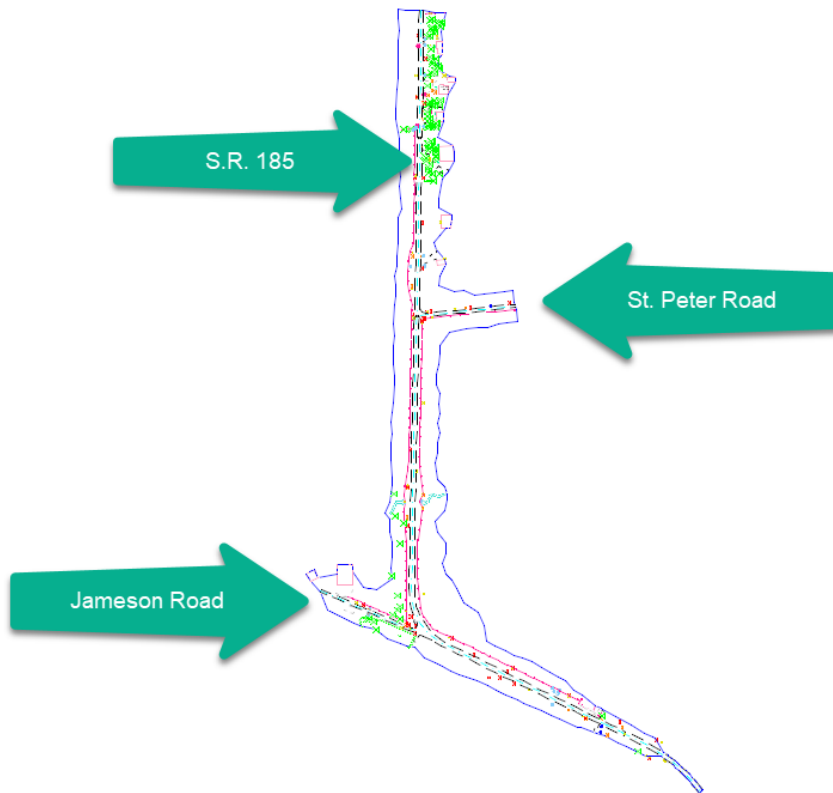# OpenRoads Designer:
305 Alignment Exercises

Alignment Exercises

The following exercises step through the process to define proposed alignments for the sample project. Two proposed alignments will be developed for S.R. 185 and Jameson Road. The existing alignment for St. Peter Road will be used for the proposed improvements.

For these exercises, the following files have already been created in a previous exercise:

File Name	Content
300-Survey\Basemaps\123456_FB001.dgn	Survey mapping and the existing ground terrain
400-Engineering\Roadway\Basemaps\123456_BK001.dgn	Centerline of Proposed S.R. 185
400-Engineering\Roadway\Basemaps\123456_BK002.dgn	Centerline of Proposed St. Peter Road
400-Engineering\Roadway\Basemaps\123456_BK003.dgn	Centerline of Proposed Jameson Road

Exercise A – Proposed State Route 185

State Route 185 is the main alignment for the sample project. In this exercise we will define a new proposed alignment 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.
- ✓ Browse to the **400-Engineering\Roadway\Basemaps** folder.
- ✓ Open the geometry basemap for State Route 185:

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

- ✓ Attach the survey information as a reference file (**Home > Attach Tools > References**). The survey information is in the following design file:

   **300-Survey\Basemaps\123456_FB001.dgn**

    When attaching the reference file, which **Orientation** option should be used? **Coincident – World**, or **Geographic – Reprojected**?

    Should **Live Nesting** be used?

- ✓ Turn on/off levels for the survey information as necessary. Start by turning off the levels listed below, and any other levels that you may not want to see while working on the geometry for the project.

    - PV_X_COP
    - SV_X_Break_Lines
    - SV_X_Random_Point
    - SV_X_Shot_Marker
    - SV_X_Text_Comment
    - SV_X_Text_Elevation
    - SV_X_Text_Name
    - SV_X_Text_Text

- ✓ Select the terrain model graphics from the reference attachment and set it as the **Active Terrain** (select the terrain boundary and then hover the mouse over the boundary to get the pop-up toolbar seen below, a long right click on the boundary will bring up a context menu where the Set of Active Terrain Model button can be found as well).
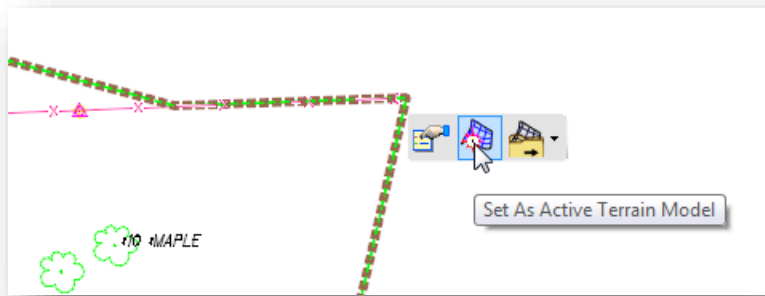
✓ From the **Geometry** tab, choose **Standards > Features Definition Toolbar**. Set the active feature to **Alignments > GE_P_Alignment**. Toggle on the **Use Active Feature Definition** icon.
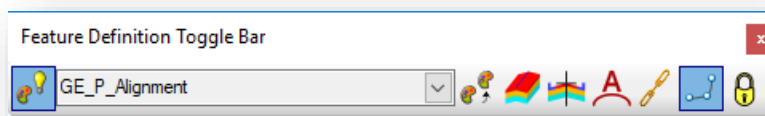
✓ From the *Geometry* tab, choose the **Lines > Line Between Points** command.

Start by placing the first line from the RSPK feature located at the intersection of St. Peter Road and S.R. 185. This is point SV901 in the Survey file. As shown below.
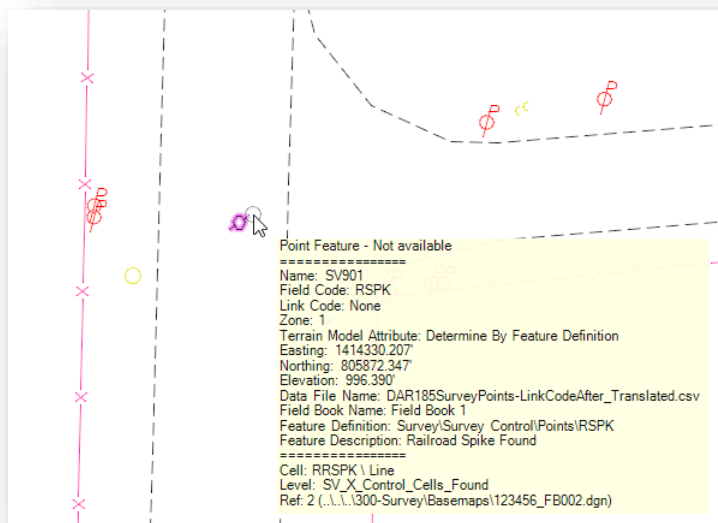
Use the MicroStation **Origin Snap** to ensure you are starting the first point of the line by snapping to the origin of the RRSKP cell.

✓ Define the second point of the line with a **Distance** value of **1556.74'** and a **Line Direction** value of **N00^44'28"E** as shown below.

Tip: Degrees, minutes, and seconds are entered using the colon character as a separator.
Example: n00:44:28e
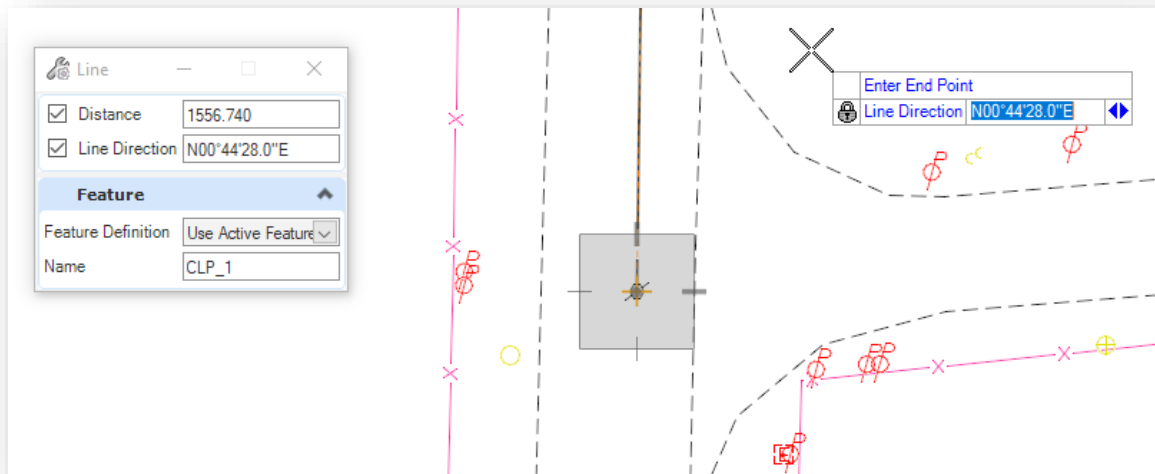
✓ Use the **Line Between Points** command to store the following lines.

        Define the second line starting from the RRSPK feature, point SV901, using the following settings:

Distance:	1595.31
Direction:	s01:13:48w

        Define the third line starting from the end of the second line.

Distance:	1838.00
Direction:	s63:50:18e

        Define the fourth like starting from the end of the third line.

Distance:	650.00
Direction:	s03:35:00w

✓ Next, use the *Design Standards Toolbar* to place a spiral-curve-spiral set. From the MicroStation *Geometry* tab, choose **Standards > Design Standards Toolbar** icon.

✓ Choose the **202-7E, 2-Lane Undivided 55 MPH** design standard as shown below.
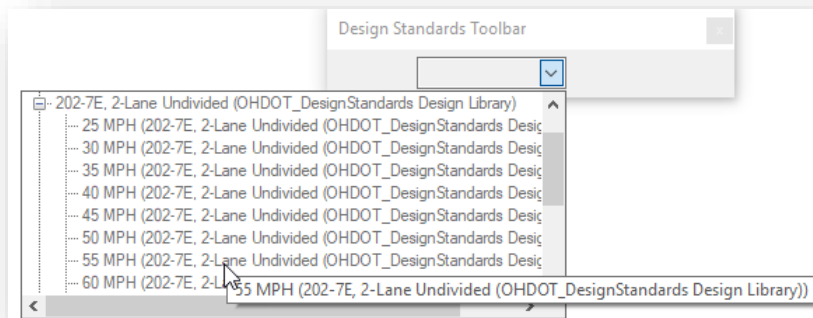
✓ Toggle on the second icon, **Toggle Active Design Standard**
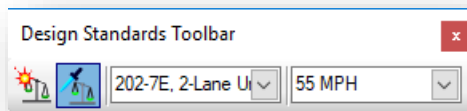
✓ From the *Geometry* tab, choose the **Arcs > Arc Between Elements > Spiral Arc Spiral** command

When using a **Design Standard**, the software will set the length of the spirals and the degree of curvature to the default values defined by the selected design standard.
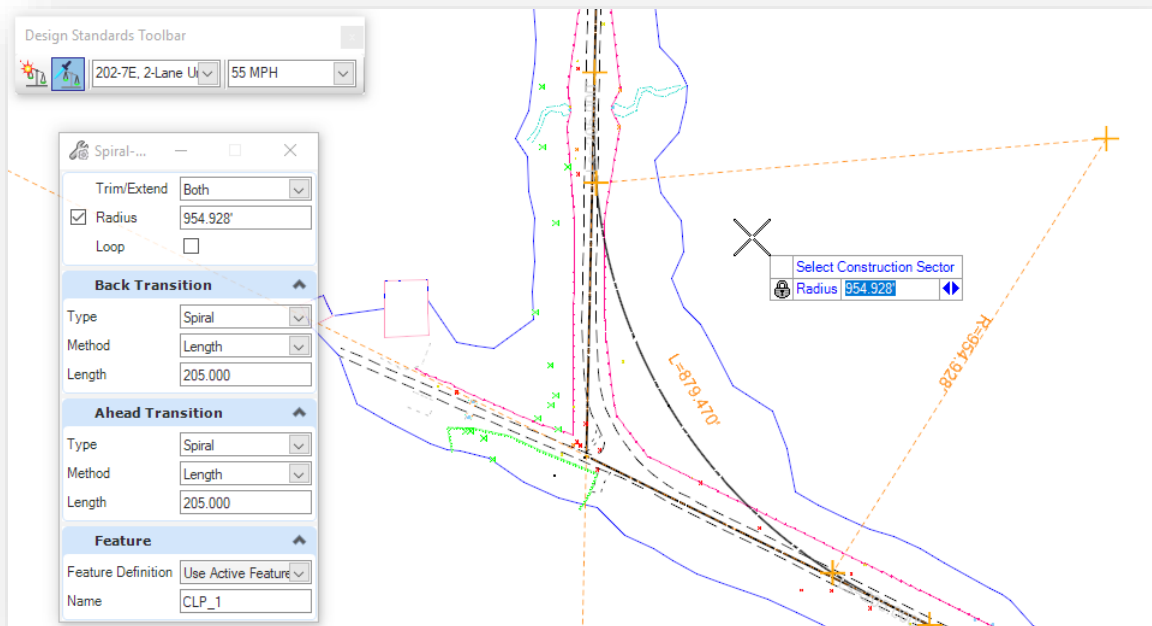
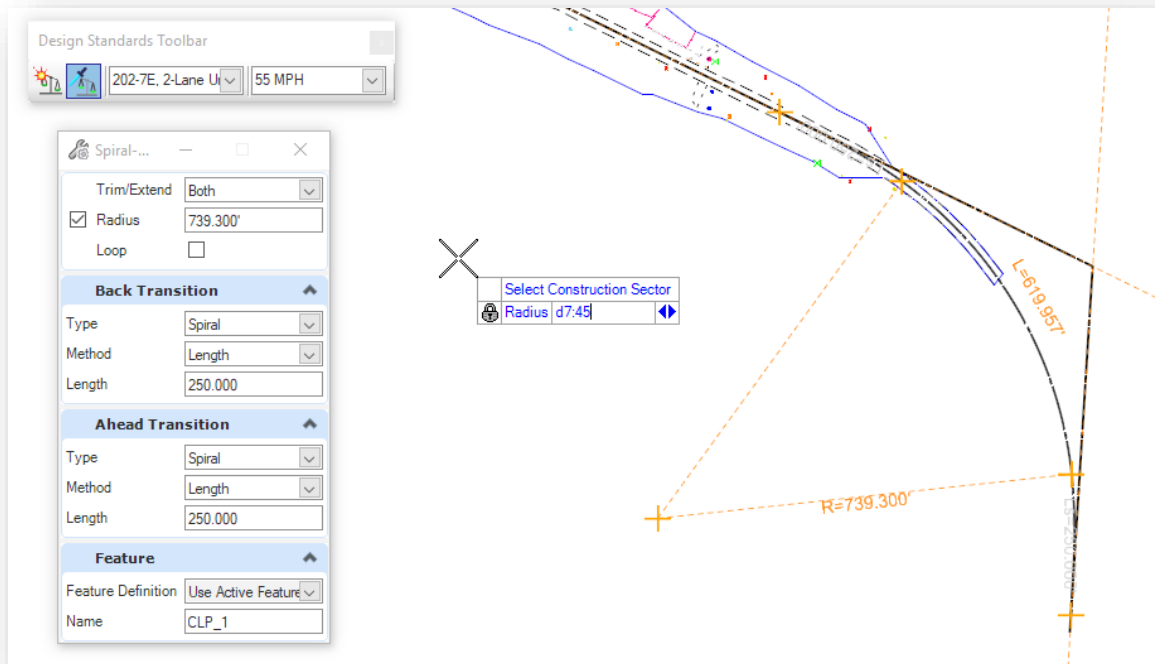✓ Select **Trim/Extend Both** to complete the process.

Be sure to enter a left-click (data point) to accept the **Trim/Extend** parameter. OpenRoads requires a left-click to accept parameters as data is entered.

Use the **Spiral Arc Spiral** command to place the second curve for the alignment. For the second curve will match the existing alignment, the values defined by the active Design Standard will be over-written.

✓ Place the second spiral-curve-spiral using the following values:

Radius:	d7:45
Back Transition Length:	250
Ahead Transition Length:	250

Tip: The degree of curve can be set by keying in the degree value in the **Radius** field prefixed with a lower case "d". Degrees, minutes, and seconds are separated by the colon character.

✓ Use the **Trim/Extend Both** option to complete the process, issuing a left-click to accept the parameter.

The 7°45' curve does not meet the currently selected 55 MPH Design Standard. A red X is displayed on the curve as shown at right.

Design errors can be reviewed in the ***Civil Message Center*** dialog by selecting **Standards > Civil Message Center** from the **Geometry** tab.

✓ Be sure to select the spiral-curve-spiral set to check the spiral lengths after the data is placed in the file. The Design Standard may have switched the length back to 205'. If the spirals were placed with a length of 205', edit the rule for each spiral length to change the value to 250'

No action is required to continue designing the corridor model. This is strictly informational and can be ignored if the data is correct.

Next, create a complex chain from the individual elements that have been placed for the proposed centerline of S.R. 185.

✓ From the **Geometry** tab, choose the **Complex Geometry > Geometry > Complex By Elements** icon
  o Set the **Feature Definition** to the **Alignments > GE_P_Alignment**.
  o Key in the **Name** for the centerline element. See the **ODOT CADD Engineering Standards Manual (ODOTcadd) Section 300** for more information on naming geometry elements.
  o Using the **Automatic Method**, choose the first element to define the complex element. Note that the direction of the element is significant. When you move the cursor over the first element, an arrow is displayed indicating the direction the complex element will be defined.
  o When prompted to **Locate First Element**, select and accept the first element at the north end of the alignment as shown below.
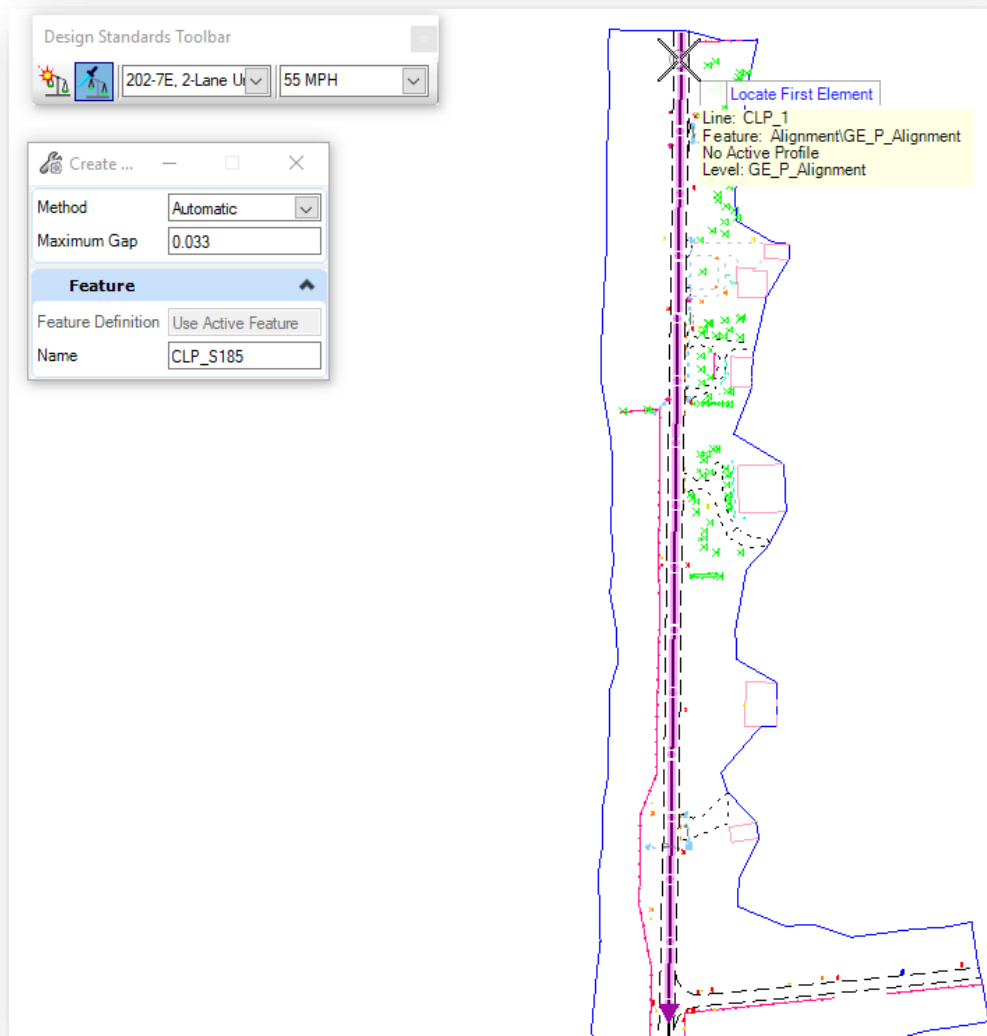

The chain is stored with a default beginning station value of 0+00. Use the **Start Station** tool to define the beginning station for the newly created alignment as detailed below.

✓ From the **Geometry** tab, choose **Modify > Start Station**

The **Start Distance** parameter defines the location along the selected alignment where the **Start Station** value is applied. The **Start Distance** should be 0 and the **Start Station** is 385+00.00

The station value can be reviewed or edited by using the MicroStation Element Selection tool to select the complex element. That station rules are displayed like the example below
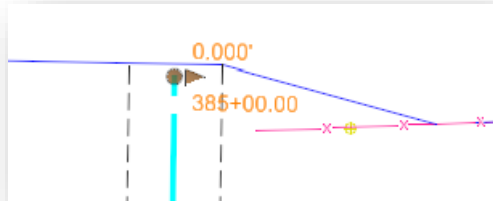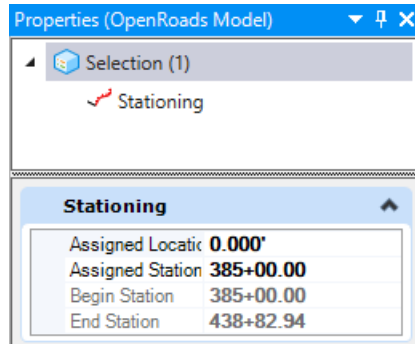

The parameters for the alignment can be reviewed using the *Project Explorer* dialog's **OpenRoads Model** group.
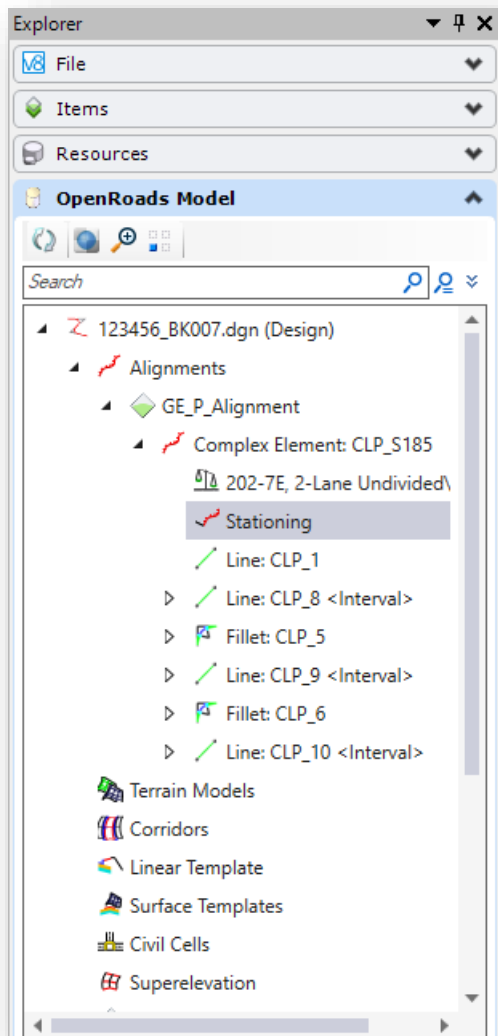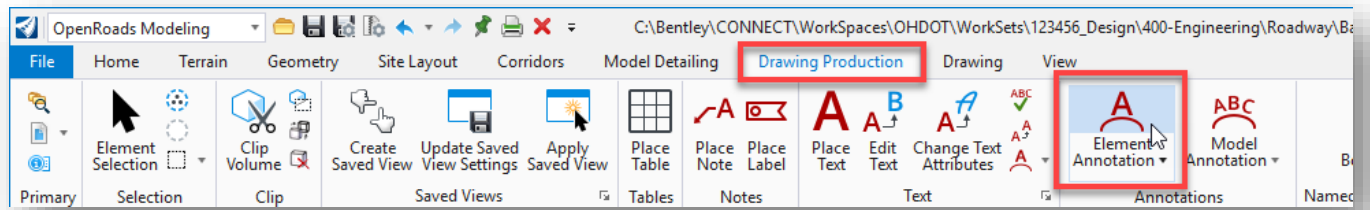

Various parameters can be reviewed and/or edited in *Project Explorer* by right-clicking on an item and selecting **Properties**.

For example, the **Assigned Station** value can be reviewed and edited in the *Properties* dialog as shown below.

✓ Annotate the alignment using the **Drawing Production** tab **Element Annotation** command

✓ From the **Drawing Production** tab, change the **Drawing Scale** value to **1:50**. Note how the annotation is scaled, including station tics and leader lines

This completes Exercise A

✓ Save settings and exit OpenRoads Designer. Be sure to check the file back into ProjectWise.

Exercise B – St. Peter Road

Take the following steps to define the centerline for St. Peter Road:
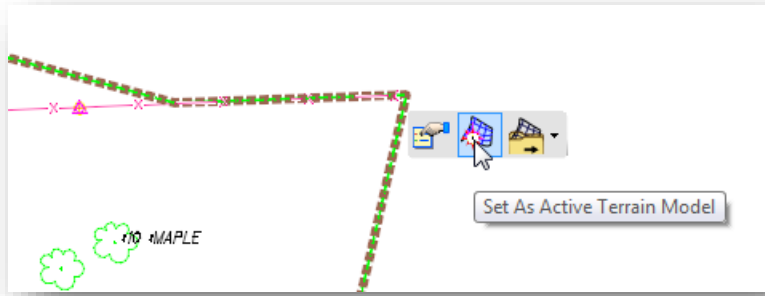
- ✓ Open **ProjectWise Explorer**

- ✓ 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

- ✓ Attach the survey information as a reference file using a **Nest Depth** value of **0**. The survey information is in the following design file:

  300-Survey\Basemaps\123456_FB001.dgn

- ✓ Turn on/off levels for the survey information as necessary. Start by turning off the levels listed below, and any other levels that you may not want to see while working on the geometry for the project.

  - PV_X_COP
  - SV_X_Break_Lines
  - SV_X_Random_Point
  - SV_X_Shot_Marker
  - SV_X_Text_Comment
  - SV_X_Text_Elevation
  - SV_X_Text_Name
  - SV_X_Text

- ✓ Select the terrain model graphics from the reference attachment and set it as the **Active Terrain** (select the terrain boundary and then hover the mouse over the boundary to get the pop-up toolbar seen below, a long right click on the boundary will bring up a context menu where the Set of Active Terrain Model button can be found as well).

Now we are ready to define the centerline alignment for St. Peter Road.

✓ From the **Geometry** tab, choose **Standards > Features Definition Toolbar**. Set the active feature to **Alignments > GE_P_Alignment**. Toggle on the **Use Active Feature Definition** icon.
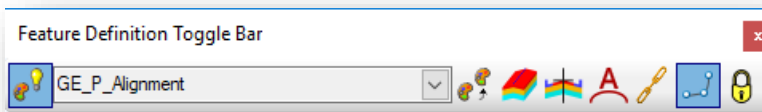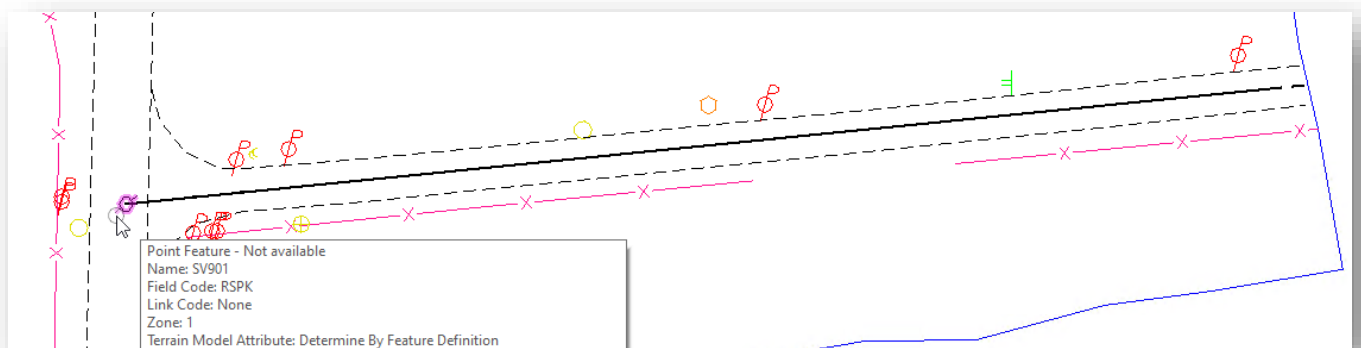

✓ From the **Geometry** tab, choose **Lines > Line Between Points**. Draw the first tangent line for proposed Jameson Road by snapping to each end of the centerline of existing Jameson Road.

The survey crew has provided coordinates for the start of St. Peter Road. Use CivilAccudraw with the XY ordinate to enter the fist point for the **Line Between Points** command with the following coordinates:

> Northing = 805922.456
> Easting = 1414827.690

The second point will end at survey point SV901. Use the MicroStation Origin Snap to snap to the survey point to end the line.

Use the **Start Station** tool to define the beginning station for the line as detailed below.

✓ From the **Geometry** tab, choose **Modify > Start Station**

The **Start Distance** parameter defines the location along the selected alignment where the **Start Station** value is applied. The **Start Distance** should be 0 and the **Start Station** is 15+00.00

✓ Annotate the alignment using the **Drawing Production** tab **Element Annotation** command
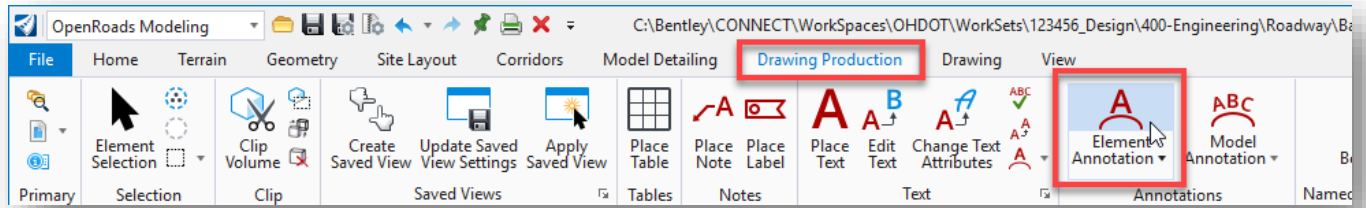
This completes Exercise B

✓ Save settings and exit OpenRoads Designer. Be sure to check the file back into ProjectWise.

Exercise C – Jameson Road Relocation

Jameson Road will be relocated by defining a new horizontal curve using the existing centerline as the back tangent and defining the ahead tangent that is perpendicular to the proposed S.R. 185 alignment.
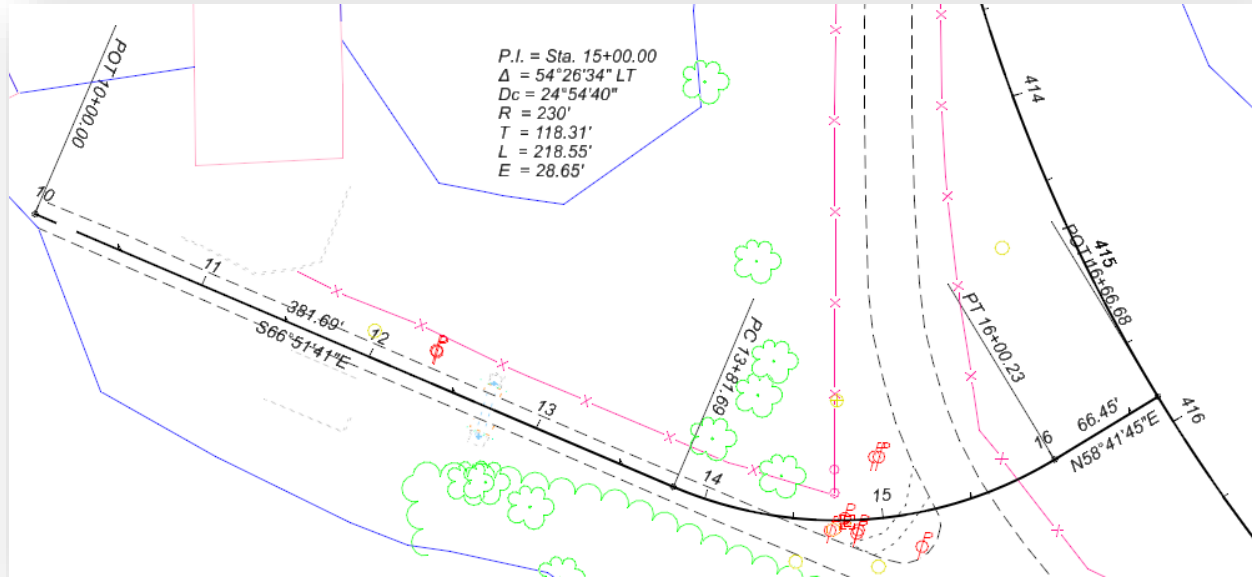
Take the following steps to define the centerline for Jameson Road:

- ✓ 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:

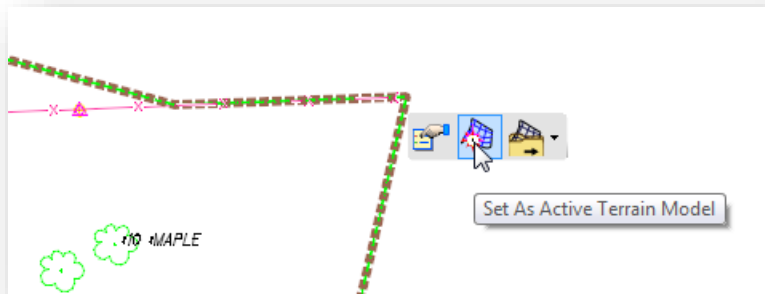   **400-Engineering\Roadway\Basemaps\123456_BK003.dgn**

- ✓ Attach the survey information as a reference file using a **Nest Depth** value of **0**. The survey information is in the following design file:

    300-Survey\Basemaps\123456_FB001.dgn

- ✓ Turn on/off levels for the survey information as necessary. Start by turning off the levels listed below, and any other levels that you may not want to see while working on the geometry for the project.

- PV_X_COP
- SV_X_Break_Lines
- SV_X_Random_Point
- SV_X_Shot_Marker
- SV_X_Text_Comment
- SV_X_Text_Elevation
- SV_X_Text_Name
- SV_X_Text

✓ Select the terrain model graphics from the reference attachment and set it as the **Active Terrain** (select the terrain boundary and then hover the mouse over the boundary to get the pop-up toolbar seen below, a long right click on the boundary will bring up a context menu where the Set of Active Terrain Model button can be found as well).


✓ Attach the geometry basemap containing the centerline of proposed S.R. 185 as a reference using a **Nest Depth** value of **0**. The survey information is in the following design file:

400-Roadway\Basemaps\123456_BK001.dgn

Now we are ready to define the centerline alignment for the Jameson Road relocation.

✓ From the **Geometry** tab, choose **Standards > Features Definition Toolbar**. Set the active feature to **Alignments > GE_P_Alignment**. Toggle on the **Use Active Feature Definition** icon.
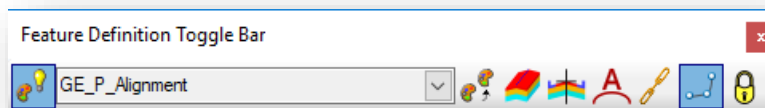

✓ From the **Geometry** tab, choose **Lines > Line Between Points**. Draw the first tangent line for proposed Jameson Road using CivilAccudraw to enter the following coordinates.

Point 1	Northing = 804471.371 Easting = 1413832.052
Point 2	Northing = 804274.892 Easting = 1414291.830

✓ Place the second tangent line from the end of the first using the MicroStation Perpendicular Snap to place the line perpendicular to the proposed S.R. 185 alignment, as shown below.
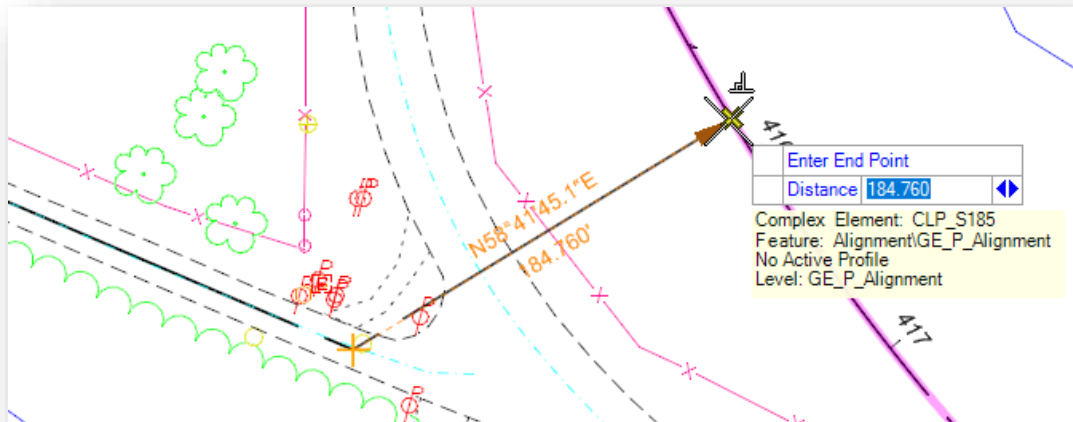
✓ From the **Geometry** tab, select **Arcs > Arc Between Elements > Simple Arc** to place an arc with a 230' radius between the two tangent lines. Be sure to trim both elements.

✓ From the **Geometry** tab, select **Complex Geometry > Complex by Element** to create a complex element for proposed Jameson Road. Use a **Name** value of **CLP_JAMESON**

✓ From the **Geometry** tab, choose **Modify > Start Station**. Define the beginning station for the alignment with a **Start Distance** value of **0** and a **Start Station** value of **10+00**

✓ Annotate the alignment by selecting the **Drawing Production** tab **Element Annotation** command

This completes Exercise C

✓ Save settings and exit OpenRoads Designer. Be sure to check the file back into ProjectWise

OpenRoads Software Version

This document was prepared using the following software version:

OpenRoads Designer CONNECT Edition – 2021 Release 1 Update 10 – Version 10.10.01.03

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