Horizontal Geometry

COLORADO
Department of Transportation

Creating & Editing Centerline Geometry Training Dataset
https://drive.google.com/file/d/139oM4Ga88gePKE80VJK6vTkAUDziEu-H/view?usp=sharing

Horizontal Geometry Editing & Modifying DEMO video
https://drive.google.com/drive/folders/1pVjlxUfOBTYcOGyOMjXUhrj9Z9KNSe02

Exercise 2: Editing Horizontal Geometry

Exercise Description

This section contains exercises teaching how the civil geometry captures "design intent" and how to edit geometric elements. You will also practice using Design Standards to evaluate the geometry and find areas which do not meet the standards.

Skills Taught

- Editing geometry elements
- Editing with the Table Editor
- Appending geometry elements
- Using Complex Redefine
- Verifying geometry layout with Design Standards
- Civil Message Center
- Annotating Geometry

Geometry Editing Tools Overview

There are many tools available to edit geometric elements. Some of the editing tools are available in the **Geometry** ribbon tab and others are located in the **Drawing** ribbon tab. Below is a partial list of the tools that can be used:

The following commands are located in **OpenRoads Modeling > Geometry**:

- **Table Editor** - Use to edit alignment in tabular format. Can be used to add and delete PI's as well as add and remove curves.

- **Insert Fillet** - Use Insert Fillet tool if you need to insert a curve or curve combinations between tangents on previously create alignment.

- **Append Elements** - If you need to add additional elements to the beginning or end of alignment.

- **Complex Redefine** - Allows you to redefine geometry over a certain range, substituting in new horizontal geometry. It preserves all rules built off the original geometry (i.e. other geometry, superelevation, civil cells, etc.)

The following commands are located in the **OpenRoads Modeling > Drawing > Modify**:

- **Insert Vertex** - Use Insert Vertex to insert PI to horizontal alignment.

- **Delete Vertex** - Use Delete Vertex to remove PI's which can also remove horizontal curves.

- **Trim/Extend** - Use to trim or extend geometric elements.

- **Modify Element** - Use to modify elements by changing their shape.

- **Delete** - Use to delete elements.

- **Break Element** - Use to delete a portion of an element.

- **Drop Element** (Found under the **Drawing** workflow: **Home > Groups > Drop Element**) - Use this tool to un-complex the alignment and return it to the base elements. Take care when using this tool, when you drop a horizontal alignment any associated vertical alignment will be deleted.

Dynamic Text and Manipulators - Simple changes to horizontal geometry can be made via the dynamic text and drag handles for easy in place editing.

Properties - Element properties can also be used to change simple curve to more complex curve combinations as well as change distance and direction of elements and other properties.

We will not be able to cover all of these tools in this course but be aware of the various tools that are available to edit and modify geometry.

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Explore Design Intent and Edit Geometry

1. Select the **River Road** alignment and observe the manipulators and handlers.

   Notice the dynamic text, the manipulators (or handlers) and snap icons attached to the geometry. The dynamic text and snap icons are examples of the rules and relationships associated with the geometry and the overall *design intent.*

   Lets explore how *design intent* influenced the rest of the geometry.

2. Select **Set Mark** from the Quick Access toolbar at the top of the ribbon. Set Mark will mark this location in the file so the following steps can easily be undone back to this point.

3. Zoom in on the northern portion of the River Road geometry where we have ruled geometry with manipulators.

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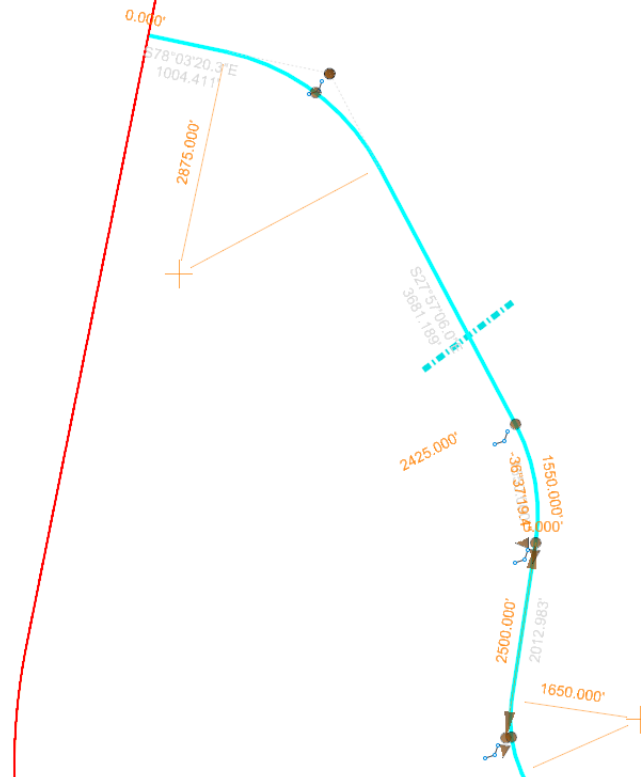
4. Observe the differences in the manipulators for each of the three curves.

   The first and third curves have radius value manipulators and handlers at the PI of the curves. The second curve (or middle curve) has a radius value manipulator but no handler at the PI of the curve. Instead, this curve has arc length and delta angle manipulators.

5. Change the *Radius* for the first (northern most) curve to **1000** *[300]*.

   The curve changes to the new radius but no other changes are made to the geometry.

6. Change the *Radius* for the second curve to **1000** *[300]*.

   The curve changes to the new radius as expected but the geometry also changed significantly. This is not an error, the software maintained our design intent to have a 1550 *[470]* arc length. The only way to maintain this arc length is to adjust the curve's exit bearing.

   Change the *Arc Length* for the second curve to **500** *[150]* and see what happens.

7. Observe the differences of the dynamic text along the tangent elements.

   a. Select the alignment. Notice the distances and bearings are shown in gray, this indicates they cannot be directly edited in the view.

      TIP: To edit the distances and bearings you need to modify the base elements (or "*gap*" elements) from which the alignment was created. This can be done by selecting the alignment and then hover and right click on the element to be edited.

8. Edit the bearing of the first tangent element in the alignment.

   a. Hover your cursor over the first tangent element until the alignment highlights.

   b. Right-click and select the tangent element. The distance and bearing will now be available to edit.
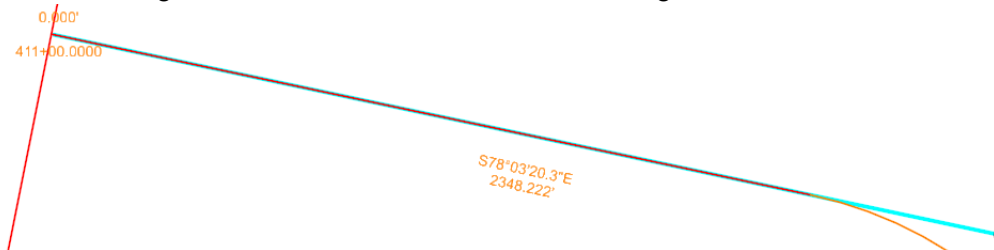
   c. Change the bearing to **N 70 00 00 E**, note the alignment adjusts. Also, note the new distance value being displayed.

9. Select **Edit > Undo Other > To Mark** to undo the previous steps back to the mark set in step 2.

   TIP: If a mark was not set in step 2, the **Undo** tool can be used several times to return all of the arcs to their original configuration.

10. Select **Fit View** to view the entire alignment.

Notes about individual geometric elements:

When a geometry feature is trimmed or extended, the portion(s) of the modified element which is visible and is being displayed using the Feature Definition settings is called the "*Interval*".

The portion(s) of the original geometry which is not visible is called the "*Gap*". This is the representation of the location of original element before modification. The gap will be displayed when you hover over the original element.

An interval element is ruled to the original geometry (or "*gap*" element), and this dependency can be viewed in the *OpenRoads Model* tab in the *Explorer*.

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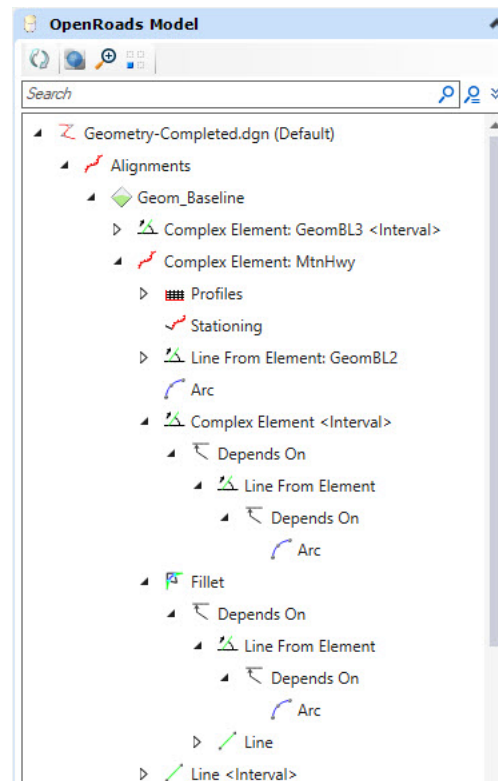
Edit Geometry with the Table Editor

1. Insert a new curve using the Table Editor.

   a. Select **Geometry > Common Tools > Table Editor**

   b. At the *Locate Alignment* prompt, select the **River_Rd** alignment.

   The alignment table editor will appear. This tool will allow you to make modifications to your alignment in a tabular format. The Alignment Table Editor is a great tool to use for making quick changes to your alignment.

Alignment Table Editor: River_Road

Station	Back Tangent Length		Back Bearing	Back Spiral Length		Northing		Easting	Radius	Arc Length	Ahead Spiral Length		Ahead Bearing	Ahead Tangent Length
100+00.0000		☐			☐	1286544.993	☐	2834597.619				☐	S78°03'20.3"E	1004.411
122+61.4746	1004.411	☐	N78°03'20.3"W	0.000	☐	1286059.000	☐	2836895.000	2875.000	2514.127	0.000	☐	S27°57'06.0"E	3681.189
179+74.7270	3681.189	☐	N27°57'06.0"W	0.000	☐	1280911.308	☐	2839626.509	2425.000	1550.000	0.000	☐	S08°40'13.4"W	2012.983
212+36.2801	2012.983	☐	N08°40'13.4"E	0.000	☐	1277646.540	☐	2839128.656	1650.000	947.141	0.000	☐	S24°13'07.8"E	3472.856
251+82.7064	3472.856	☐	N24°13'07.8"W	0.000	☐	1274035.193	☐	2840753.086	0.000	0.000	0.000	☐	S45°37'20.6"E	10299.400
359+86.2219	10299.400	☐	N45°37'20.6"W	0.000	☐	1266479.178	☐	2848475.067	12000.000	1008.230	0.000	☐	S50°26'10.8"E	3186.719
421+29.1215	3186.719	☐	N50°26'10.8"W	0.000	☐	1262544.253	☐	2853237.720	12000.000	4904.132	0.000	☐	S27°01'15.0"E	2313.092
468+94.2788	2313.092	☐	N27°01'15.0"W		☐	1258268.334	☐	2855418.367				■		

Report   Apply

Tip: The table editor can also be used to Insert and Delete PI's. Just select a row and right click to *Insert Before*, *Insert After* or *Delete*.

Alignment Table Editor: River_Road

Station	Back Tangent Length		Back Bearing	Back Spiral Length		Northing		Easting	Radius	Arc Length	Ahead Spiral Length		Ahead Bearing	Ahead Tangent Length
100+00.0000		☐			☐	1286544.993	☐	2834597.619				☐	S78°03'20.3"E	1004.411
122+61.4746	1004.411	☐	N78°03'20.3"W	0.000	☐	1286059.000	☐	2836895.000	2875.000	2514.127	0.000	☐	S27°57'06.0"E	3681.189
179+74.7270	3681.189	■	N27°57'06.0"W	0.000	■	1280911.308	■	2839626.509	2425.000	1550.000	0.000	■	S08°40'13.4"W	2012.983
		☐	N08°40'13.4"E	0.000	☐	1277646.540	☐	2839128.656	1650.000	947.141	0.000	☐	S24°13'07.8"E	3472.856
		☐	N24°13'07.8"W	0.000	☐	1274035.193	☐	2840753.086	0.000	0.000	0.000	☐	S45°37'20.6"E	10299.400
		☐	N45°37'20.6"W	0.000	☐	1266479.178	☐	2848475.067	12000.000	1008.230	0.000	☐	S50°26'10.8"E	3186.719
421+29.1215	3186.719	☐	N50°26'10.8"W	0.000	☐	1262544.253	☐	2853237.720	12000.000	4904.132	0.000	☐	S27°01'15.0"E	2313.092

Insert Before
Insert After
Delete

c. **Click on the fifth row in the first column** to locate the fifth PI point in the alignment. Notice that the fifth tangent element of the alignment highlights in the plan view. Also, notice the Radius is set to 0.0 indicating there is currently no curve at this location.

Alignment Table Editor: River_Road

Station	Back Tangent Length	Back Bearing	Back Spiral Length	Northing	Easting	Radius	Arc Length	Ahead Spiral Length	Ahead Bearing	Ahead Tangent Length
100+00.0000		☐		☐ 1286544.993	☐ 2834597.619				☐ S78°03'20.3"E	1004.411
122+61.4746	1004.411	☐ N78°03'20.3"W	0.000	☐ 1286059.000	☐ 2836895.000	2875.000	2514.127	0.000	☐ S27°57'06.0"E	3681.189
179+74.7270	3681.189	☐ N27°57'06.0"W	0.000	☐ 1280911.308	☐ 2839626.509	2425.000	1550.000	0.000	☐ S08°40'13.4"W	2012.983
212+36.2801	2012.983	☐ N08°40'13.4"E	0.000	☐ 1277646.540	☐ 2839128.656	1650.000	947.141	0.000	☐ S24°13'07.8"E	3472.856
▶ 251+82.7064	3472.856	☐ N24°13'07.8"W	0.000	☐ 1274035.193	☐ 2840753.086	0.000	0.000	0.000	☐ S45°37'20.6"E	10299.400
359+86.2219	10299.400	☐ N45°37'20.6"W	0.000	☐ 1266479.178	☐ 2848475.067	12000.000	1008.230	0.000	☐ S50°26'10.8"E	3186.719
421+29.1215	3186.719	☐ N50°26'10.8"W	0.000	☐ 1262544.253	☐ 2853237.720	12000.000	4904.132	0.000	☐ S27°01'15.0"E	2313.092
468+94.2788	2313.092	☐ N27°01'15.0"W		☐ 1258268.334	☐ 2855418.367				☐	

Report | Apply

d. Click in the *Radius* field and key-in **2580** *[875]*.

Alignment Table Editor: River_Road

Station	Back Tangent Length	Back Bearing	Back Spiral Length	Northing	Easting	Radius	Arc Length	Ahead Spiral Length	Ahead Bearing	Ahead Tangent Length
100+00.0000		☐		☐ 1286544.993	☐ 2834597.619				☐ S78°03'20.3"E	1004.411
122+61.4746	1004.411	☐ N78°03'20.3"W	0.000	☐ 1286059.000	☐ 2836895.000	2875.000	2514.127	0.000	☐ S27°57'06.0"E	3681.189
179+74.7270	3681.189	☐ N27°57'06.0"W	0.000	☐ 1280911.308	☐ 2839626.509	2425.000	1550.000	0.000	☐ S08°40'13.4"W	2012.983
212+36.2801	2012.983	☐ N08°40'13.4"E	0.000	☐ 1277646.540	☐ 2839128.656	1650.000	947.141	0.000	☐ S24°13'07.8"E	2985.277
▶ 251+77.0231	2985.277	☐ N24°13'07.8"W	0.000	☐ 1274035.193	☐ 2840753.086	2580.000	963.791	0.000	☐ S45°37'20.6"E	9811.821
359+74.8553	9811.821	☐ N45°37'20.6"W	0.000	☐ 1266479.178	☐ 2848475.067	12000.000	1008.230	0.000	☐ S50°26'10.8"E	3186.719
421+17.7548	3186.719	☐ N50°26'10.8"W	0.000	☐ 1262544.253	☐ 2853237.720	12000.000	4904.132	0.000	☐ S27°01'15.0"E	2313.092
468+94.2788	2313.092	☐ N27°01'15.0"W		☐ 1258268.334	☐ 2855418.367				☐	

Report | Apply

e. Click **Apply** and close the Alignment Table Editor dialog.

Append the Alignment by Creating Additional Geometry

Now that you have learned how to insert a curve into the alignment. Now you will learn how to append to the alignment by adding a spiral-curve-spiral to the end of the alignment.

___

1. **Zoom in** near the end of the **River Rd.** alignment and the end of **Pike Rd.**

2. Append the end of the alignment by adding a spiral-curve-spiral to connect to the Pike Road alignment.

   a. Select **Geometry > Horizontal > Arcs > Arc Between Elements > Spiral Arc Spiral**

   b. Following the heads-up prompt:

      - *Locate the First Element:* Select the **River Rd.** base element near its end. Use *Right-click* to toggle between selecting the alignment and base element.

      - *Locate Second Element:* Select the **Pike Rd.** base element near its end. Use *Right-click* to toggle between selecting the alignment and base element.

      Note: It's important to select the base elements of the alignment and not the actual complex alignment when adding additional geometry.

      - *Radius:* **2580** *[875]* (Do not data point or left-click yet), press **<Enter>** or **<Tab>** to lock the value.

   c. Next, Use the **right arrow key** to toggle to the *Back Transition Length* and *Ahead Transition Length*.

   d. Follow the heads-up prompts and enter the values shown below and **left click** to accept:

      - *Back Transition Length:* **350** *[100],* use the right arrow key to advance to the next input field.

      - *Ahead Transition Length:* **350** *[100]*

      - *Trim/Extend:* **Back**
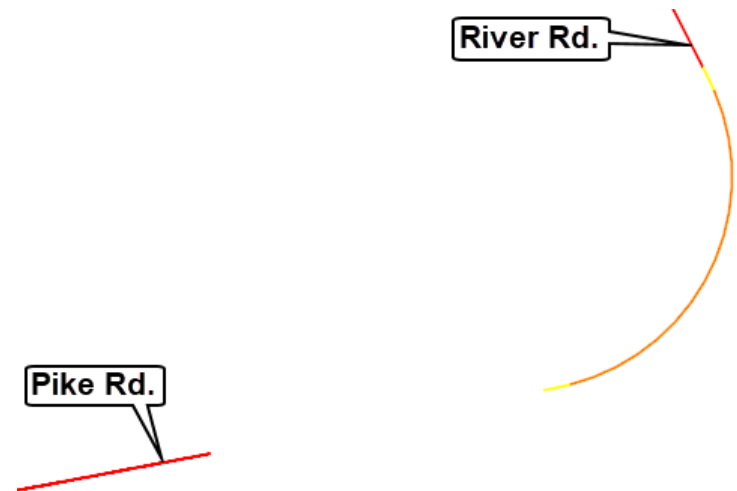
   We don't want to truncate both in this case because we don't want to extend the Pike Rd. alignment.

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3. Connect a tangent line from Pike Road to the spiral curve spiral created previously.

   a. Select **Geometry > Horizontal > Lines > Line From Element > Simple Line From Element**

   b. Follow the heads-up prompts and left click to accept:

      ▪ *Locate Element:* Select outgoing spiral

      ▪ *Enter Start Point:* Snap to the end point of the outgoing spiral

      ▪ *Enter End Point Distance:* Snap to the end point of the **Pike Rd.** alignment

      ▪ *Trim/Extend:* None

      Tip: Pay attention to the *Persist Snaps* icon on the Feature Definition toolbar. When this is enabled, snap rules are created when snapping to geometric elements. If you don't want snap rules created be sure to toggle off the *Persist Snaps* icon.
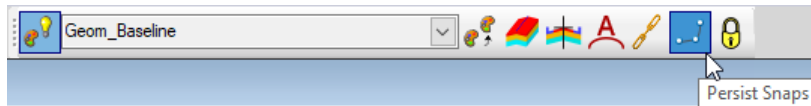
4. Add the newly created geometry to the River Rd. alignment.

   a. Select **Geometry > Horizontal > Modify > Append Element**

   b. Follow the heads-up prompts:

      ▪ *Locate Complex Element:* Select the **River Rd.** alignment

      ▪ *Locate Element to Add/Insert:* Select the spiral curve spiral element

      ▪ *Locate Next Element to Add/Insert:* Select the line connecting **Pike Rd.** to the spiral curve spiral element

   c. **Right click** to complete.

   The geometry has now been added to the River Rd. alignment.
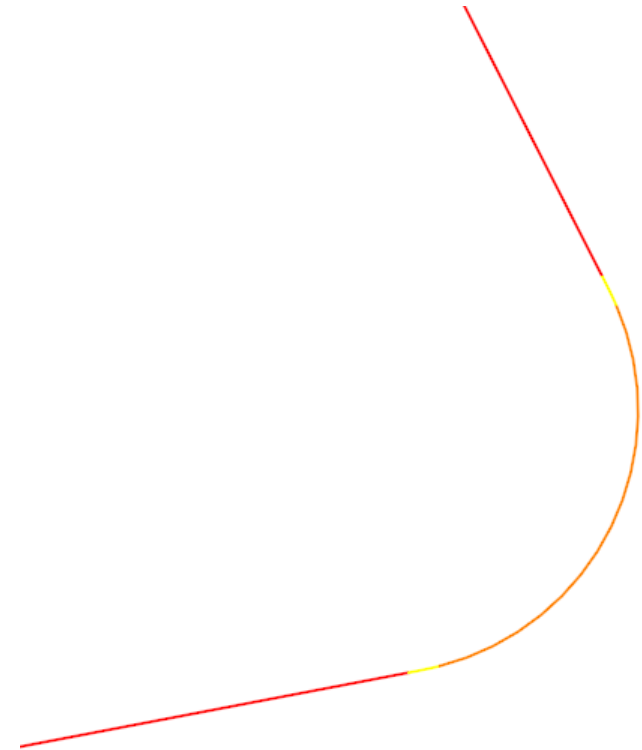
5. Select the **River Rd.** alignment to verify the elements have been added to the alignment. When selected, the alignment should now include the additional geometry you created.

6. Annotate the River Rd. alignment.

    a. Select **Drawing Production > Annotations > Element Annotation > Annotate Element**

    b. Select the **River Rd.** alignment.

    c. Reset to complete.

   **Note:** It may take a few seconds for the alignment annotation to complete.
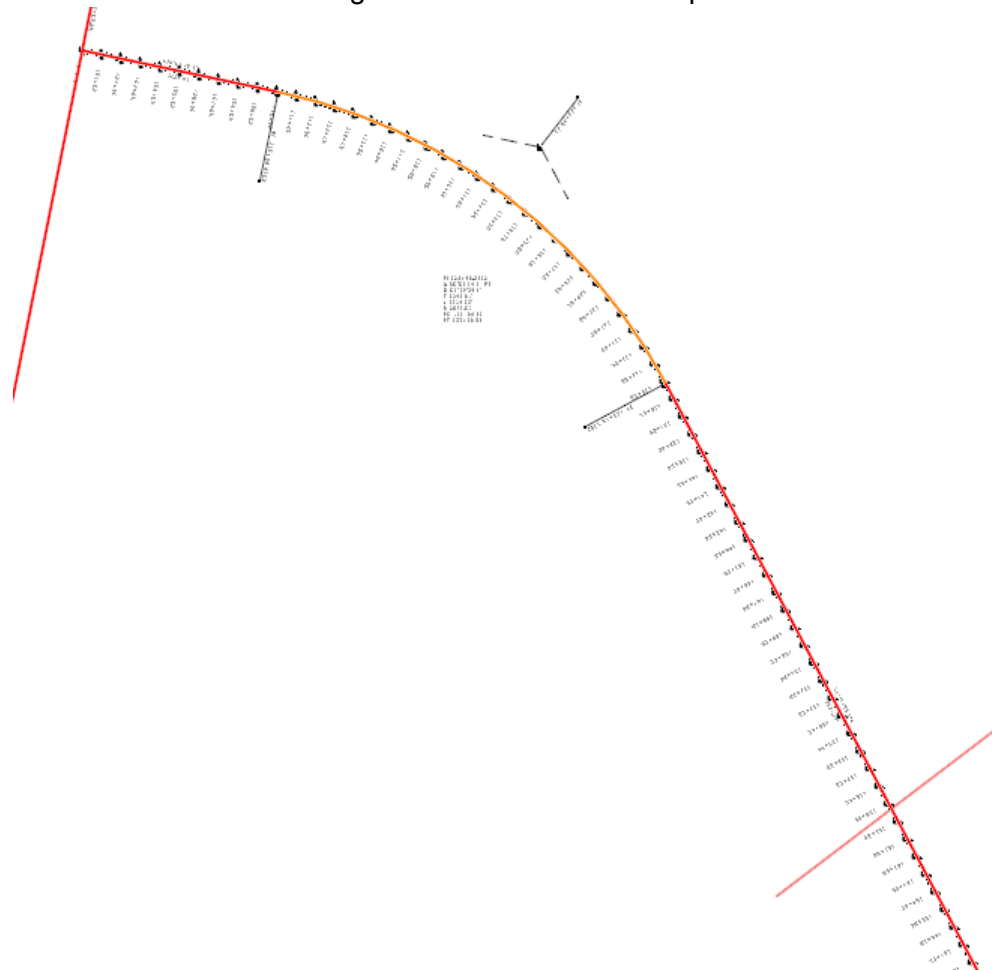
Using Complex Redefine

Sometimes it is necessary to replace (or substitute) a portion of your alignment with a new set of geometric elements. Using the Complex Redefine tool allows you to redefine geometry over a certain range, substituting in new horizontal geometry. It preserves all rules built off the original geometry. In this section you will learn how to re-define a section of the geometry along Pike Rd. using the Complex Redefine tool.

1. **Zoom in** near the area where **MtnHwy** intersects **Pike Rd.**

2. Using the *Level Display* tool, **turn ON** the level named **Geom_Secondary**.

   Notice there is an alternate section of geometry connected to Pike Rd. We are going to re-define the Pike Rd. alignment by adding this section of geometry.
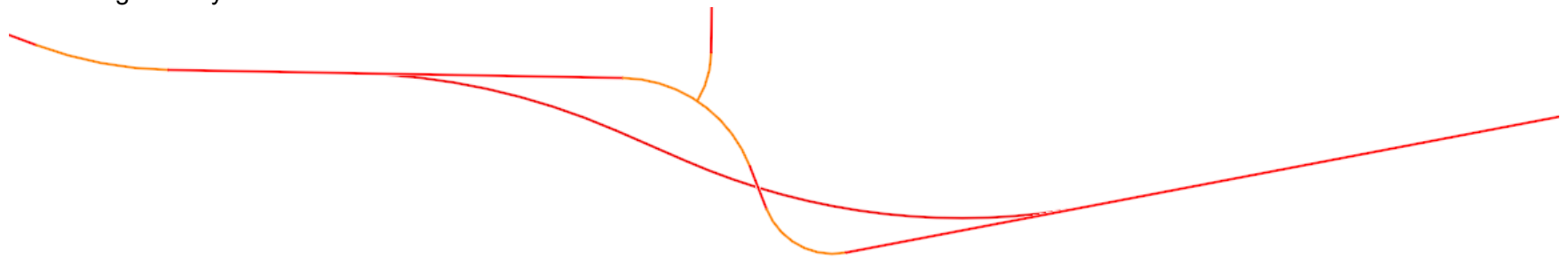
3. Open **View 4** view to see the profile of Pike Rd. Before we make changes to the horizontal its very important to understand the profile is ruled and associated to the horizontal. When the horizontal alignment changes the profile will be updated.
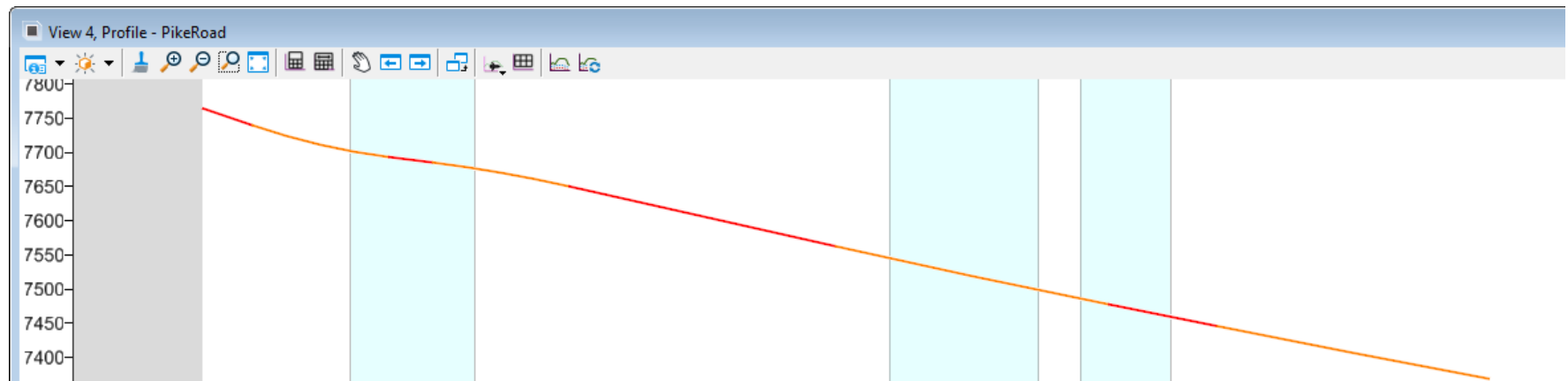
4. Select **Geometry > Common Tools > Complex Redefine**

   a. Follow the heads-up prompts:

   - *Locate Complex Element:* Select the Pike Rd. alignment

   - *Locate Element Redefining Complex:* Select the alternate section of geometry for Pike Rd.

   The Pike Rd. alignment will be updated with the new section of geometry. The old geometric elements still exist but they are no longer part of the Pike Rd. alignment. Also, notice that the profile gets updated and the overall length is adjusted.
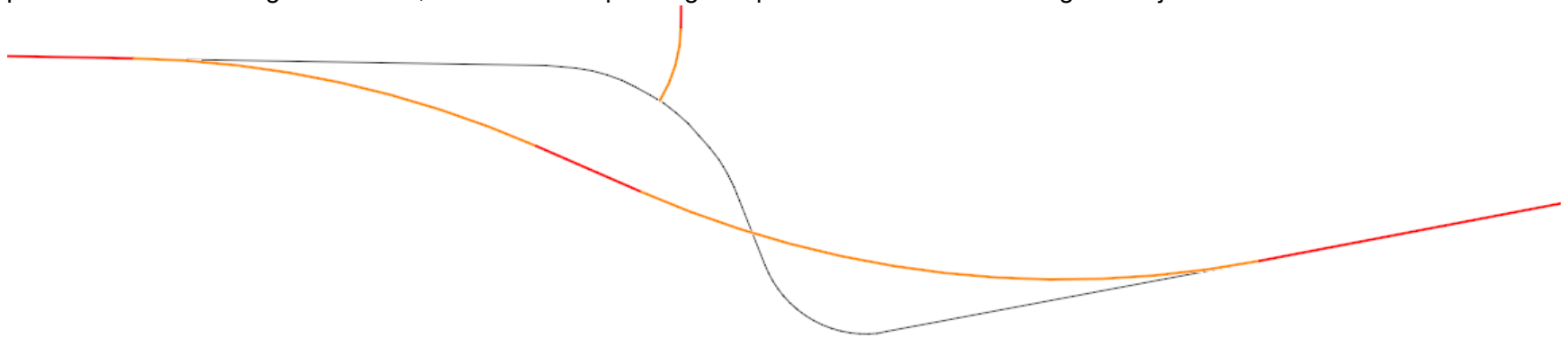
   Now that Pike Rd. has been updated we need to extend the Mountain Highway alignment to intersect the new geometry of Pike Rd.

5. Extend Mountain Highway to Pike Rd.

   a. Select **Geometry > Horizontal > Lines > Line From Element > Simple Line From Element**

   - *Locate Element:* Select **MtnHwy**

   - *Enter Start Point:* Snap the end point of the MtnHwy alignment

   - *End Distance:* **-500** *[-150]* (You need to key in a negative value to force the line to be created in the opposite direction).

   - *Trim/Extend:* None
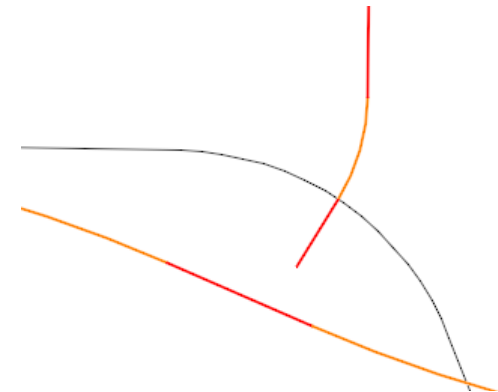
b. Select **Drawing > Modify > Trim To Element**

- *Identify elements to Modify:* Select the line you just created in the previous step.

- *Identify cutting element/edge:* Select the **Pike Rd.** alignment

At this point all you did was create a single line constrained between Pike Rd. and the ending curve of the Mountain Highway alignment. This line still needs to be added to the alignment of Mountain Highway. We will now add this line to the alignment using the *Append Element* command.
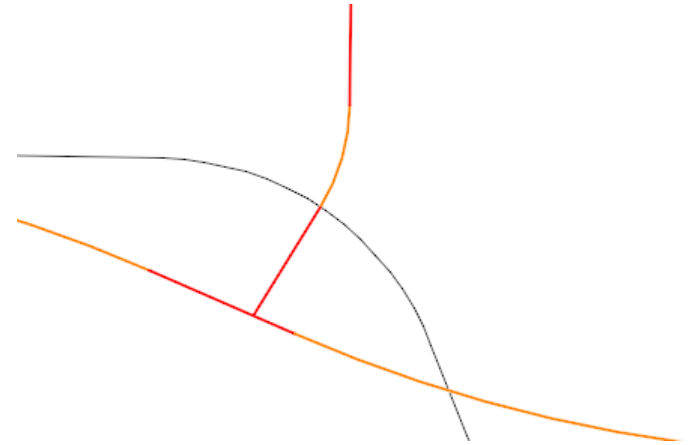
6. Add the newly created line to the Mountain Highway alignment.

a. Select **Geometry > Horizontal > Modify > Append Element**

b. Follow the heads-up prompts:

- *Locate Complex Element:* Select the **MtnHwy** alignment

- *Locate Element to Add/Insert:* Select the line connecting Mountain Highway to Pike Rd.

c. **Right-click** to complete.

The geometry has now been added to the Mountain Highway alignment.

d. Select the **MtnHwy** alignment and verify that the line you just added is now part of the alignment.

e. **Right-click** to de-select the alignment.

f. Close *View 4*.

7. Update the Mountain Highway corridor. Since the geometry has changed you need to open the corridor so that it updates to follow the new geometry.

a. Open **Corridor-MtnHwy.dgn** *[Metric - Corridor-MtnHwy.dgn]*. Notice the corridor will re-process and update.

b. Re-open **Geometry.dgn** *[Metric - Geometry.dgn]*.

Design Standards

Design standards should be used throughout the design of your project. It ensures that you are meeting minimal standards, generally based on design speed. They can also be based on type of roadway, and other geometric or design characteristics.

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1. Select the **Design Standard Toolbar** icon from **Geometry > General Tools > Standards > Design Standards Toolbar** to open the Design Standard Toolbar.

2. In the *Design Standards Toolbar*, set the *Active Design Standard* to **2Lane (AASTO2011)\4%Super\55MPH** *[2 Lane\4%Super\80 KPH].*
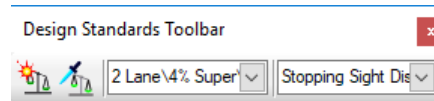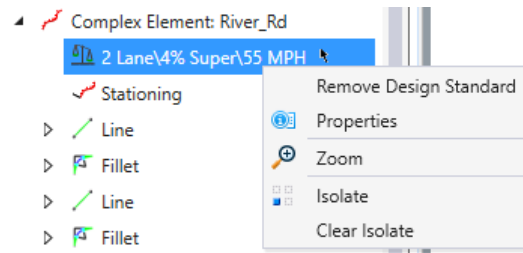

3. Select **Set Design Standard** from either the *Design Standards Toolbar* or the *General Tools > Standards* section of the ribbon.

4. Select the **River_Road** complex geometry element.

5. Verify the design standard is set on the element by using **Project Explorer > OpenRoads Model**

   a. Expand the *Alignments* folder.

   b. Expand the *Geom_Baseline* feature definition.

   c. Expand the *Complex Element: River_Rd* folder. Notice the design standard you set on the geometry is listed. This confirms the design standard has been assigned to the alignment.
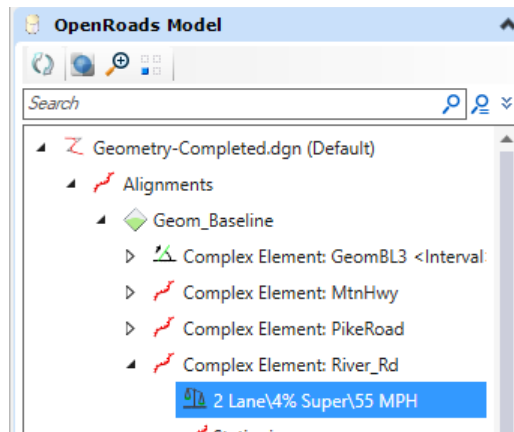
6. Review the Properties of the Design Standard.

   a. **Right-click** on the *2 Lane\4% Super\55 MPH [2 Lane\4% Super\80 KPH]* design standard.

   b. Select **Properties** to review the design standards properties.

   Design standards can be used to maintain required curvature and other horizontal and vertical alignment checks when performing geometric layouts.

   c. Close **Properties** when finished.

   Tip: To remove a standard from a geometry element, right-click on the standard in the OpenRoads Model Explorer and select *Remove Design Standard*.

7. Open the **Civil Message Center** and review the design standard errors and warnings.

   a. Select **Geometry > General Tools > Standards > Civil Message Center**

8. Click the **MicroStation** tab to clear any MicroStation messages.

9. Observe the warnings and errors. Warnings indicate that the geometry is below the design standard value and errors indicate the geometry is below the minimum requirement.

   Most of the warnings are because the imperial or metric design standard we choose to use recommends spiral transitions between lines and arcs and we did not include any spirals in our design.

   Notice there are 4 warnings stating the *Arc radius is less than default*. This means that our curve radius is less that the minimum value. To clear such messages you must adjust the radius value of each curve.

   NOTE: WHEN WORKING THIS COURSE IN METRIC THE NUMBER OF WARNINGS MAY BE DIFFERENT.

10. Modify curve radius to follow the recommended design standard value.

    a. Click on the last warning message at the bottom of the list.

⚠ Warning	Missing transition between arc and line	Missing transition between arc and line
⚠ Warning	Arc radius is less than default	Design Standard Value = 2860.000' Actual Value = 2580.000'
⚠ Warning	Tangent length is longer than maximum value	Design Standard Value = 5000.000 Actual Value = 9811.821
⚠ Warning	Arc radius is less than default	Design Standard Value = 2860.000' Actual Value = 2580.000'
⚠ Warning	Arc radius is less than default	Design Standard Value = 2860.000' Actual Value = 1650.000'

    b. Right click on last warning message and select **Zoom To**.**

    You will now be zoomed into the location of the curve that is below the minimum value.

    c. Zoom out as necessary to see the entire curve.

    d. Change the radius to **2860** *[870]*.

    ▪ Select the curve and change the radius dynamic text to **2860** *[870].*

    The Error will now be cleared from the *Civil Message Center*. Also, notice the curve data annotation updates automatically.**

    e. Close the *Explorer* and *Civil Message Center*.

    Note: Design standards are developed for both horizontal and vertical geometry and are stored in DGNLibs. Several default libraries are provided in the installation packages. They are utilized by including the file / path in your MS_ DGNLIBLIST configuration variable. An organization can modify the default libraries or create them from scratch, depending on your standards. Multiple standards can be utilized, i.e., consulting firm doing work for multiple governmental agencies who all have their own standards.

    As you select a standard, it is copied from the DGNLib into your design file. Therefore, your organization can maintain the integrity of the standards by having them "read-only" in a central location, but a designer has the flexibility to override for a project-specific circumstance. The Project Explorer has one set of standards derived from DGNLibs, and another set shown for the design file.

Training Pathway
Roadway ► All Users ► Horizontal Geometry

COLORADO
Department of Transportation

	Duration (Minutes)	Description	Dataset	Video	Workflow	Link Url (Copy & Paste to Broswer for best results)
How To's						
Geometry						
Add Internal Station Equation	3	This video demonstrates how to use the "Add Internal Station Equation" command to automatically add station equations to an offset alignment in order to keep its stationing matching the primary alignment		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/40230/video-add-internal-station-equation
Add Station Equation Command	4	The "Add Station Equation" tool is used to define a station equation at a designated location on the alignment. Multiple station equations can be added to an element, but that should be added in order from the beginning to end of element.			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36823/add-station-equation-command
Change the Direction of Horizontal Geometry	5	This video demonstrates how to use the "Transpose" command		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36824/how-to-change-direction-of-horizontal-geometry
Complex Redefine message, "Embedded Complex are not supported"	3	This message explains how multiple complexes are being complexed together to create a single complex element.			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/43627/complex-redefine-message-embedded-complex-are-not-supported
Define and Edit Start Station	2	This workflow shows how to define and edit start station			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36827/define-and-edit-start-station
Elevation Options for Placing a Civil Point	3	This workflow shows what elevation options for placing a civil point			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/41707/elevation-options-for-placing-a-civil-point
Geometry Builder Tool Demonstration	3	This video demonstrates how to lay out a parcel using Bearings and Distances with the Geometry Builder Tool.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/42631/video-geometry-builder-tool-demonstration
Geometry Builder Tool Overview	6	This video explains the Geometry Builder Tool.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/42632/video-geometry-builder-tool-overview
How to Annotate Alignments Automatically	2	This workflow shows how to annotate alignments automatically			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/38521/how-to-annotate-alignments-automatically
How to annotate an alignment without the Station Equation name	2	This workflow demonstrates how to update dgnlib to update annotation			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/50619/how-do-i-annotate-my-alignment-without-the-station-equation-name
How to Change Horizontal Annotation Angle Readout	3	This video demonstrates How to Change Horizontal Annotation Angle Readout			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36825/how-to-change-horizontal-annotation-angle-readout
How to copy OpenRoads Geometry	2	This workflow shows how to copy an element			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36807/how-do-i-create-a-copy-of-openroads-geometry
How to Import Horizontal Points from ASCII File	6	This video demonstrates how to Import Horizontal Points from ASCII File in OpenRoads Designer.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/43446/video-how-to-import-horizontal-points-from-ascii-file
How to Remove Intervals	3	This workflow shows how to remove intervals			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36848/how-to-remove-intervals
Insert PI into Civil Geometry	2	This workflow show how to use the command "Insert Vertex"			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36816/insert-pi-into-civil-geometry
Locate Point by Angle Resection	2	This video overviews the Locate Point by Angle Resection tool		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/43453/locate-point-by-angle-resection
Modify Geometry Points Tool	4	This video shows how to use the Modify Points to add elevation and or rotation to the points.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/43009/video-modify-geometry-points-tool
Simple Arc Between Elements Tool	3	This video demonstrates how to use the simple arc between elements tool in OpenRoads Designer.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/39845/video-simple-arc-between-elements-tool-in-openroads-designer
Transpose Element - Reversing Horizontal and Vertical Profile	2	This workflow shows			X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/53355/transpose-element---reversing-horizontal-and-vertical-profile
Using the Append Element Command (ORD)	2	This video demonstrates the use of the Append Element command to add elements to an existing complex element.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/34909/video-using-the-append-element-command-ord
Short Video						
Geometry						
Create and Annotate Horizontal Alignment	3	This video demonstrates how to create and annotate a horizontal alignment.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/35581/video-create-and-annotate-horizontal-alignment
Create Compound Spiral	3	This video demonstrates how to create clothoid compound spirals.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/35917/video-create-compound-spiral
Create Horizontal Tangent Elements	12	In this video, you will learn how to create horizontal geometric elements.		X		https://learn.bentley.com/app/VideoPlayer/LinkToIndividualCourse?LearningPathID=113539&CourseId=119652&MediaID=5012805
Create Reverse Spirals	2	This video demonstrates how to create clothoid reverse spirals.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/35918/video-create-reverse-spirals
Create/Edit Horizontal Curves and Create Horizontal Alignment	7	In this video, you will learn how to create horizontal curve geometric elements and also how to create the horizontal alignment.		X		https://learn.bentley.com/app/VideoPlayer/LinkToIndividualCourse?LearningPathID=113539&CourseId=119651&MediaID=5012804
Define Start Stationing on a Horizontal Geometry	2	This video demonstrates how to define a start station on horizontal geometry in OpenRoads designer.		X		https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/52756/video-define-start-stationing-on-a-horizontal-geometry

Define Stationing and Annotation	3	In this video, you will learn how to define the horizontal alignment stationing and also how to annotate the alignment.		X	https://learn.bentley.com/app/VideoPlayer/LinkToIndividualCourse?LearningPathID=113539&CourseId=119649&MediaID=5012802
Edit Start Stationing on Horizontal Geometry	1	This video demonstrates how to edit the stationing on horizontal geometry in OpenRoads Designer CONNECT Edition.		X	https://communities.bentley.com/products/road___design/w/road_and_site_design__wiki/52757/video-edit-start-stationing-on-horizontal-geometry
How to edit spirals within a complex alignment	2	This video demonstrates about the functionality of the alignment which ensures to add/edit spirals.		X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/38989/video-how-to-edit-spirals-within-a-complex-alignment
How To Use The Replace Reference Command For Arc Geometry	2	This video demonstrates how to use the Replace Reference command made available through the Context Tool Box associate to arc geometry.		X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/36946/video-how-to-use-the-replace-reference-command-for-arc-geometry
Introduction to Intervals and Base Elements	3	This video introduces the concept of "intervals" and "base elements" in the OpenRoads Designer Geometry tools. When clicking on an interval, the manipulators will often be grey meaning that they depend on a base element. Clicking on the base element will then give orange manipulators that can be edited.		X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/41135/video-introduction-to-intervals-and-base-elements
Introduction to QuickStart for OpenRoads Designer Geometry	6	In this video, you will learn how to select the proper WorkSpace and WorkSet, create a new dgn and review the ribbon interface.		X	https://learn.bentley.com/app/VideoPlayer/LinkToIndividualCourse?LearningPathID=113539&CourseId=119653&MediaID=5012806
Rename Linear Geometry Element Description	1	This video demonstrates how to rename the Element Description of Linear Geometry		X	https://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/41786/video-rename-linear-geometry-element-description