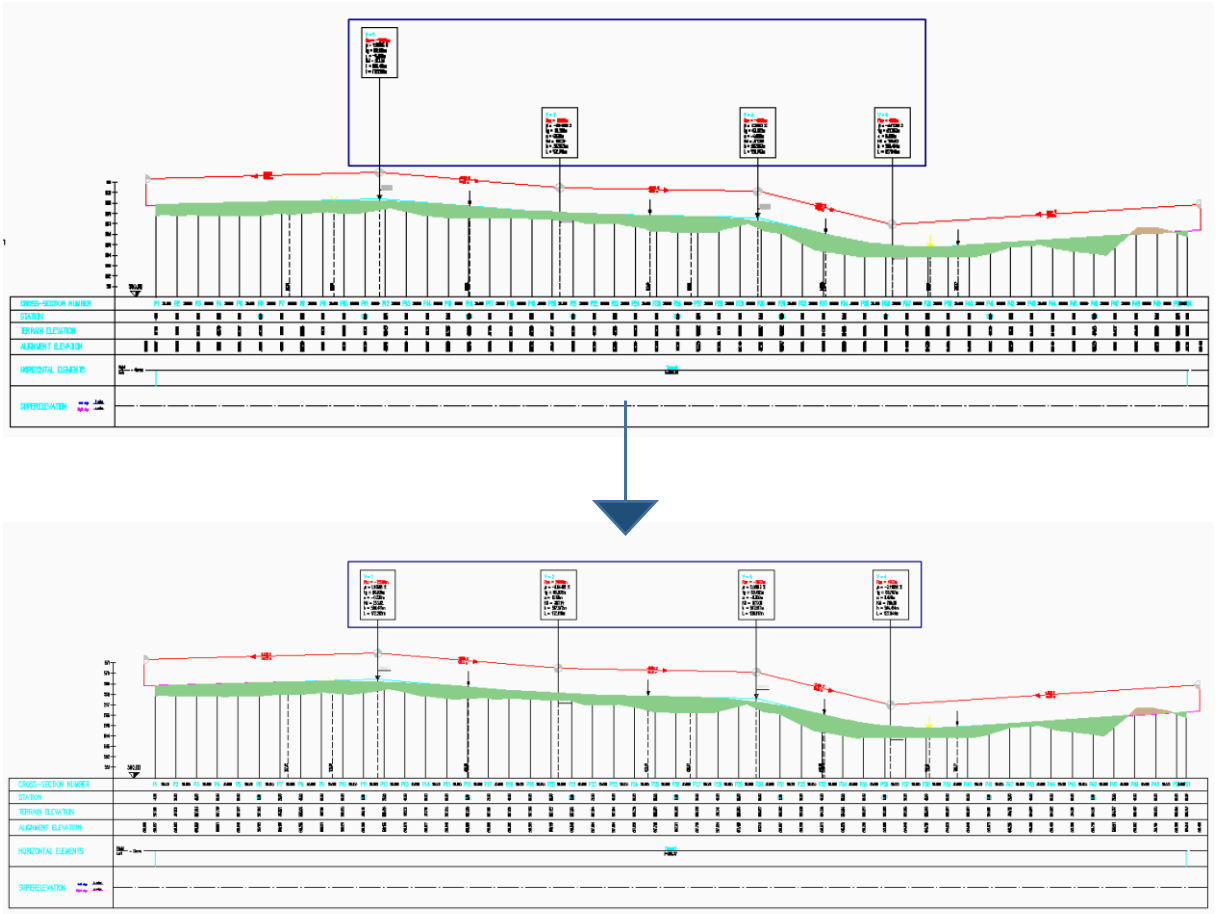
Profile labels are drawn with the default setting. If you want to change the default setting please read the following tutorial.



3.2.3 3.2.3 Move vertical curve labels

The table in which the calculated values of individual curvature elements are written can also be moved.

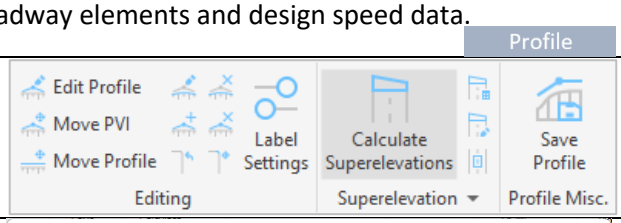
1. Run the Reposition Vertical Curve Labels (31H9) command. 2. Select the existing table and move it to a different location.	



4. Superelevation

The definition of superelevation usually follows the vertical alignment design. Program calculates superelevation according to the horizontal roadway elements and design speed data.

1. Run the Calculate Superelevations command.



2. A new dialogue box opens. First define the area, where you want to calculate superelvations. Normally we calculate the superelevations on the whole axis, but you can also define your own area by pressing the Plus icon.

3. Then define superelevation type. Available options are:
   - undivided crowned,
   - undivided planar,
   - divided crowned with median and
   - divided planar with median.

In this case select the undivided crowned.

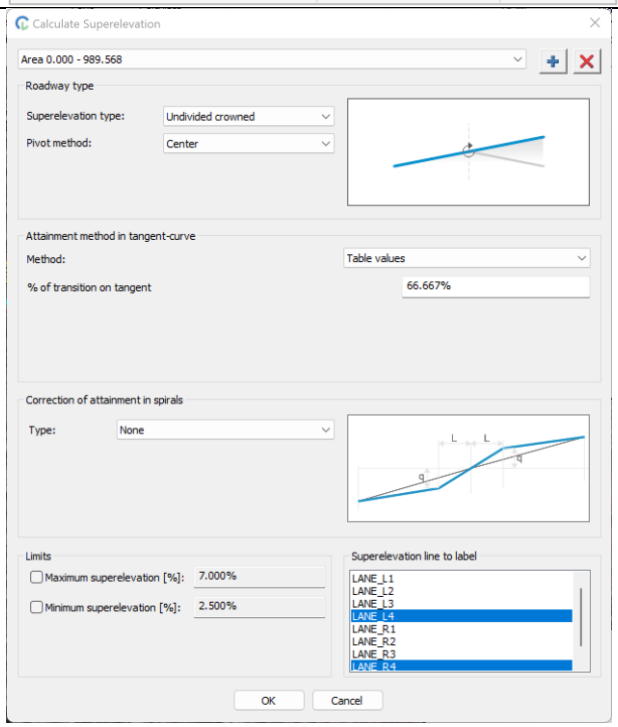
4. Then select the pivot method. It defines the point on the lane about which the roadway is superelevated. Select center.

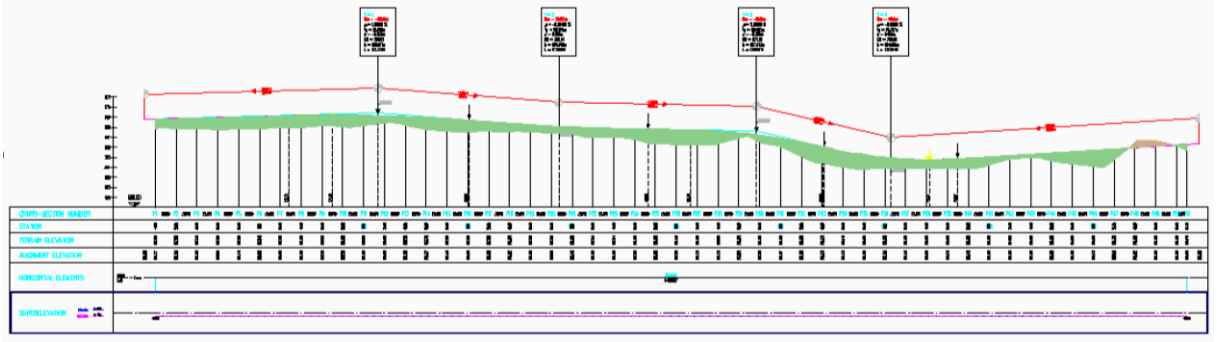
5. The next two settings (Attainment method in tangent-curve and Correction of attainment in spirals) are advanced, so leave them as they are.

6. At the bottom of the dialog box specify limits (max. and min. superelevation).

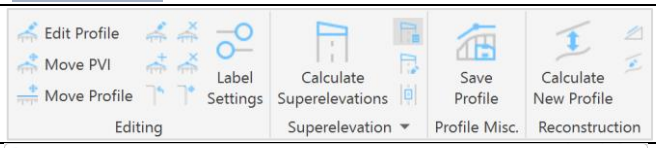
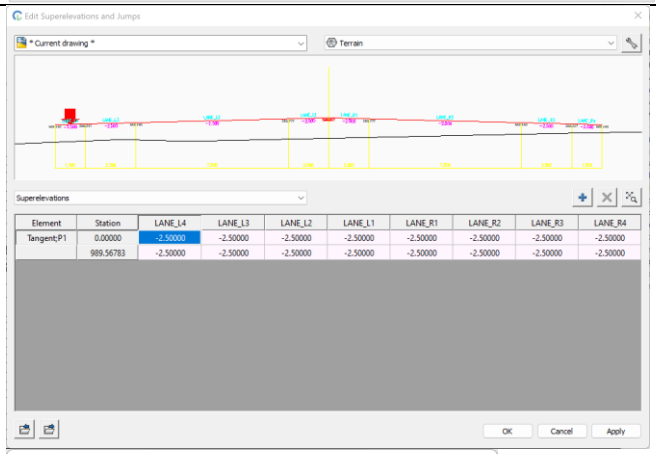
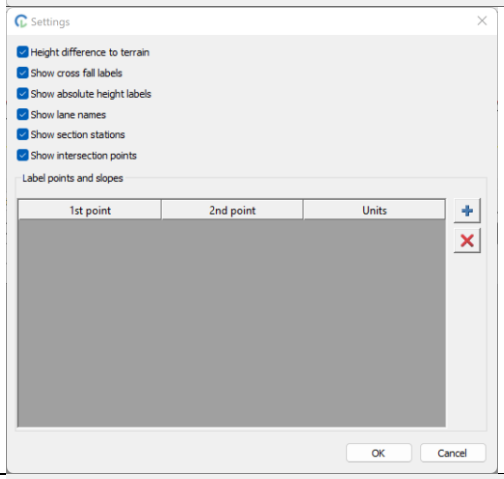
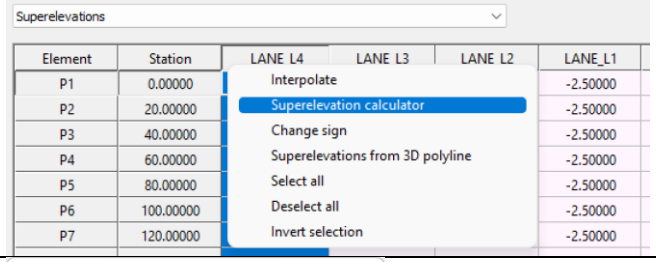
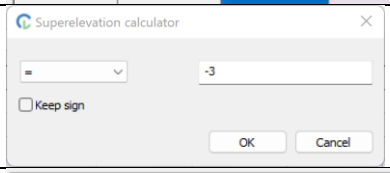
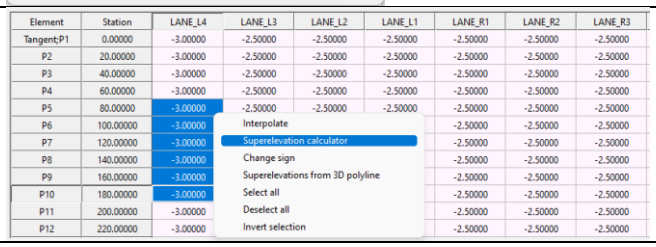
7. On the right side you can specify which superelevation line should be labelled.

8. Confirm by pressing the OK button.





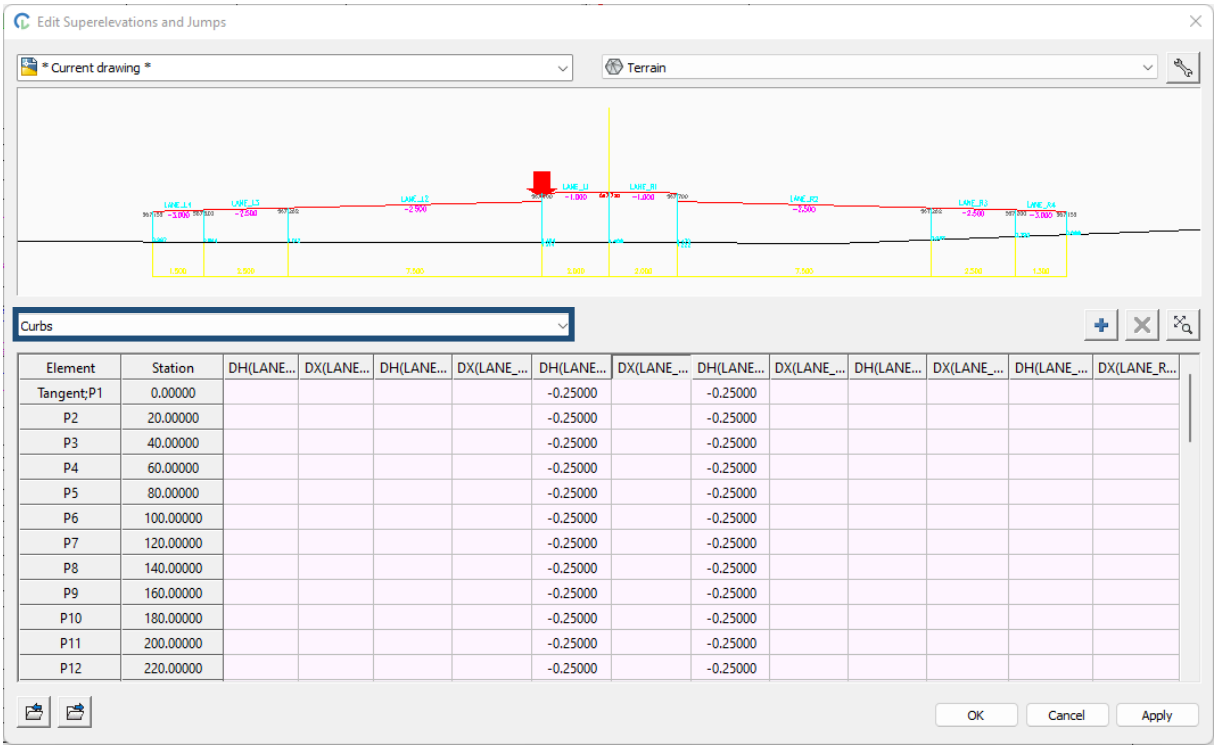
4.1 Edit superelevations

1. Run the Edit superelevation and curbs command.	
2. Select the Terrain from the right drop-down menu on the top. 3. Click settings button ( ) and check all the options and click OK.	 
4. Right click on the LANE_L4 and select the Superelevation calculator option.	
5. Select the = from the drop-down menu, uncheck the keep sign option and type -3. Press OK.	
NOTE! You can also change a single cell or a range. If you want to change the superelevation of an area, click in a first cell with the mouse, press Shift, and then click in the last cell of the desired area.	

4.2 Edit curbs

1. Select Curbs option in the drop-down menu.
2. Change the values where you want the curbs.

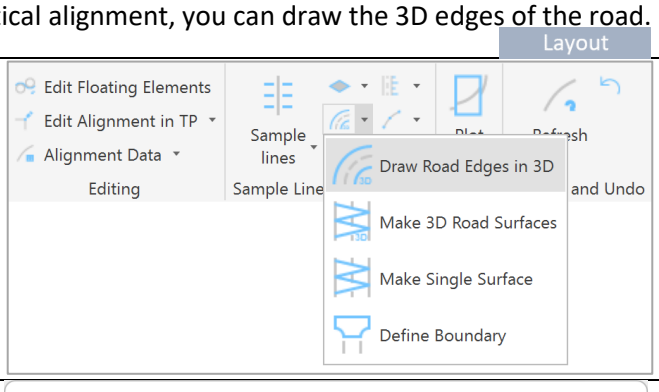
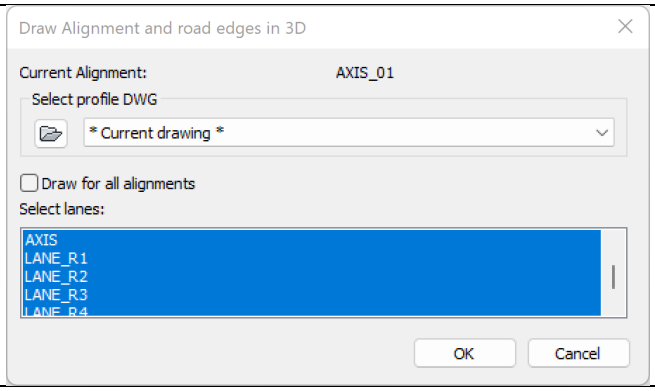
NOTE! This is optional. The user can also leave the value 0 here and specify the ~~edge~~ curbs in cross-sections.

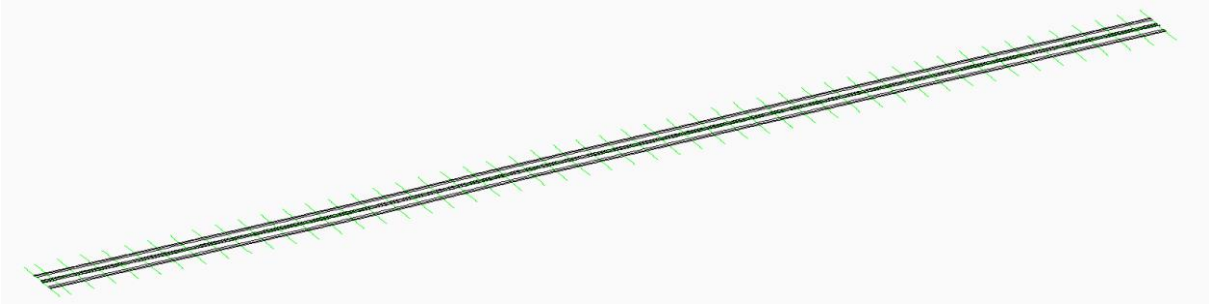


Element	Station	DH(LANE...	DX(LANE...	DH(LANE...	DX(LANE_...	DH(LANE...	DX(LANE_...	DH(LANE...	DX(LANE_...	DH(LANE...	DX(LANE_...	DH(LANE_...	DX(LANE_R...
Tangent;P1	0.00000					-0.25000		-0.25000					
P2	20.00000					-0.25000		-0.25000					
P3	40.00000					-0.25000		-0.25000					
P4	60.00000					-0.25000		-0.25000					
P5	80.00000					-0.25000		-0.25000					
P6	100.00000					-0.25000		-0.25000					
P7	120.00000					-0.25000		-0.25000					
P8	140.00000					-0.25000		-0.25000					
P9	160.00000					-0.25000		-0.25000					
P10	180.00000					-0.25000		-0.25000					
P11	200.00000					-0.25000		-0.25000					
P12	220.00000					-0.25000		-0.25000					

5. 3D Road Edges

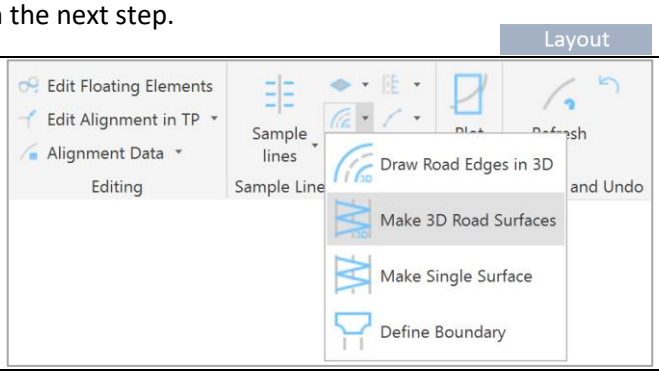
Once you have drawn the horizontal and vertical alignment, you can draw the 3D edges of the road.

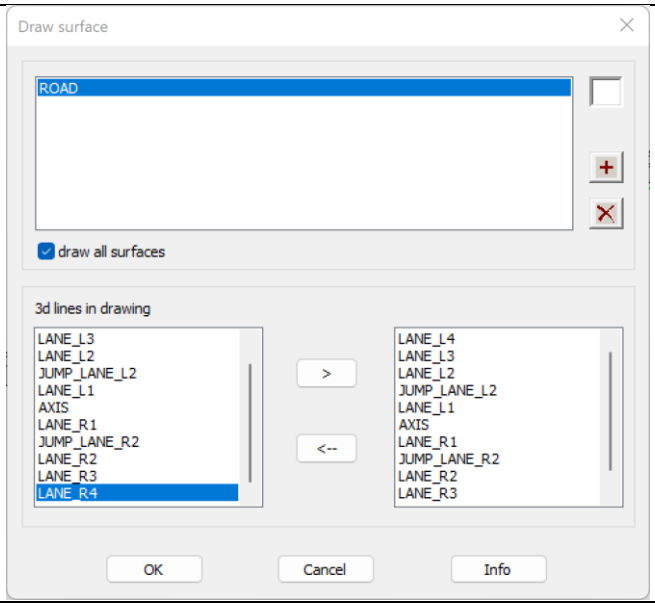
1. Run the Draw Road Edges in 3D command.	
2. Select all lanes from the list and press OK.	

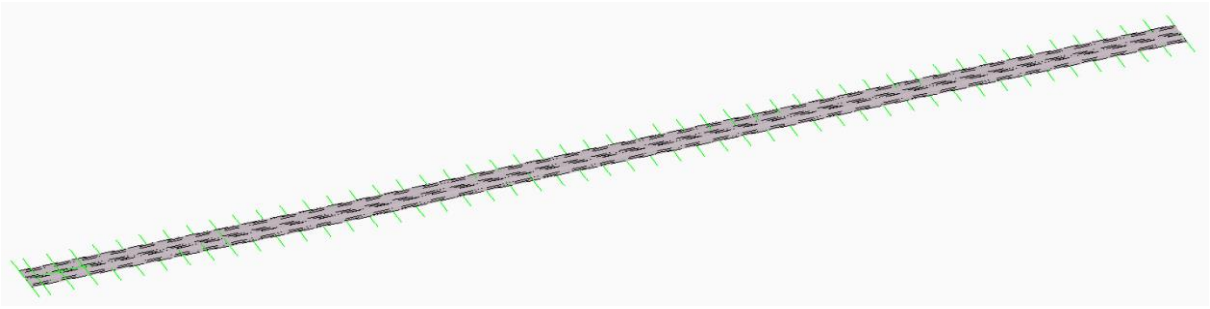


5.1 5.1 Top Surface

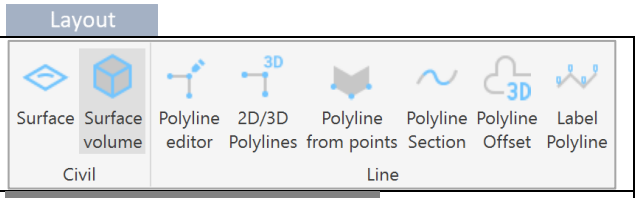
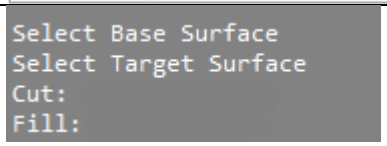
Based on 3D edges, we can create the surface of the roadway structure. This can also serve us to quickly calculate the volume of cut and fills in the next step.

1. Run the Make 3D Road Surfaces command.	

2. Using the dialog box shown on the right, you can define between which lines a roadway surface is to be made. 3. After defining lines click OK.	

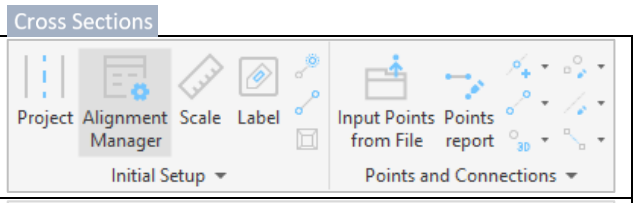
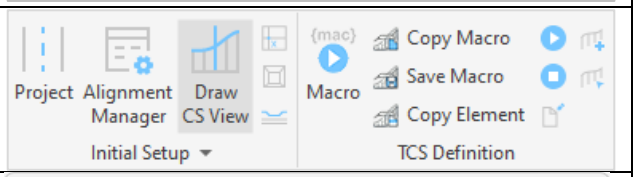
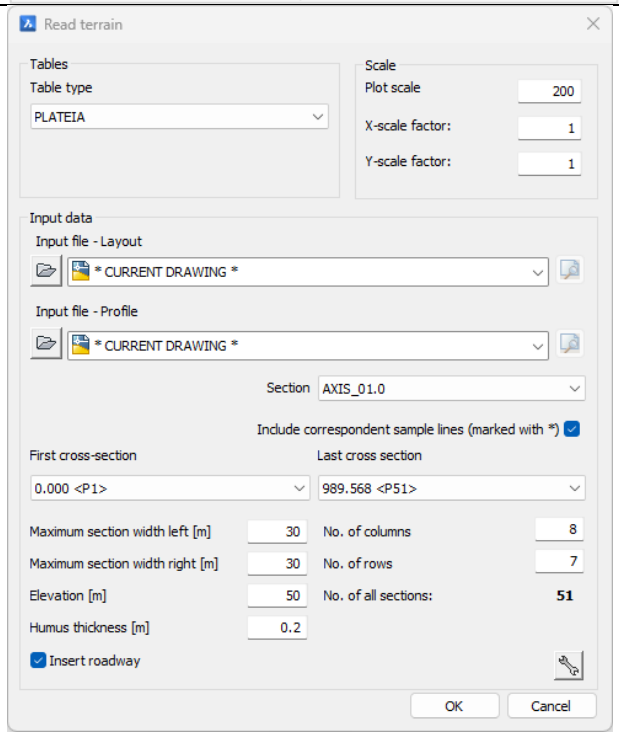


5.2 5.2 Quick Volume Calculation

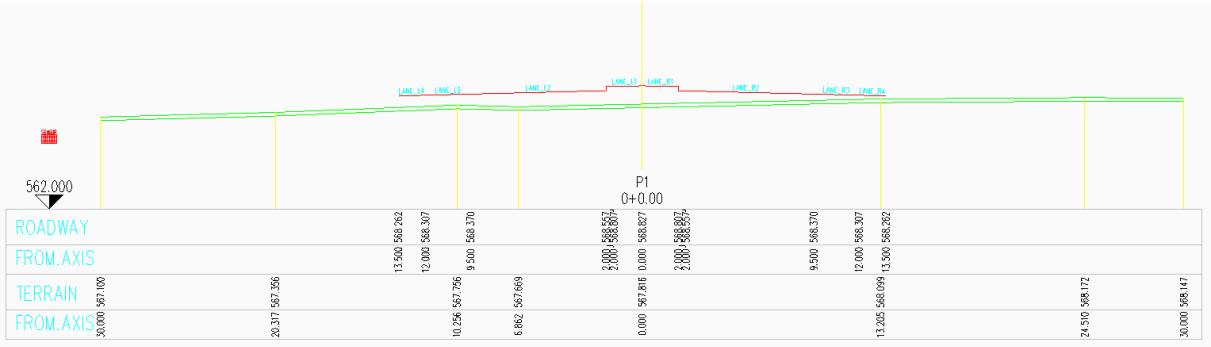
1. Run the Surface Volume command.	
2. Select the base surface from the list. 3. Select the target surface from the list. 4. The result is cut and fill volume quantity, which is written in the command line.	

6. Draw cross-section view

This command reads the data from the source DWG files (Layout and Profile) or CRO and LS files and draws terrain lines and symbols in desired number of consecutive cross-sections. It also enables to insert and label the roadway.

1. Click on the Layout tab, select Alignment Manager and double click on the Axis_A to set it as an active alignment.	
2. Click on the Cross-sections tab and run the Draw CS View command.	
3. In Read terrain dialog box specify: Table type: Plateia Plot scale: 200 X-scale factor: 1 Y-scale factor: 1 Input file - Layout: *current drawing* Input file - Profile: *current drawing* Select the first and the last cross-section from the drop-down menu. Maximum section width left [m]: 30 Maximum section width right [m]: 30 Elevation [m]: 50 Humus thickness [m]: 0.2 Check: Insert roadway. 4. Press OK to confirm parameters.	

Select insertion point for upper-left corner and cross-sections will be inserted in the drawing.



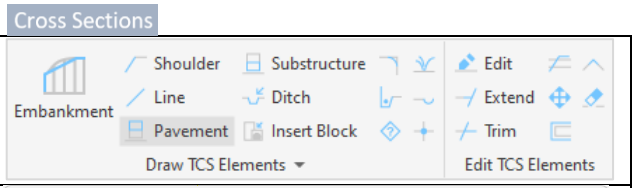
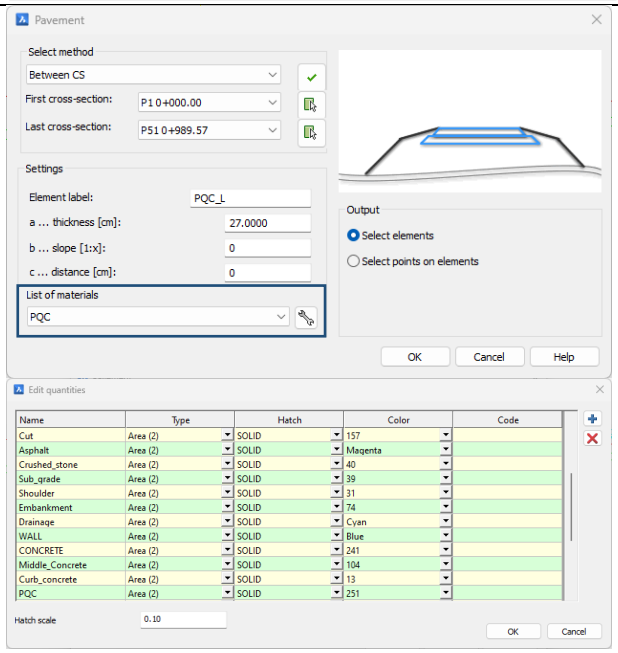
6.1 Typical cross – section elements

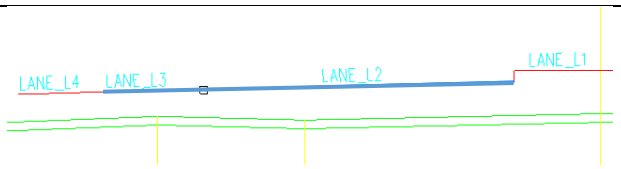
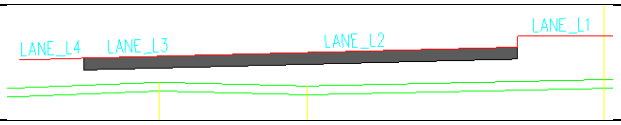
Plateia provides capabilities for designing and editing roadway cross-sections in a detailed way with almost no geometry limitations to the final project design.

The typical cross-section elements (TSC) group of commands contains commands for inserting of individual TCS elements such as shoulders, embankments, substructure, ditches, pavements, etc. It is possible to insert TCS elements such as blocks, lines, points, etc.

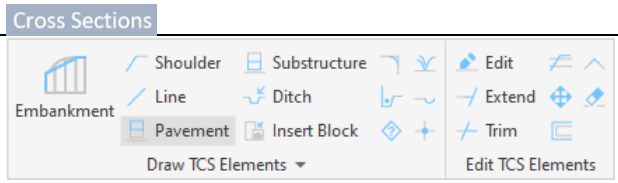
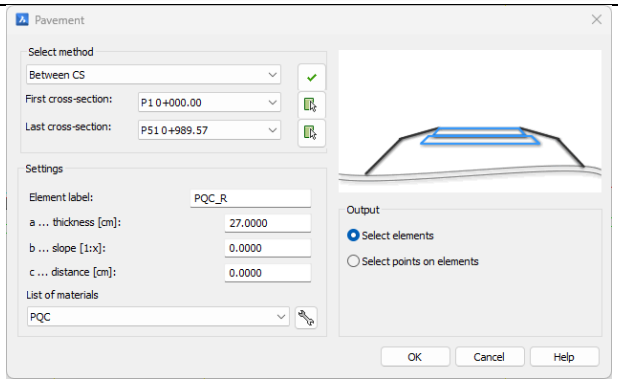
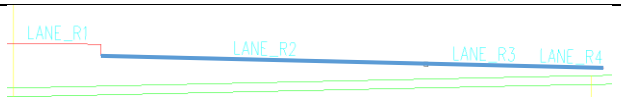
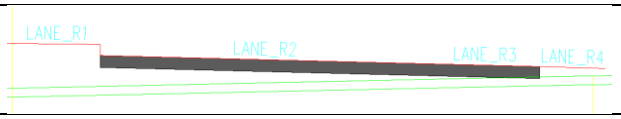
*NOTE! When editing a cross-section, it is essential to use **only Plateia's commands**, not AutoCAD's, such as Move, as this change will not be written to the cross-sections and will not be visible if we refresh them later.*

6.1.1 Pavement

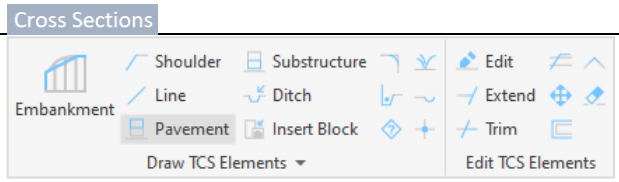
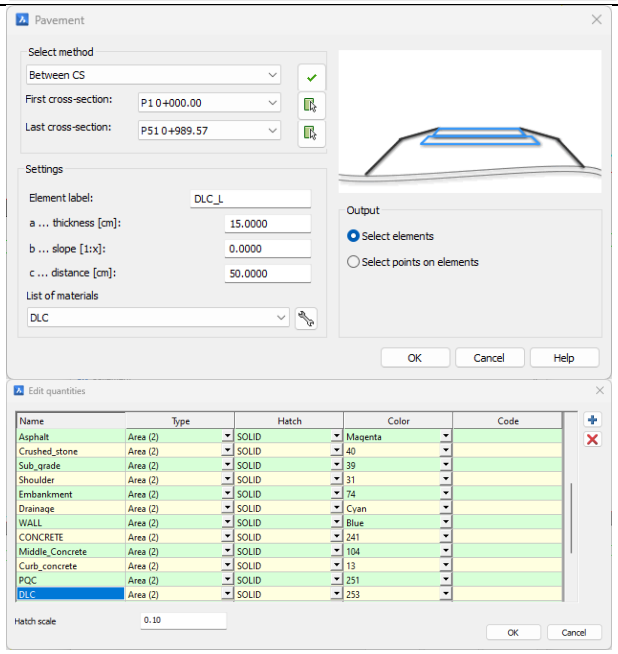
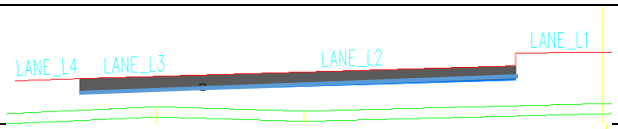
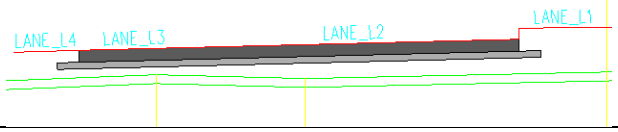
1. Run the Pavement command.	
2. Select the first and the last cross-section: - first cross-section: P1 - last cross-section: P51 3. Define other settings: - element label: PQC_L - a … thickness [cm]: 27 - b … slope [1:x]: 0 - c … distance [cm]: 0 4. Click on the icon ( ) and define new quantity: - name: PQC - type: Area (2) - hatch: solid - color: 251 5. Press OK to confirm this new defined quantity and select it from the drop-down menu.	

6. For output check the option at the Select elements. 7. Click on the element LANE_L2 and LANE_L3 and press Enter or right-mouse click.	
The figure on the right shows the final result.	

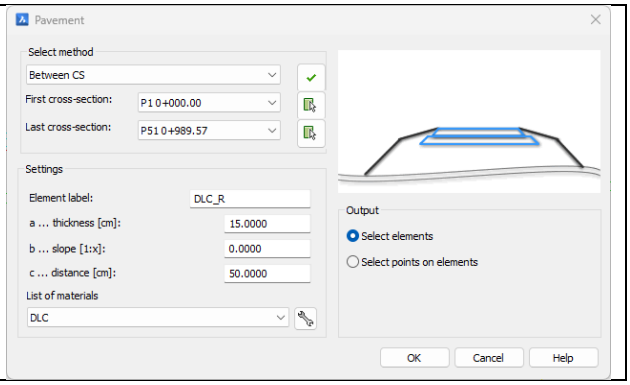
Now let's repeat the same procedure for the right lane.

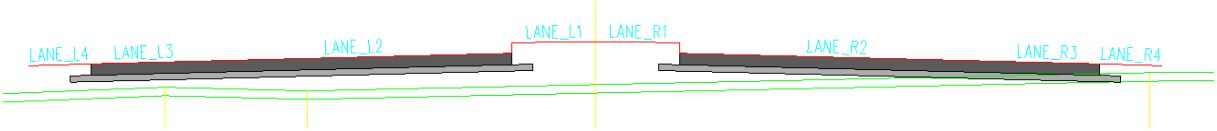
1. Run the Pavement command.	
2. Select the first and the last cross-section: - first cross-section: P1 - last cross-section: P51 3. Define other settings: - element label: PQC_R - a … thickness [cm]: 27 - b … slope [1:x]: 0 - c … distance [cm]: 0 4. Select the PQC from the drop-down menu and then check the box at the Select elements option. 5. When you have finished, confirm by pressing the OK button.	
6. Click on the element LANE_R2 and LANE_R3 and press Enter or right-mouse click.	
The figure on the right shows the final result.	

Now we will add another pavement layer.

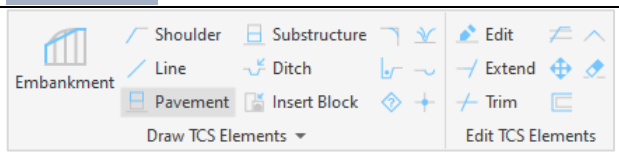
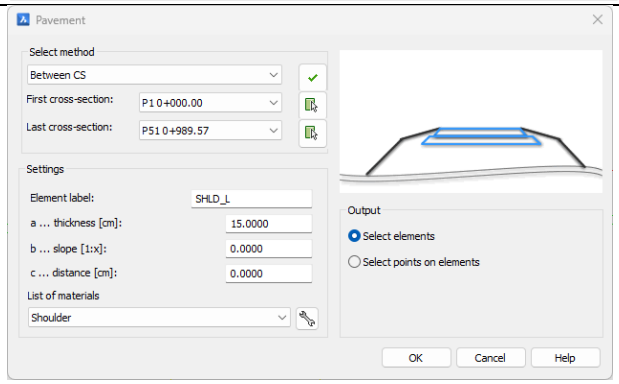
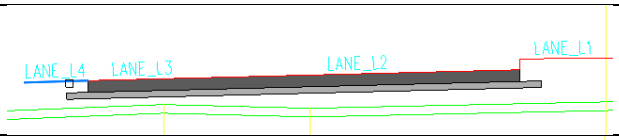
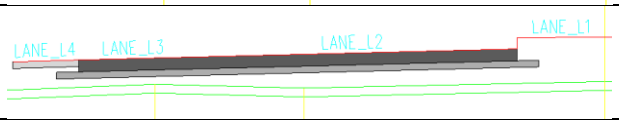
1. Run the Pavement command.	
2. Select the first and the last cross-section: - first cross-section: P1 - last cross-section: P51 3. Define other settings: - element label: DLC_L - a … thickness [cm]: 15 - b … slope [1:x]: 0 - c … distance [cm]: 50 4. Click on the icon and define new quantity: - name: DLC - type: Area (2) - hatch: solid - color: 253 5. Press OK to confirm this new defined quantity and select it from the drop-down menu. 6. For output check the option at the Select elements.	
7. Click on the lower edge of the first layer of pavement structure on the left and press Enter.	
The figure on the right shows the final result.	

Then repeat the same procedure for the right part:

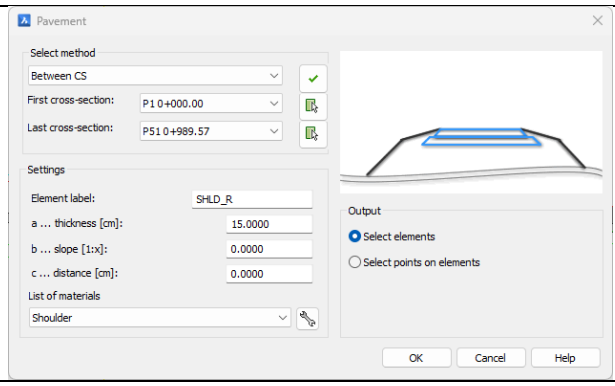
1. Run the Pavement command. 2. Define parameters. 3. Click on the lower edge of the first layer of pavement structure on the right and press Enter.	

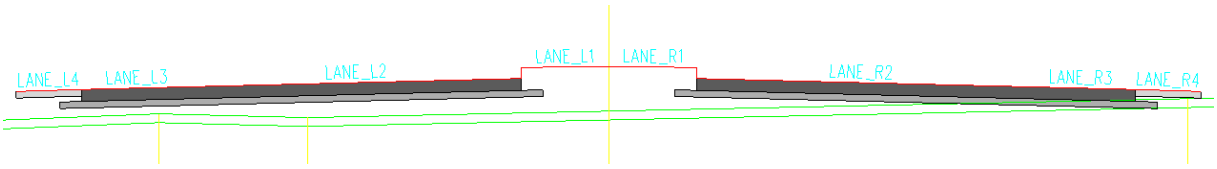


Shoulder

1. Run the Pavement command.	
2. Select the first and the last cross-section: - first cross-section: P1 - last cross-section: P51 3. Define other settings: - element label: SHLD_L - a … thickness [cm]: 15 - b … slope [1:x]: 0 - c … distance [cm]: 0 4. Select the Shoulder from the drop-down menu and then check the box at the Select elements option.	
5. Click on the element LANE_L4 and then press Enter or right-mouse click.	
The figure on the right shows the final result.	

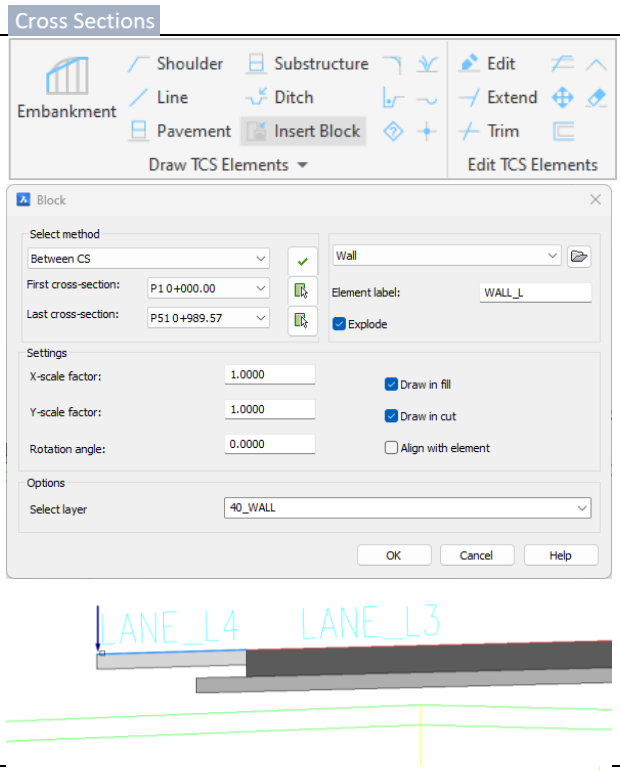
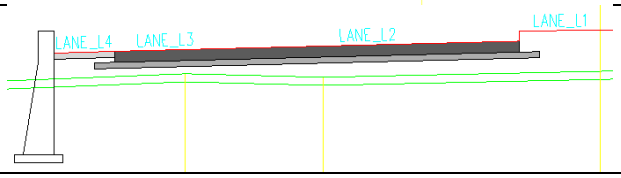
Then repeat the same procedure for the right part:

1. Run the Pavement command. 2. Define parameters. 3. Click on the lower edge of the first layer of pavement structure on the right and press Enter.	

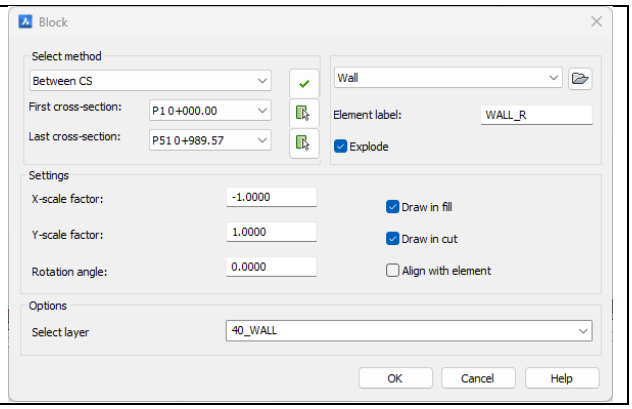


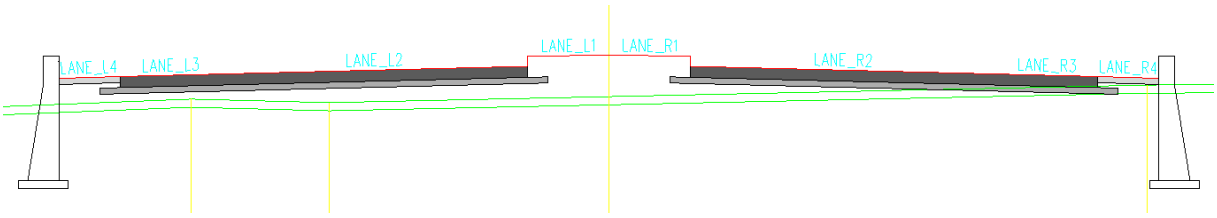
Parapet Wall

If you have a wall that is the same shape and size along the alignment, you can insert it as a block.

1. Run the Insert block command. 2. Select block from the drop-down menu. In this case the name of the block is wall. 3. Check the box at the Explode option. 4. Define the layer name. 5. Click OK. 6. Select the left edge of the shoulder.	
The figure on the right shows the final result.	

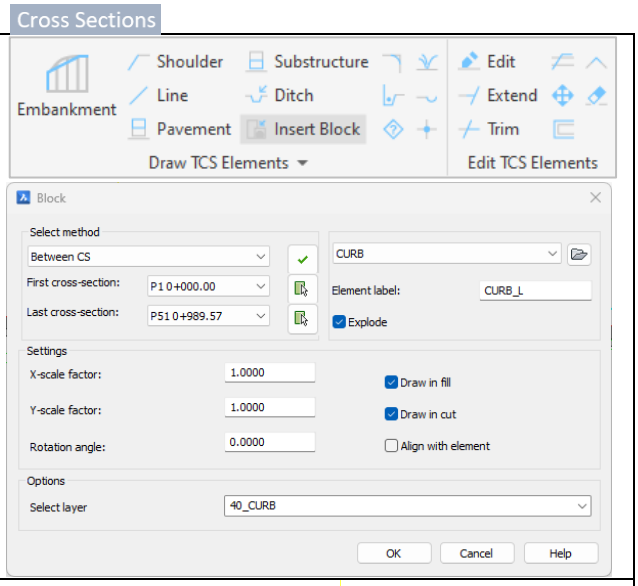
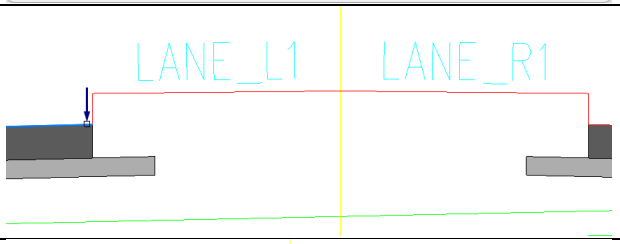
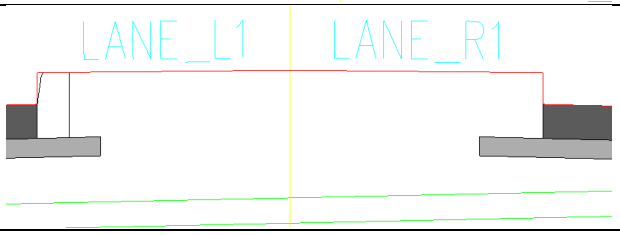
Repeat the same procedure for the right side.

1. Run the Insert block command. 2. Define parameters. Be careful that you type -1 for the X-scale factor to mirror the block. 3. Confirm by pressing the OK button.	

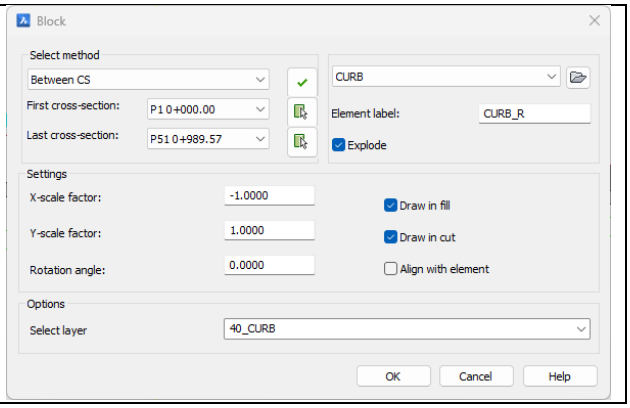


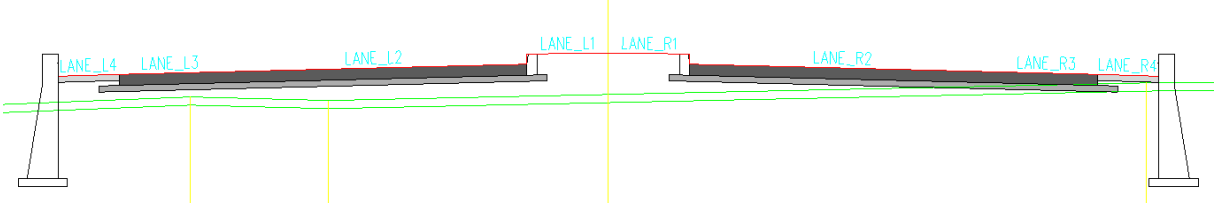
Curb

We will also insert the curb as a block.

1. Run the Insert block command. 2. Select block from the drop-down menu. In this case the name of the block is curb. 3. Check the box at the Explode option. 4. Define the layer name. 5. Click OK.	
6. Click on the right edge of the LANE_L2.	
The figure on the right shows the final result.	

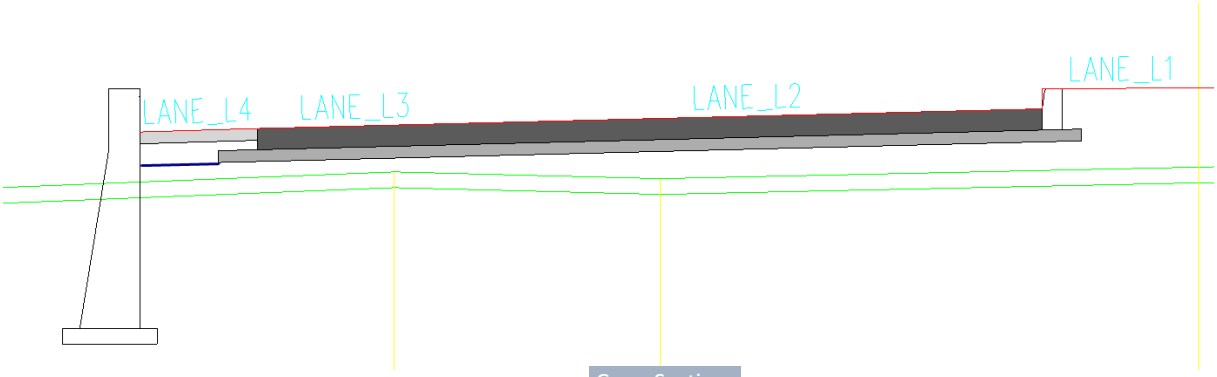
Repeat the same procedure for the right side.

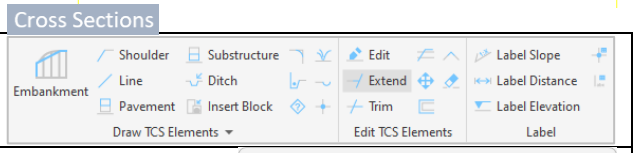
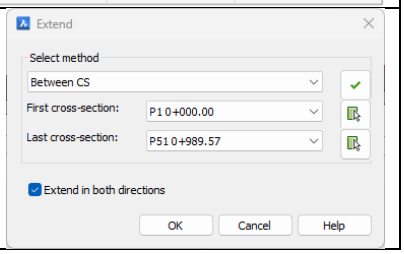
1. Run the Insert block command. 2. Define parameters. Be careful that you type -1 for the X-scale factor to mirror the block. 3. Confirm by pressing the OK button.	

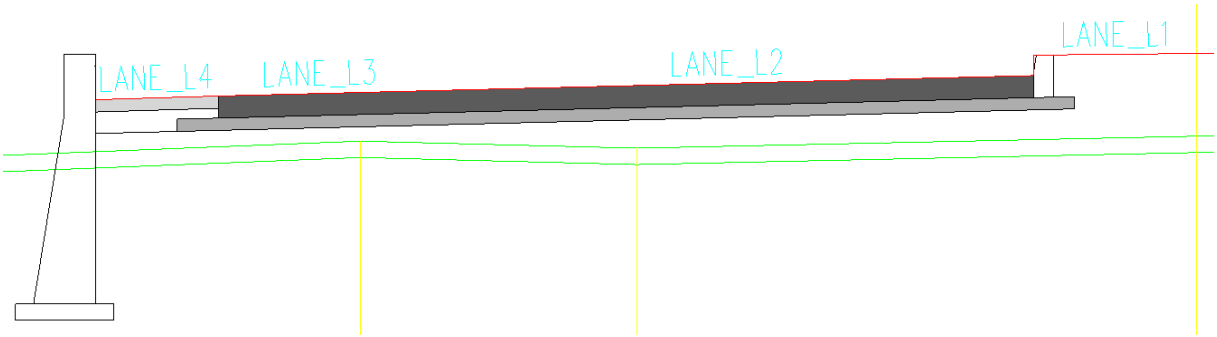


Shoulder – second layer

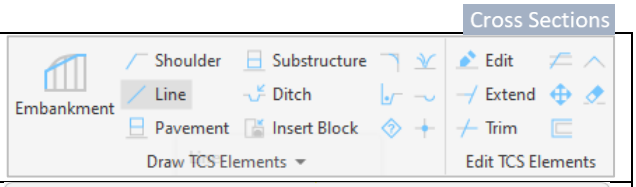
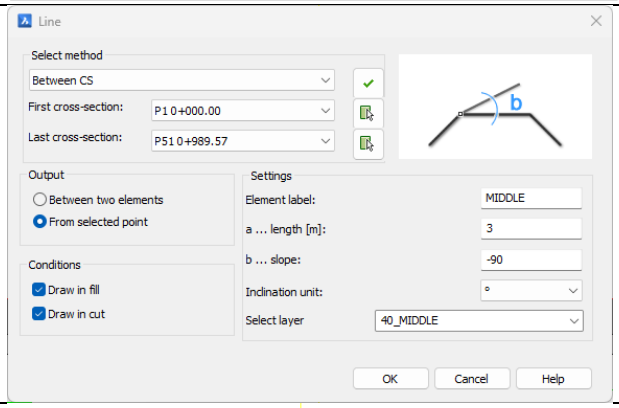
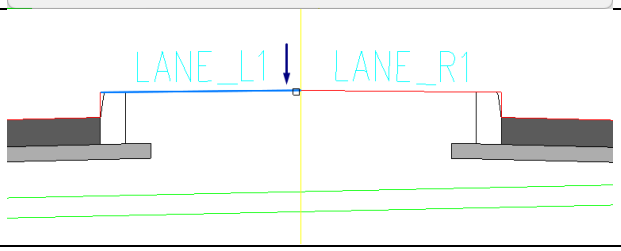
If you want to create a second layer of shoulder, you have to first define the bottom. This bottom represents the blue line in the image below. You draw this line by extending the line represenmting the lower part of the material DLC to the wall.

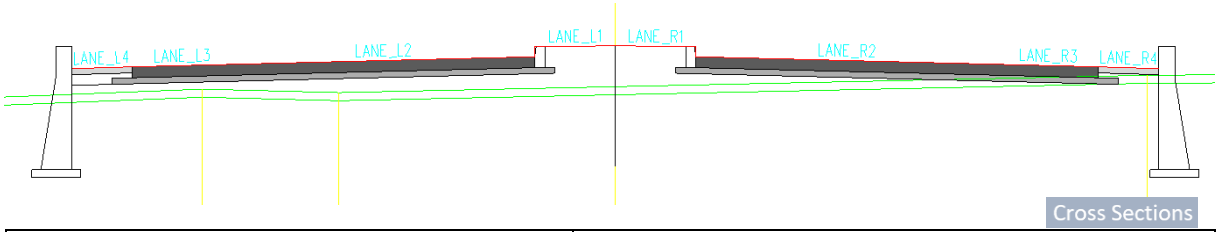


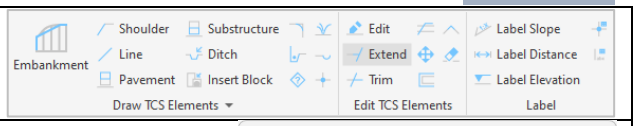
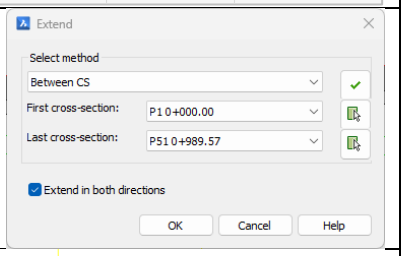
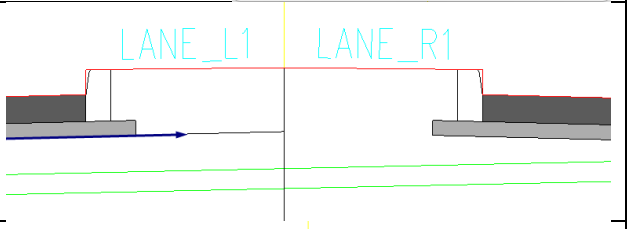
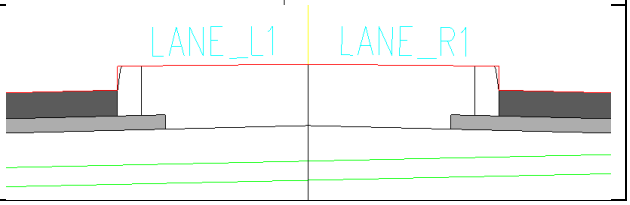
1. Run the Extend command.	
2. It opens a new dialogue box. Simply press OK. 3. Select edge (wall) and press Enter. 4. Select element to extend and press Enter.	



Middle of the road

1. Run the Line command.	
2. Define parameters: - element labels: MIDDLE - a … length [m]: 3 - b … slope: -90 - inclination unit: ° - layer: 40_MIDDLE 3. Press OK.	
4. Click on the right edge of the LANE_L1.	



1. Run the Extend command.	
2. It opens a new dialogue box. Simply press OK. 3. Select edge (MIDDLE line) and press Enter. 4. Select element to extend and press Enter.	
	
After that extend the line on the right side.	

7. Planimetry

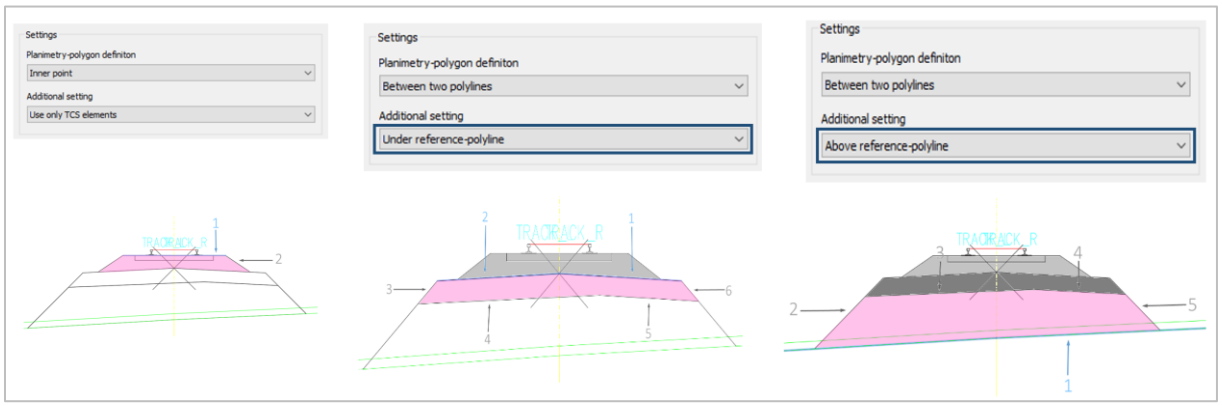
Based on constructed cross-sections, it is possible to precisely calculate the cut, the fill and other volumes. The calculation is based on the so-called planimetry polygon lines that represent borders of planimetry quantities.

When we made the Pavement element, we had the option to automatically create the planimetric quantity. For other elements, such as inserted blocks, we have to planimetry manually.

These planimetry quantities are the basis for quantity take-off report and 3D model creation.

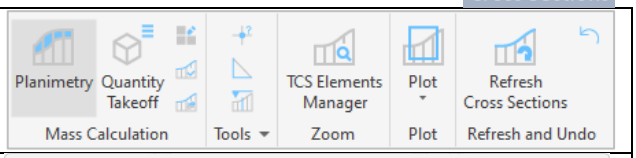
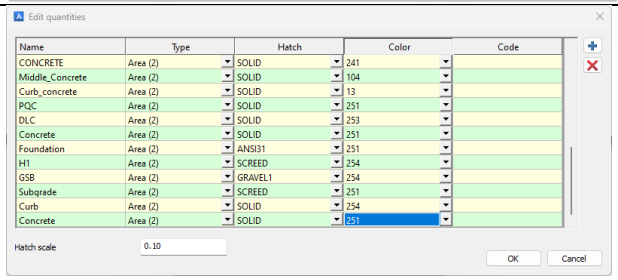
The user has three options for creating planimetric quantities:

- inner point,
- under reference polyline and
- above reference polyline.



Retaining wall on the left – Under reference- polyline method

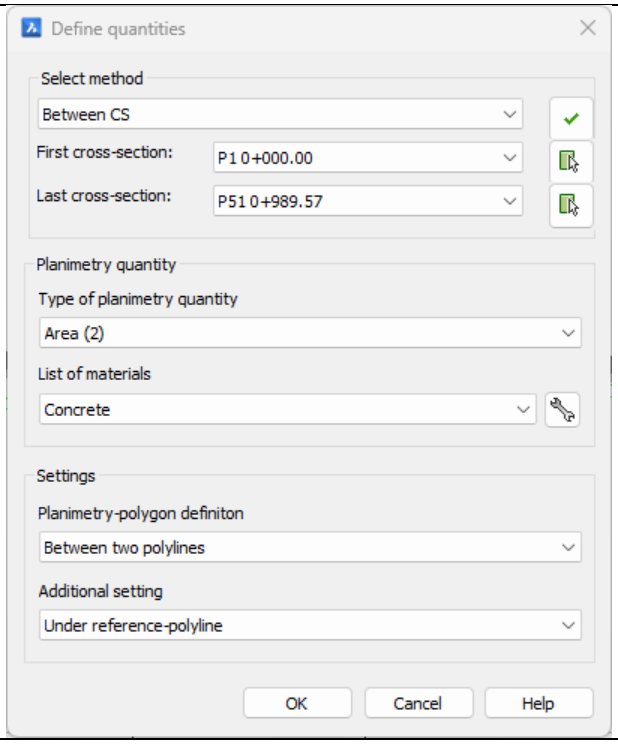
Cross Sections

1. Click on the Cross Sections tab and select the Planimetry icon.	
2. In the dialog box press the tick button to select all cross-sections and define the type of the planimetry quantity. 3. Click on the button next to the list of materials. It opens a new dialog, where you add and edit quantities. 4. Press the plus button and define new quantity. Enter the name Curb and select the colour from the drop-down menu. 5. When finished, press OK.	

6. Select a new defined material from the list.

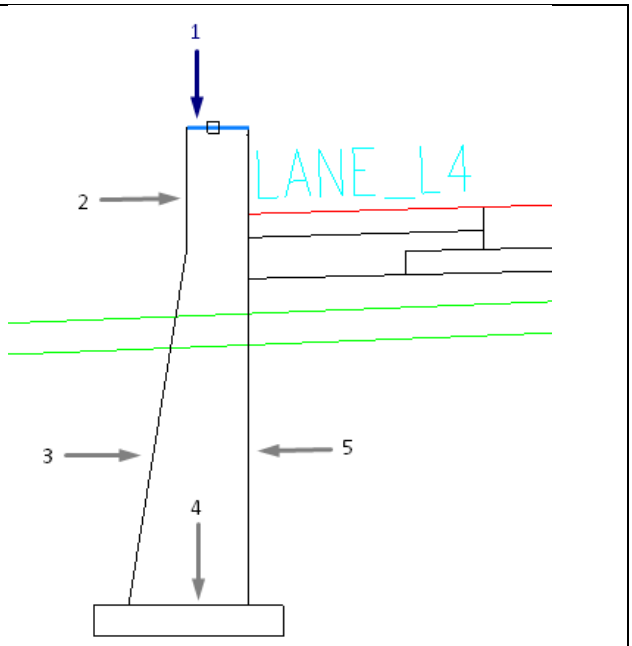
7. Select <u>Between two polylines</u> for the Planimetry-polygon definition and then define the additional settings. Select Under reference-polyline option from the drop-down menu.

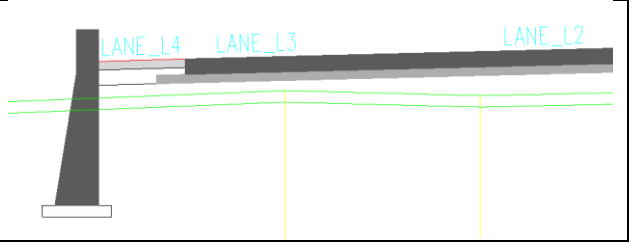
8. Confirm by pressing OK.



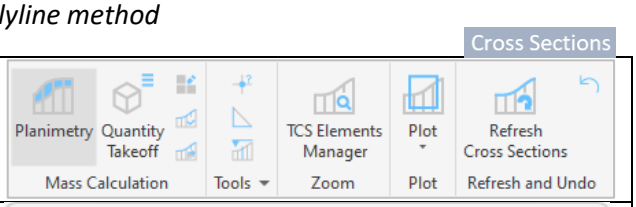
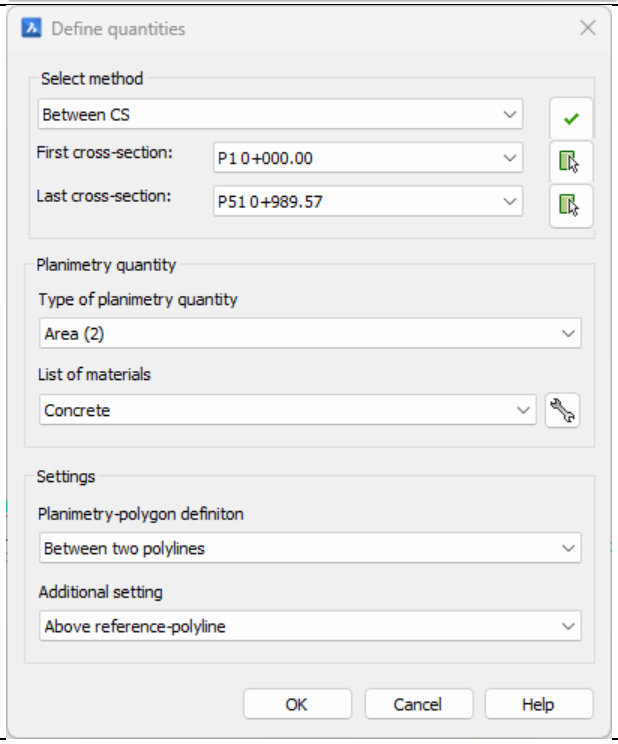
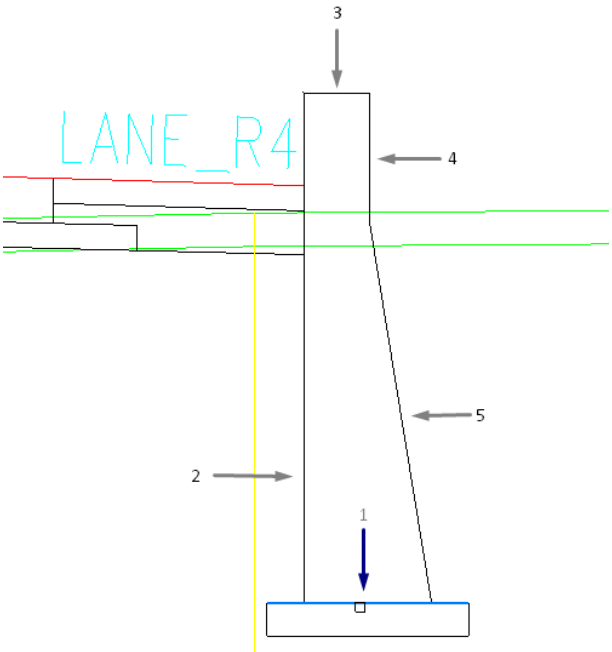
9. First, click on the line, which represents the upper edge of the Wall. Press Enter and then cloick on the remaining lines, representing the wall's boundary. For this option (under reference-polyline) be sure to click lines in a counter clockwise direction.

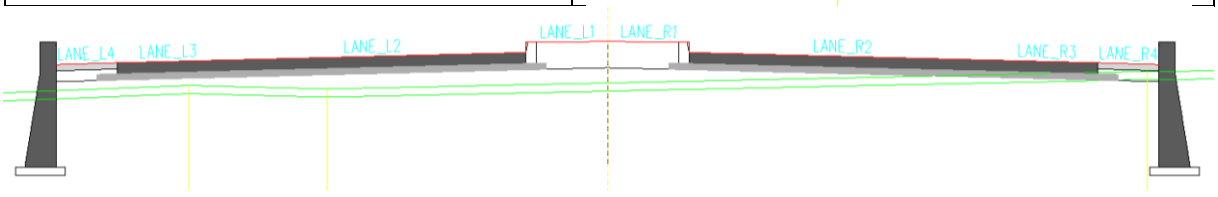
10. When finished, press Enter.



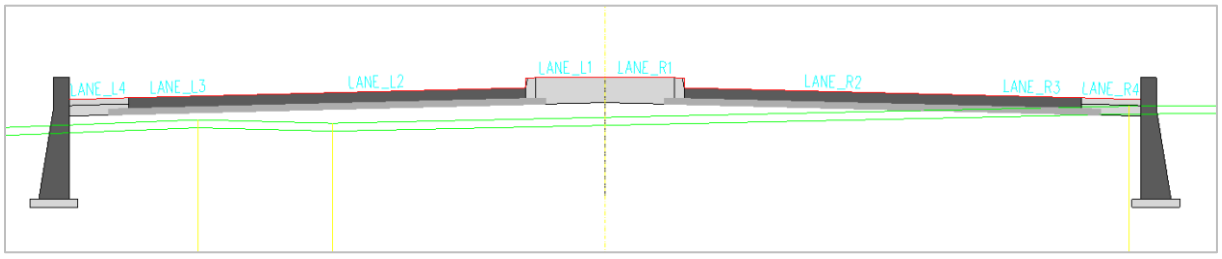


Retaining wall on the right– Above reference- polyline method

1. Click on the Planimetry once again and repeat the procedure.	
2. In the dialog box select all cross sections, select the planimetry quantity and select Concrete from the list of materials. 3. Select Between two polylines for the Planimetry-polygon again, but this time select the Above reference-polyline for the Additional settings. 4. Confirm by pressing OK.	
First, click on the line that represents the bottom of the wall. Press Enter and then click on the remaining lines, representing the wall's boundary. For this option (above reference-polyline) be sure to click lines in a clockwise direction.	



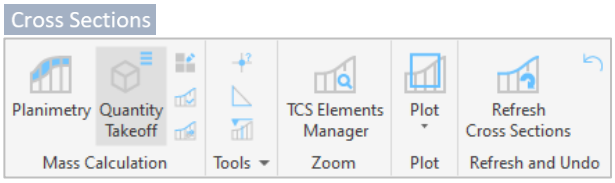
With the help of the Planimetry command, we then planimetrify the rest of the quantities, so that at the end we have the cross-section shown in the image below:



8. Quantity Take-Off

The command calculates the quantities by sections as well as for the whole area. The results can be saved to a file and/or displayed in the drawing.

1. Click on the Cross Sections tab and select the Quantity take-off icon.

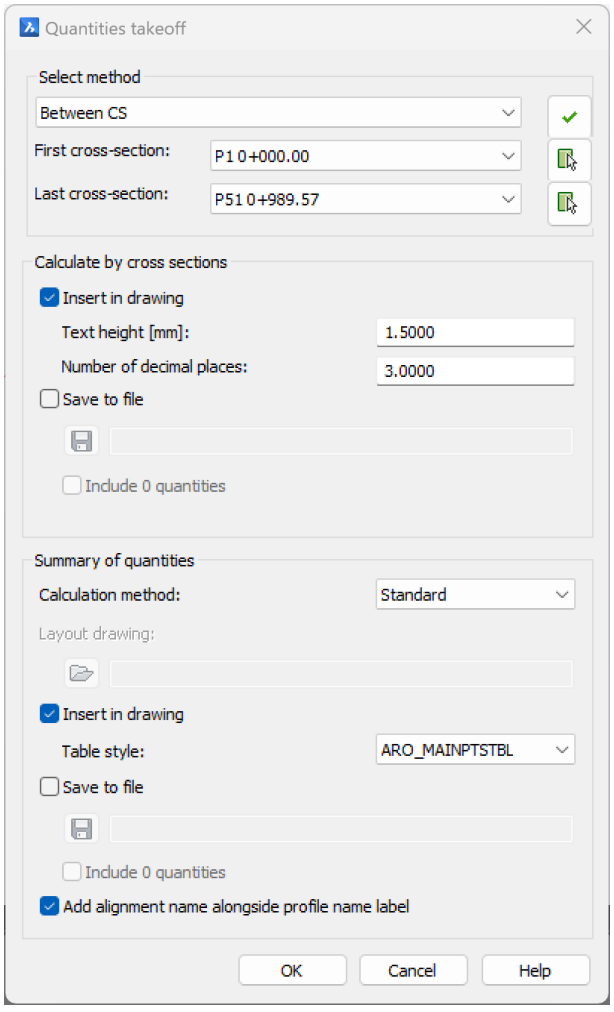


2. Press the tick button to select all cross sections.

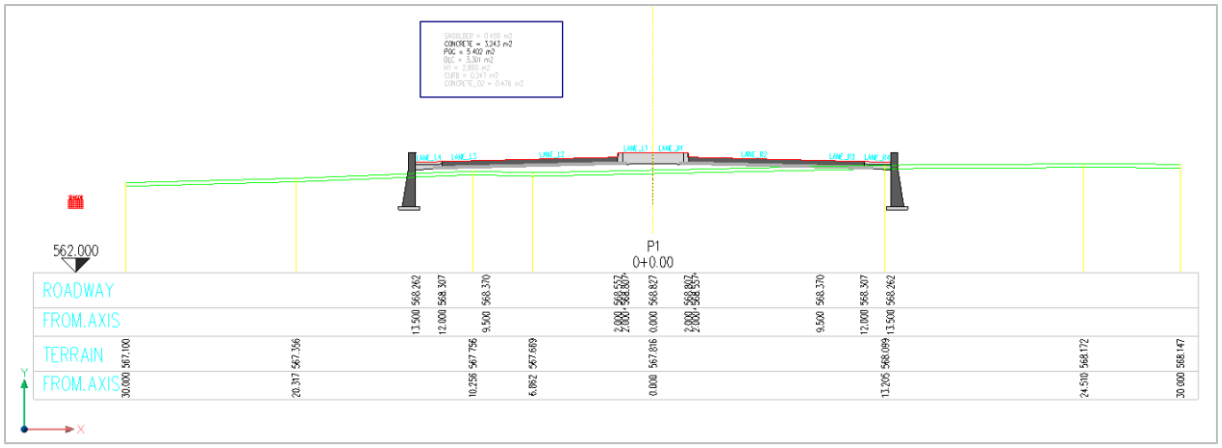
Check insert in drawing and select the location for planimetry labels in the drawing.

3. For summary of quantities calculation, check insert in drawing option and define an insertion point of quantity table in the drawing.

4. Confirm by pressing OK.



Calculate by cross-sections:



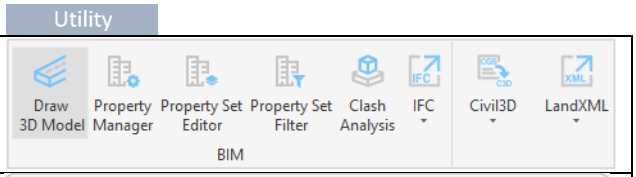
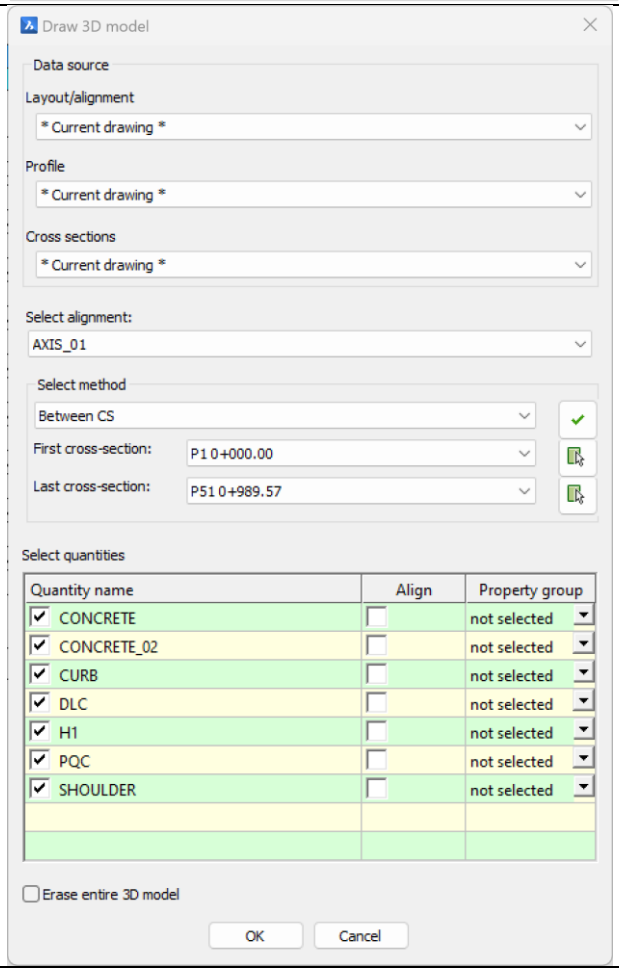
Summary of quantities for first ten cross-sections:

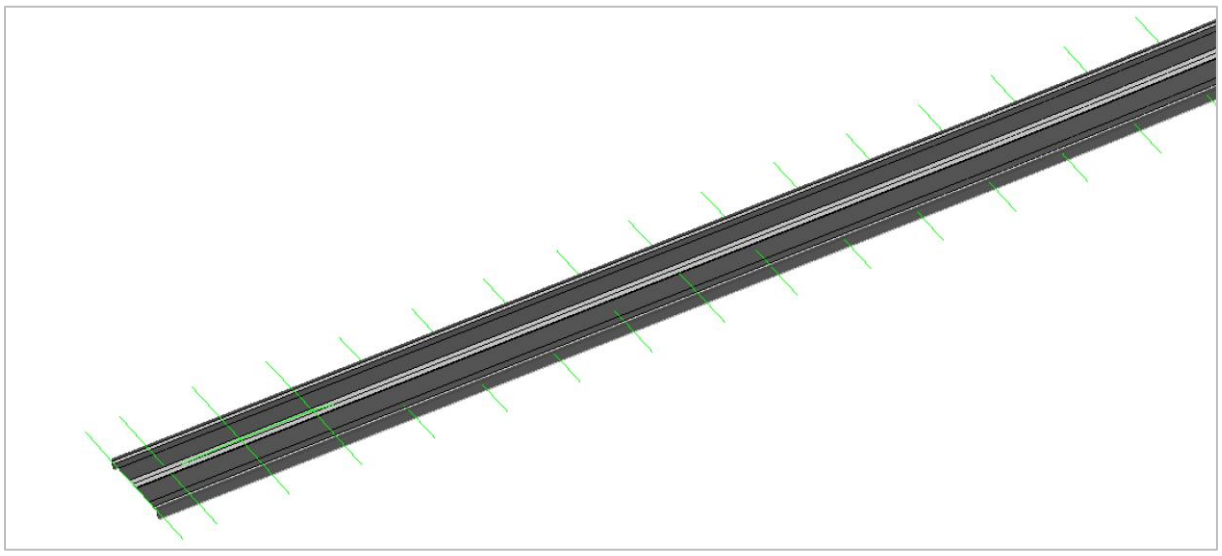
Quantity takeoff

Sect	Stat Dist	SHOULDER [m³/m³]	Dist.	CONCRETE [m³/m³]	Dist.	POC [m³/m³]	Dist.	DLC [m³/m³]	Dist.	HI [m³/m³]	Dist	CURB [m³/m³]	Dist.	CONCRETE_02 [m³/m³]	Dist.
P1|AXIS_01	0+0.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P2|AXIS_01	0+20.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P3|AXIS_01	0+40.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P4|AXIS_01	0+60.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P5|AXIS_01	0+80.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P6|AXIS_01	0+100.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P7|AXIS_01	0+120.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P8|AXIS_01	0+140.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P9|AXIS_01	0+160.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
	20.000	9.004	20.000	64.869	20.000	108.034	20.000	66.019	20.000	57.207	20.000	4.933	20.000	9.518	20.000
P10|AXIS_01	0+180.00	0.450		3.243		5.402		3.301		2.860		0.247		0.476	
Sume:		81.036		583.823		972.304		594.169		514.865		44.397		85.660	
		SHOULDER [m³]		CONCRETE [m³]		POC [m³]		DLC [m³]		HI [m³]		CURB [m³]		CONCRETE_02 [m³]	

Calculation method: Standard

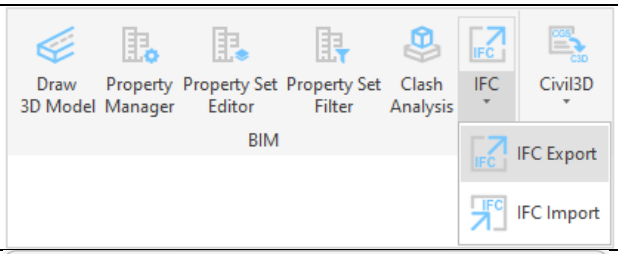
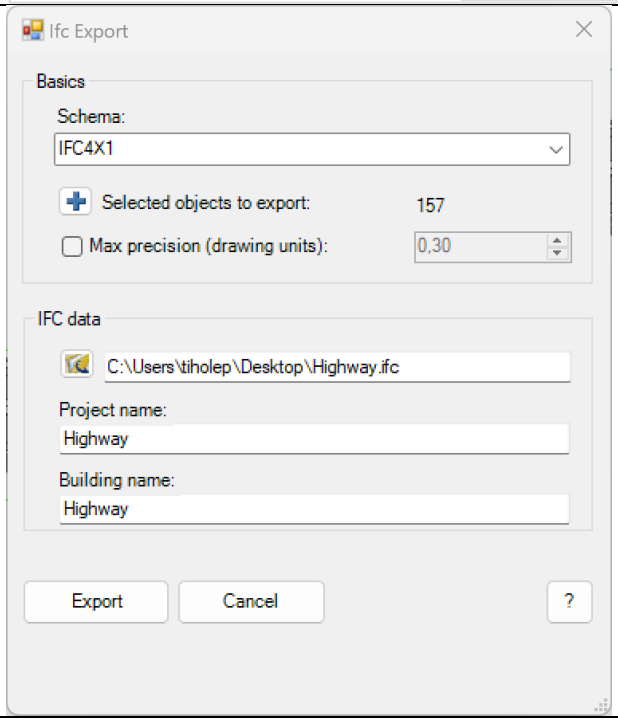
9. Create a 3D Model

1. Click on the Draw 3D model icon.	
2. Select *Current drawing* for the alignment, profile and cross-sections. 3. Select the alignment from the drop-down menu and define the starting and ending cross-section. 4. Check the boxes at the planimetry quantities you want to create a 3D solid model from. 7. Confirm by clicking OK.	



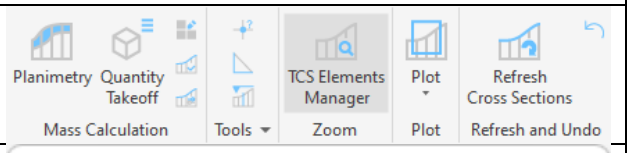
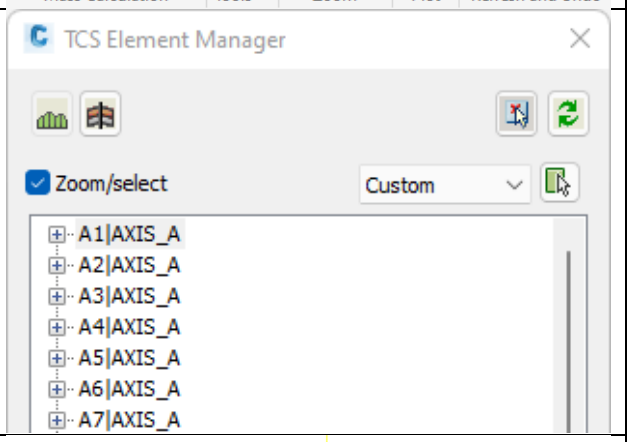
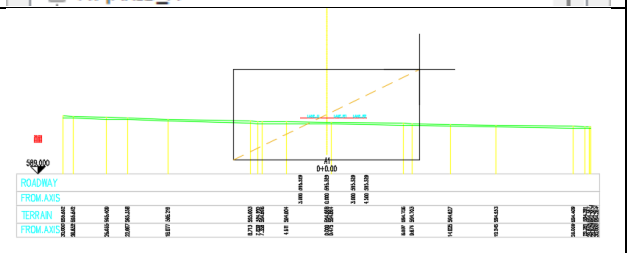
10. IFC Export

Export 3D solid objects with Property set definitions to external IFC exchange file with IFC Export command.

1. Run the IFC Export command.	
2. Click on the Plus icon and select the objects that you want to export. 3. Select the path to save the file. 4. Define project and building name. 5. Confirm by clicking the Export button.	

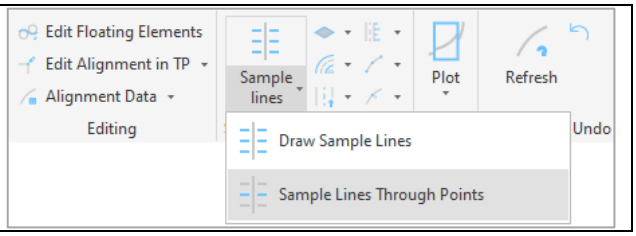
Macro

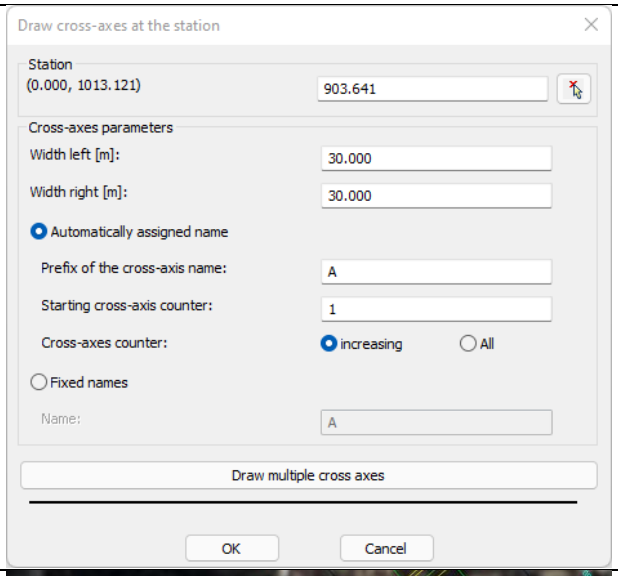
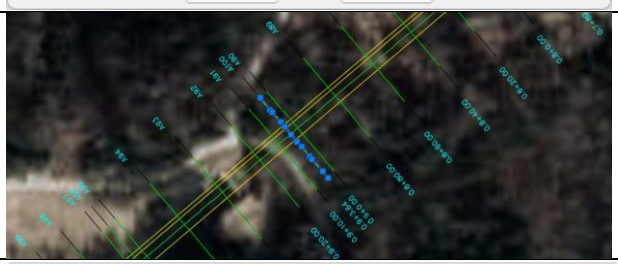
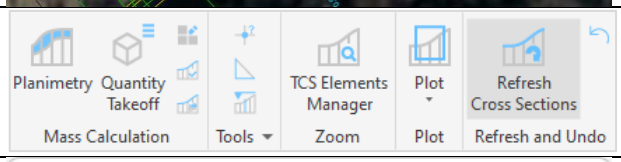
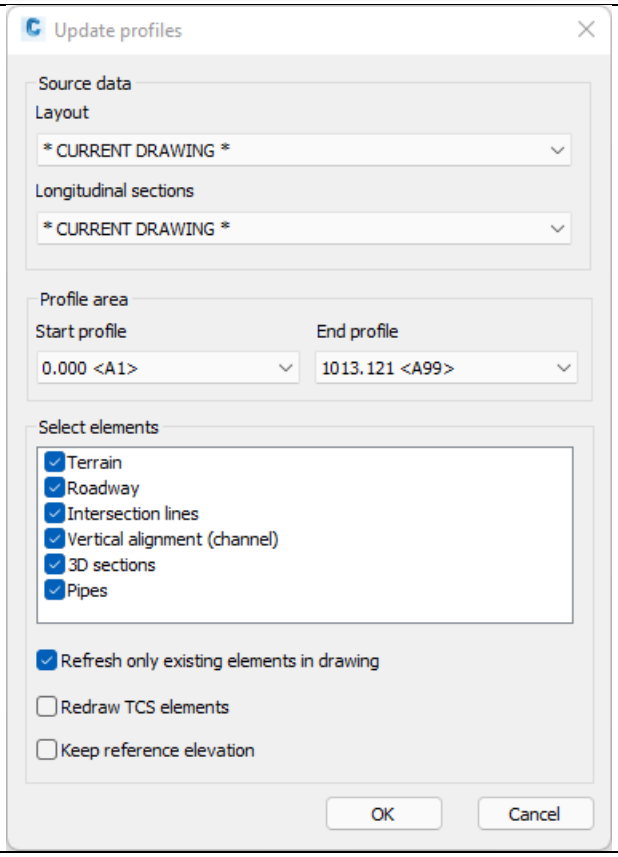
Moving accros Cross Sections

TCS Element Manager command is a tool, designed to quickly zoom to specific cross – section or element in the drawing. TCS elements manager also enables to use arrow keys to move up or down.	
Run the TCS Elements Manager command.	
After launching the command, a dialog box opens, where you have two options: zoom by profiles or zoom by elements. Click on the button »Zoom by profiles* and the list of all cross – sections in the drawing will be shown in this dialog. Then select the profile A1 in the list. In the drop-down menu select the custom scale and click on the button  .	
Then go to the drawing and draw a rectangle around the first cross – section. When the rectangle is drawn, the software automatically zooms in this cross – section. Then you can move between sections by clicking on the profile in the list or with the arrow keys.	
However, when you have TCS elements in the drawing, you can also zoom in on a specific element. You can see the instructions and example in the link on the right.	

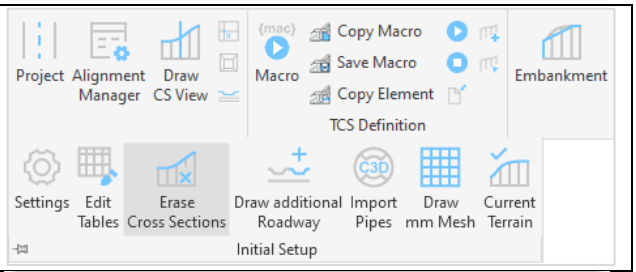
1. Adding and deliting cross – sections

10.1 Adding cross - section

Let's move back to the layout. Click on the Layout ribbon and run the Sample Lines Through Points command.	

In this example, you just change the prefix name to A and then click on the icon at the top of the dialog box, as you will only add one new sample line. Click somewhere in the area between sample lines A90 and A91. Then it opens a dialog box again. Confirm parameters by clicking OK.	
A new cross – section is drawn in the drawing, but if you look at the cross sections you can see that this new defined cross section has not yet been shown.	
Click on the Cross section ribbon and run the Refresh Cross Sections command.	
A new dialog box opens, where you specify the input data, the area and select the elements to be refreshed. Confirm by clicking the OK button and the cross sections will be refreshed.	

10.2 Deleting existing cross -sections

In the Plateia software, we do not delete cross-sections with the CAD command Delete, but we have a special functionality. Run the Erase Cross Section command.	
A dialog box opens, where you select which profile you want to delete. The cross-sections can be selected from the drop-down menu or click on the X icon  next to the drop-down list and the cross-section can be selected directly in the drawing. Select profile A100, confirm by pressing OK and this profile will be deleted.