OpenRoads Designer: Vertical Geometry Exercises

S.R. 185 Proposed Profile

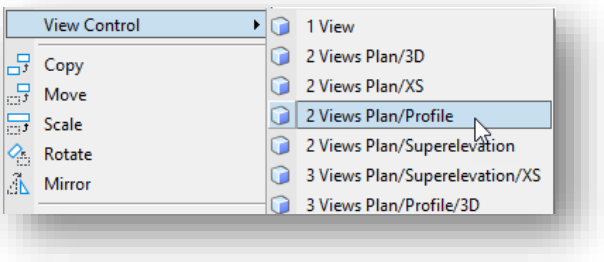
In this exercise, we'll define the proposed profile for State Route 185.

- ✓ Open **ProjectWise Explorer**

- ✓ Browse to the folder containing the training data. The folder location will be provided by the instructor for each class.
- ✓ Open the project with PID number **123456**.
- ✓ Browse to the **400-Engineering\Roadway\Basemaps** folder.
- ✓ Open the geometry basemap for State Route 185:

  400-Engineering\Roadway\Basemaps\123456_BK001.dgn

- ✓ Open a profile window for S.R. 185. This can be accomplished by selecting the alignment and then choosing the **Open Profile Model** icon from the pop-up menu, or by holding down the right-mouse button until the menu shown below appears and choosing the **2 Views Plan/Profile** option and then following the prompts.

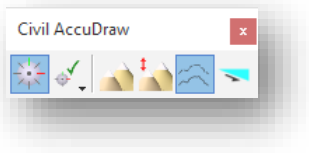


The existing ground is displayed in the profile view.

Use **Civil Accudraw** to store the tangent lines for the profile. Once these lines are stored, go back and store the vertical curves for the proposed alignment using the **Parabola Between Elements** command.

- ✓ Open the ***Civil AccuDraw*** dialog by choosing **Civil Toggles > Civil Accudraw** from the **Geometry** tab
  - Toggle **Civil AccuDraw** on by choosing the first icon

With the profile window active, the **Civil AccuDraw** dialog will display icons relative to vertical geometry functions as shown below



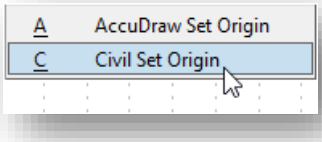
✓ Store the vertical tangent lined for the proposed profile for S.R. 185 using the values shown in the table below.

Use Civil Accudraw with the appropriate ordinate to facilitate entering the profile points.

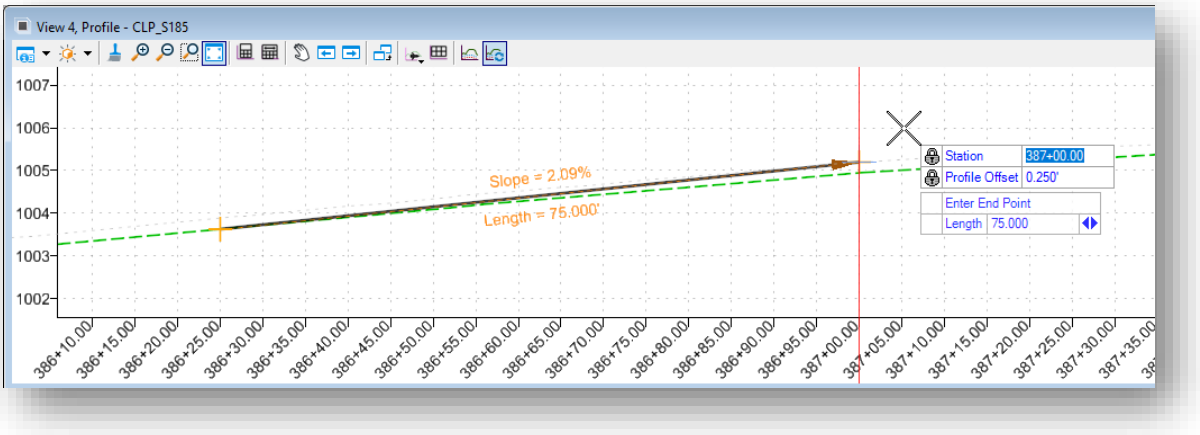
VPI	Station	Civil Accudraw Ordinate	Offset/Elevation
1	386+25	ProfileOffset	Offset = 0
2	387+00	ProfileOffset	Offset = 0.25
3	392+00	Z	Elevation = 1014.07
4	398+00	Z	Elevation = 998.65
5	403+00	Z	Elevation = 993.65
6	410+00	Z	Elevation = 982.17
7	422+50	Z	Elevation = 966.61
8	426+00	Z	Elevation = 964.45
9	427+50	ProfileOffset	Offset = 0

✓ Start by choosing the **Lines > Profile Line Between Points** command to enter the first two VPI points listed above.

- Set **GE_P_Alignment** as the active **Feature Defintion**
- Toggle on the CivilAccudraw **ProfileOffset** ordinate
- With the **Profile Line Between Points** command active, tab so the **Profile Offset** field that is floating on the cursor has focus
- Type in the letter "**o**" to select the existing ground profile element as the origin for entering profile offset values. When prompted, choose the option to set the origin for Civil AccuDraw



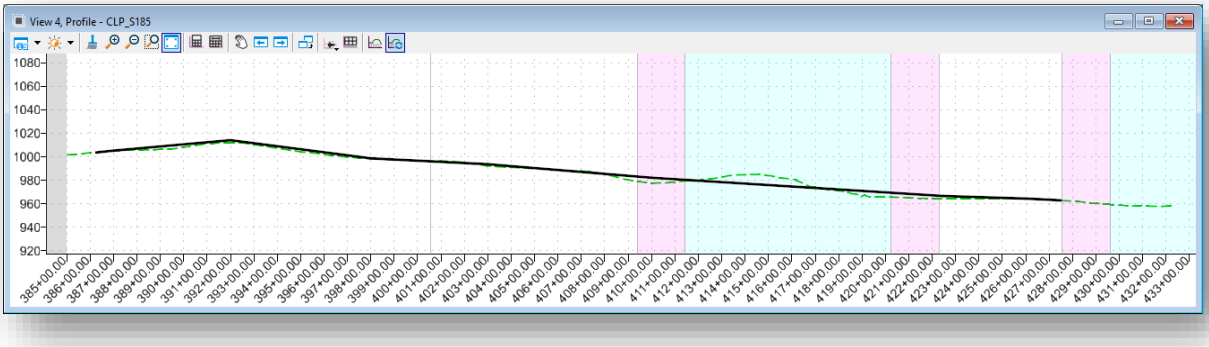
- Select the existing ground profile. With the existing ground profile active, the cursor station and offset values will change relative to the cursor position in relation to the profile
- Key in the values for the first VPI point in the table above to enter the first point on the tangent line. Left-click to enter the first point
- Key in the values for the second VPI from the table above. Left-click to accept the second data point



- ✓ Take the following steps to place the second tangent line, defined by VPI 2 and VPI 3:
  - Start the line by snapping to the end of the first tangent line
  - Place the second point, defined by VPI 3 in the table above, by toggling the Civil AccuDraw ordinate to the Z mode
  - Enter the Station and Elevation for the point

- ✓ Continue placing the remaining tangent lines using the values in the table above and the approprite Civil AccuDraw ordinate.

  The tangent lines for the profile are defined like the example below

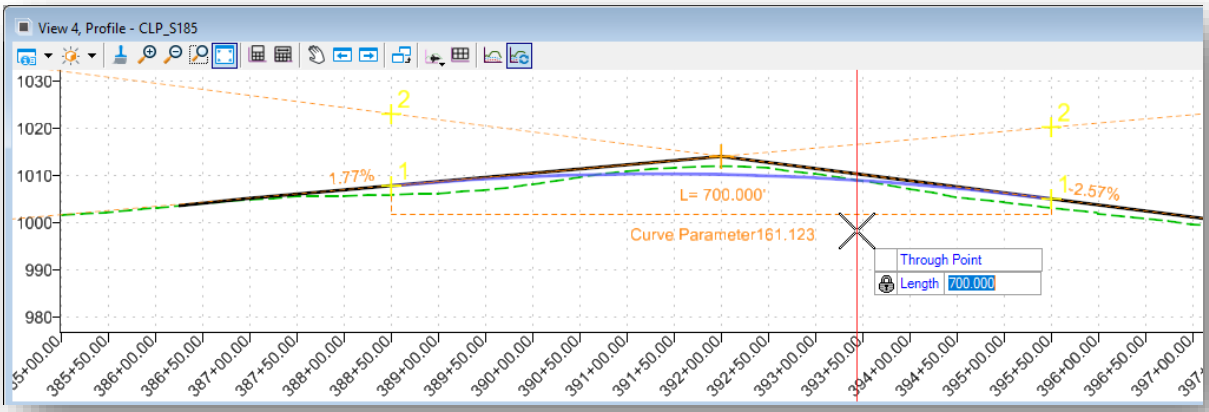


✓ After placing the tangent lines, from the **Geometry** tab, select **Curves > Profile Curve Between Elements > Parabola Between Elements** to place the vertical curves for the alignment

VPI	Station	Curve Length
1	386+25	
2	387+00	No Curve
3	392+00	700’
4	398+00	300’
5	403+00	300’
6	410+00	300’
7	422+50	450’
8	426+00	150’
9	427+50	

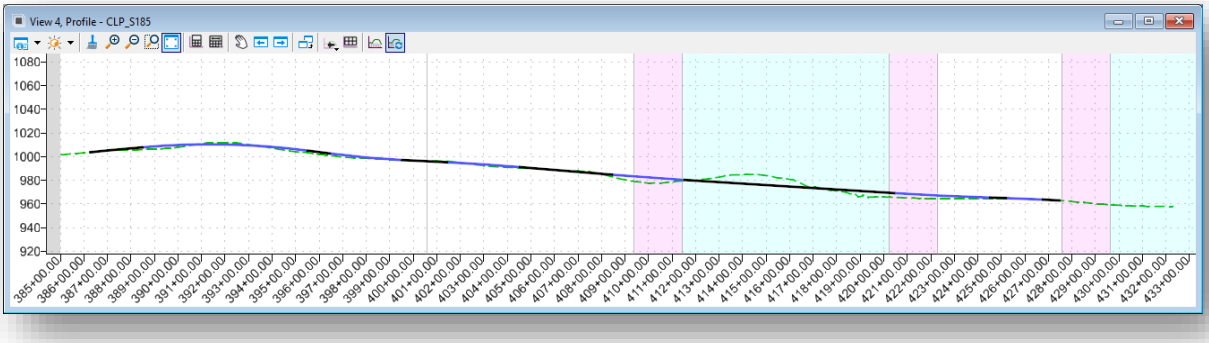
✓ Toggle off **Civil AccuDraw**. It is not needed to define the vertical curves

✓ Place the first curve at VPI 3 as shown below. Use the **Trim/Extend Both** option. Be sure to enter a left-click (data point) to accept the **Trim/Extend** parameter.



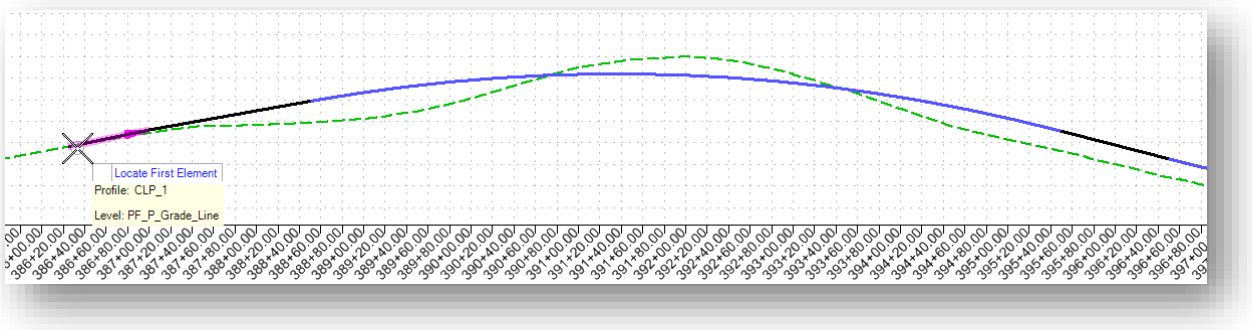
✓ Continue to place the remaing vertical curves

The vertical curves are defined like the example below



Next create a complex element for the vertical profile.

- ✓ From the **Geometry** tab, select **Complex Geometry > Profile Complex By Elements**
  - Set the **Feature Definition** to **GE_P_Alignment**
  - Define the **Name** as **PGL_CLP_S185**. See the **CADD Engineering Standards Manual**, Section 300 for standards geometry element names
  - Using the **Automatic Method**, choose the first tangent element to define the complex chain



  - Left-click to accept the solution

Take the following steps to define the proposed profile as the active profile:

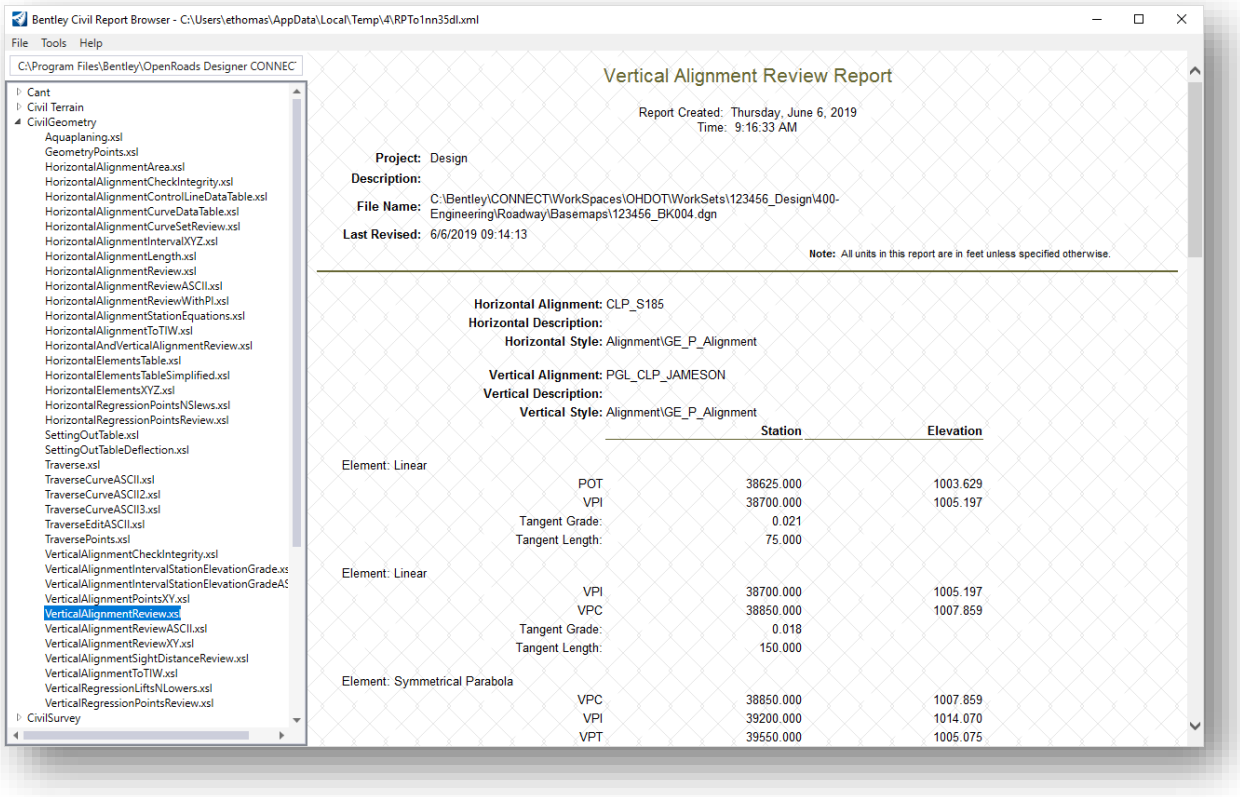
- ✓ Use the MicroStation **Select Element** tool to select the proposed profile line
  - Allow the cursor to rest on the selected element until the pop-up menu appears
  - Choose the **Set As Active Profile** icon

Review the profile by generating a report

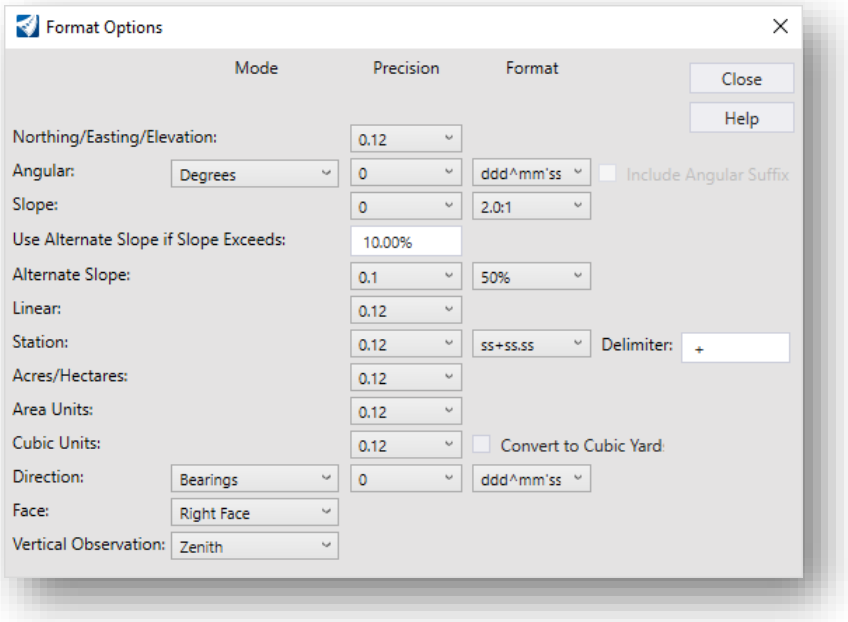
- ✓ Use the MicroStation **Select Element** tool to select the proposed profile line
- ✓ Allow the cursor to rest on the selected element until the pop-up menu appears
- ✓ Choose the **Profile Report** icon

A report is displayed in the ***Bentley Civil Report Browser*** dialog

The default **Vertical Alignment Review** report is displayed as shown below. Click on the other formats options to view the available options.



The format for the report, such as the number of decimal places, can be customized by choosing **Tools > Format Options**. Changes to these parameters are applied to the report when the ***Format Options*** dialog is closed. Suggested values for ODOT reports are shown below.



The report can be saved by choosing **File > Save As**

This completes this exercise.

- ✓ Exit OpenRoads Designer, checking the file back in to ProjectWise

St. Peter Road Proposed Profile

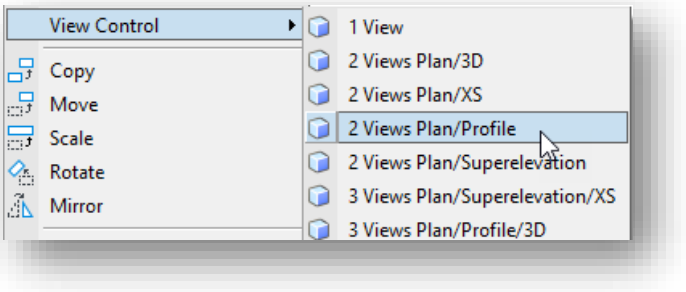
In this exercise, we'll define the proposed profile for St. Peter Road.

- ✓ Open **ProjectWise Explorer**

- ✓ Browse to the folder containing the training data. The folder location will be provided by the instructor for each class.
- ✓ Browse to the **400-Engineering\Roadway\Basemaps** folder.
- ✓ Open the geometry basemap for St. Peter Road:

  400-Engineering\Roadway\Basemaps\123456_BK002.dgn

- ✓ Open a profile window for St. Peter Road. This can be accomplished by selecting the alignment and then choosing the **Open Profile Model** icon from the pop-up menu, or by holding down the right-mouse button until the menu shown below appears and choosing the **2 Views Plan/Profile** option and then following the prompts.



The existing ground is displayed in the profile view.

The profile for St. Peter Road will tie in to S.R. 185. The profile grade point for the intersection of St. Peter Road with S.R. 185 can be drawn on the profile with the following steps:

- ✓ From the **Geometry** tab, choose the **Profile Creation > Profile Intersection Point** command and take the following steps:
  - When prompted to **Locate Element to Show Intersection**, choose the plan view graphic for St. Peter Road
  - When prompted to **Locate Element Which Intersects**, choose the plan view graphic for proposed S.R. 185

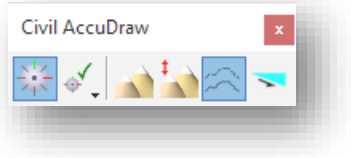
  A point representing the PGL location of S.R. 185 at the intersection with St. Peter Road is drawn on the profile

Next, use Civil Accudraw to store the tangent lines for the profile. Once these lines are stored, go back and store the vertical curves for the proposed alignment using the **Parabola Between Elements** command.

- ✓ Open the ***Civil AccuDraw*** dialog by choosing **Civil Toggles > Civil Accudraw** from the **Geometry** tab

  - Toggle Civil AccuDraw on by choosing the first icon

    With the profile window active, the Civil AccuDraw dialog will display icons relative to vertical geometry functions as shown below

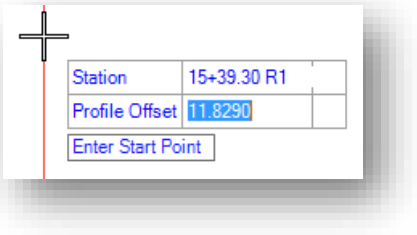


- ✓ Set **GE_P_Alignment** as the active **Feature Defintion**

- ✓ Store the proposed tangent lines for St. Peter Road using the values shown in the table below. Use Civil Accudraw with the appropriate ordinate to facilitate entering the profile points.

Station	Elevation	Civil Accudraw Ordinate
17+00	Meet Existing	ProfileOffset
18+25	997.8800	Z
19+70	995.6026	Z
20+00	Snap to S.R. 185 PGL Point	

Tips:
To use the **Civil Accudraw Profile Offset** ordinate, use the tab key to shift keyboard focus to the **Offset** field as shown below.



With focus in the **Offset** field, key in the "o" shortcut to select the profile element that will be used as the origin for the **Station** and **Profile Offset** values. You are prompted to **Select a reference element**. Select the exiting ground line for St. Peter Road.

- ✓ After placing the tangent lines, from the **Geometry** tab, select **Curves > Profile Curve Between Elements > Parabola Between Elements** to place the vertical curves for the alignment

  Toggle off Civil AccuDraw. It is not needed to define the vertical curves

Station	Curve Length
18+25	200'
19+70	10'

Use the **Trim/Extent Both** option when defining the curves.

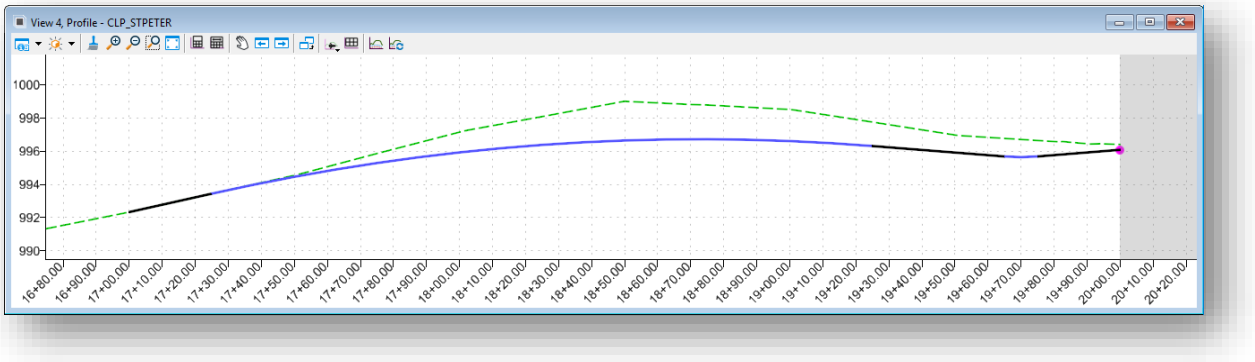
Create a complex element for the profile.

- ✓ From the **Geometry** tab, select **Complex Geometry > Profile Complex by Elements**
- ✓ Set the **Feature Definition** to **GE_P_Alignment**
- ✓ Set the **Name** to **PGL_CLP_STPETER**. See the **CADD Engineering Standards Manual**, Section 300 for standards geometry element names.
- ✓ Using the **Automatic Method**, choose the first tangent element to define the complex chain
- ✓ Left-click to accept the solution

Take the following steps to define the proposed profile as the active profile:

- ✓ Use the MicroStation **Select Element** tool to select the proposed profile line
- ✓ Allow the cursor to rest on the selected element until the pop-up menu appears
- ✓ Choose the **Set As Active Profile** icon

The completed profile should appear like the example shown below.



This completes this exercise.

- ✓ Exit OpenRoads Designer, checking the file back in to ProjectWise

Jameson Road Proposed Profile

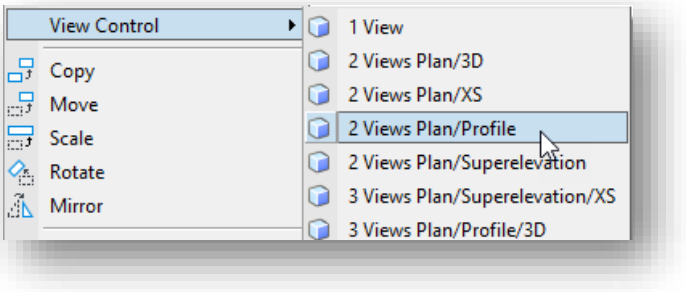
In this exercise, we'll define the proposed profile for Jameson Road.

- ✓ Open **ProjectWise Explorer**

- ✓ Browse to the folder containing the training data. The folder location will be provided by the instructor for each class.
- ✓ Browse to the **400-Engineering\Roadway\Basemaps** folder.
- ✓ Open the geometry basemap for Jameson Road:

  400-Engineering\Roadway\Basemaps\123456_BK003.dgn

- ✓ Open a profile window for Jameson Road. This can be accomplished by selecting the alignment and then choosing the **Open Profile Model** icon from the pop-up menu, or by holding down the right-mouse button until the menu shown below appears and choosing the **2 Views Plan/Profile** option and then following the prompts.



The existing ground is displayed in the profile view.

The profile for Jameson will tie in to S.R. 185. The profile grade point for the intersection of Jameson with S.R. 185 can be drawn on the profile with the following steps:

- ✓ From the **Geometry** tab, choose the **Profile Creation > Profile Intersection Point** command and take the following steps:
  - When prompted to **Locate Element to Show Intersection**, choose the plan view graphic for Jameson Road
  - When prompted to Locate Element Which Intersects, choose the plan view graphic for proposed S.R. 185

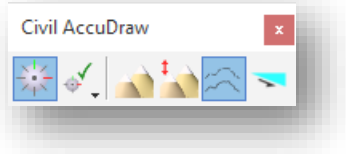
  A point representing the PGL location of S.R. 185 at the intersection with Jameson Road is drawn on the profile

Next, use Civil Accudraw to store the tangent lines for the profile. Once these lines are stored, go back and store the vertical curves for the proposed alignment using the **Parabola Between Elements** command.

✓ Open the ***Civil AccuDraw*** dialog by choosing **Civil Toggles > Civil Accudraw** from the **Geometry** tab

- Toggle Civil AccuDraw on by choosing the first icon

  With the profile window active, the Civil AccuDraw dialog will display icons relative to vertical geometry functions as shown below



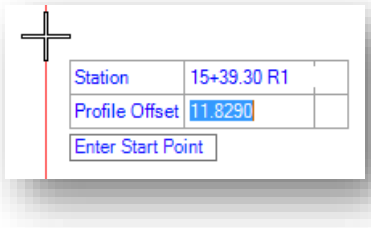
✓ Set **GE_P_Alignment** as the active **Feature Defintion**

✓ Store the proposed tangent lines for Jameson Road using the values shown in the table below. Use Civil Accudraw with the appropriate ordinate to facilitate entering the profile points.

Note: Store the VPI points in this order:
- Store VPI 1 and VPI 2 first
- Then store the line from the point at the intersection with S.R. 185 moving backwards to define VPI 4 using a -8.0% slope for a lenth of -12'
- Next store VPI 3 movoing backwards from VPI 4 using a -3.0% slope for a lenth of -12'
- Finally, place the tangent line between points VPI 2 and VPI 3

VPI	Station	Elevation	Civil Accudraw Ordinate
1	12+00	Meet Existing	ProfileOffset
2	12+75	-0.65% Slope from VPI 1	NA
3		-3.0% Slope, 12' left of VPI 4	NA
4		-8.0% Slope, 12' left of VPI 5	NA
5		Snap to S.R. 185 PGL Point	NA

Tips:
To use the **Civil Accudraw Profile Offset** ordinate, use the tab key to shift keyboard focus to the **Offset** field as shown below.



With focus in the **Offset** field, key in the "o" shortcut to select the profile element that will be used as the origin for the **Station** and **Profile Offset** values. You are prompted to **Select a reference element**. Select the exiting ground line for St. Peter Road.

✓ After placing the tangent lines, from the **Geometry** tab, select **Curves > Profile Curve Between Elements > Parabola Between Elements** to place the vertical curves for the alignment

Toggle off Civil AccuDraw. It is not needed to define the vertical curves

Station	Curve Length
VPI 2, Station 12+75	100'
VPI 3	10'
VPI 4	No Curve

Use the **Trim/Extent Both** option when defining the curves.

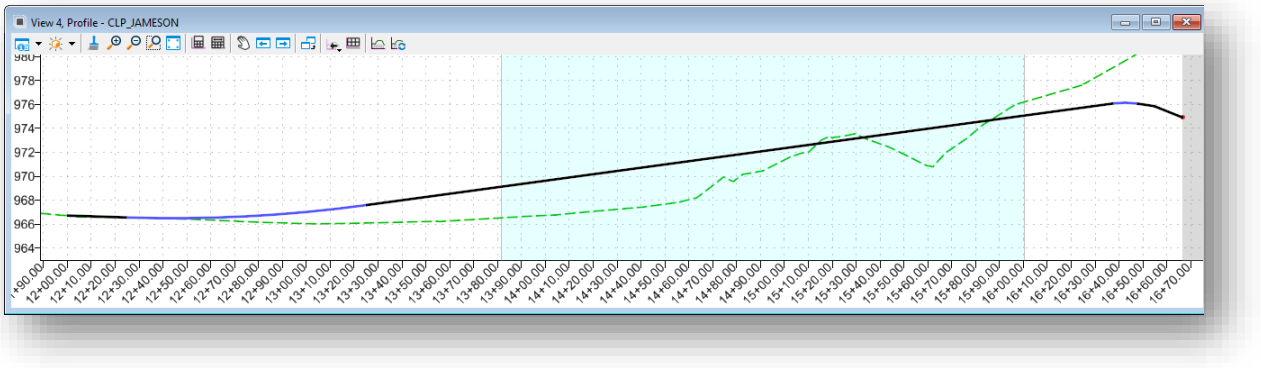
Create a complex element for the profile.

- ✓ From the **Geometry** tab, select **Complex Geometry > Profile Complex by Elements**
- ✓ Set the **Feature Definition** to **GE_P_Alignment**
- ✓ Set the **Name** to **PGL_CLP_JAMESON**. See the **CADD Engineering Standards Manual**, Section 300 for standards geometry element names.
- ✓ Using the **Automatic Method**, choose the first tangent element to define the complex chain
- ✓ Left-click to accept the solution

Take the following steps to define the proposed profile as the active profile:

- ✓ Use the MicroStation **Select Element** tool to select the proposed profile line
- ✓ Allow the cursor to rest on the selected element until the pop-up menu appears
- ✓ Choose the **Set As Active Profile** icon

The completed profile should appear like the example below.



This completes this exercise.

- ✓ Exit OpenRoads Designer, checking the file back in to ProjectWise

OpenRoads Software Version

This document was prepared using the following software version:

OpenRoads Designer CONNECT Edition – 2020 Release 3 Update 9 – Version 10.09.00.91

Contacts

For any questions, suggestions, or problems with this document please contact the ODOT Office of CADD and Mapping Services by use of the following form on the ODOT website:

https://odot.formstack.com/forms/cadd_servicerequest