LAB 22 - Modeling Around Bridge Abutments

Modeling the surface at the ends of a bridge can accomplished using a variety of tools. This lab illustrates a simple slope, but more complex slopes can be modeled using the same tools and methodologies. In general, you will be using InRoads tools to create breaklines that define the desired surface. For additional information on the tools used here as well as others, please see the *Surface Editing* chapter of the *Practical Guide for Using InRoads XM*.

Chapter Objectives::

- Develop an understanding of modeling surfaces without templates.
- Learn how some of InRoads' Surface tools can create breaklines necessary for modeling surfaces at the ends of a bridge.

The following files are used with this lab:

- C:\Projects\12345\Design\Drawings\Reference_Files\12345DES_Model.dgn
- C:\Projects\12345\Bridge\Drawings\Reference_Files\12345BRDG_Outline.dgn as a reference file
- C:\Projects\12345\Design\InRoads\12345 SH119 SH52 interchange.alg
- C:\Projects\12345\Design\InRoads\12345 SH52 71st intersection.dtm
- C:\Projects\12345\ROW_Survey\InRoads\DTM\12345 existing ground for interchange.dtm

## Lab 22.1 - Create the Surface East of the Bridge

In this section, the design surface is used to create a smaller surface for the portion of the roadway East of the bridge. This surface will subsequently be used as the basis for the grading around the bridge abutment.

1. Open MicroStation and InRoads using the *12345DES_Model.dgn* file.

2. Delete in existing graphics in the file.

3. Select **File > Open** from the InRoads menu.

4. Navigate to the *C:\Projects\12345\Design\InRoads* folder.

5. Open the following files:

   ♦ **C:\Projects\12345\Design\InRoads\12345 SH52 71st intersection.dtm**
   ♦ **C:\Projects\12345\Design\InRoads\12345 SH119 SH52 interchange.alg**
   ♦ **C:\Projects\12345\ROW_Survey\InRoads\DTM\12345 existing ground for interchange.dtm**

6. Select **File > Reference** from the MicroStation menu.

7. Select **Tools > Attach**.

8. Select *C:\Projects\12345\Bridge\Drawings\Reference_Files\12345BRDG_Outline.dgn*.

9. **<D> OK** to accept the default reference settings.

10. In the *Level Display* dialog box, toggle on the reference file level *BRDG_Outline-Bridge.*
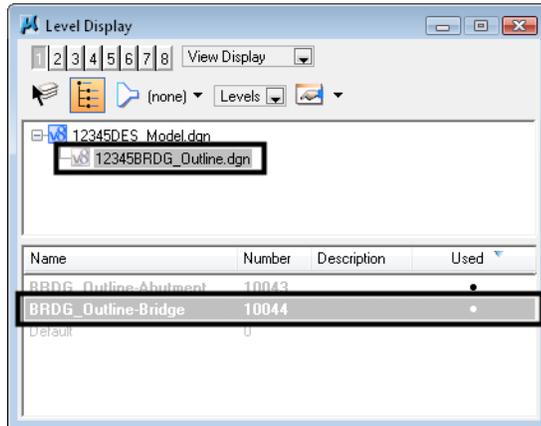
11. *Fit* the view. An outline of the proposed bridge is shown in the file.
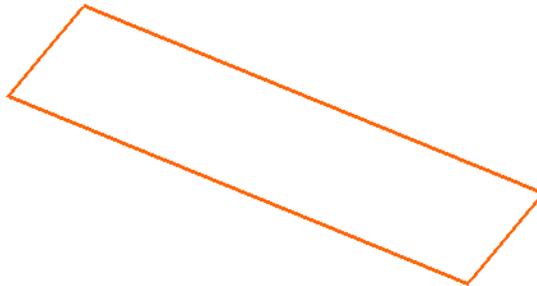
12. Set the *Pen/Pencil* lock to **Pencil.**

13. Select **Surface > Update 3D/Plan Surface Display** from the InRoads main menu.

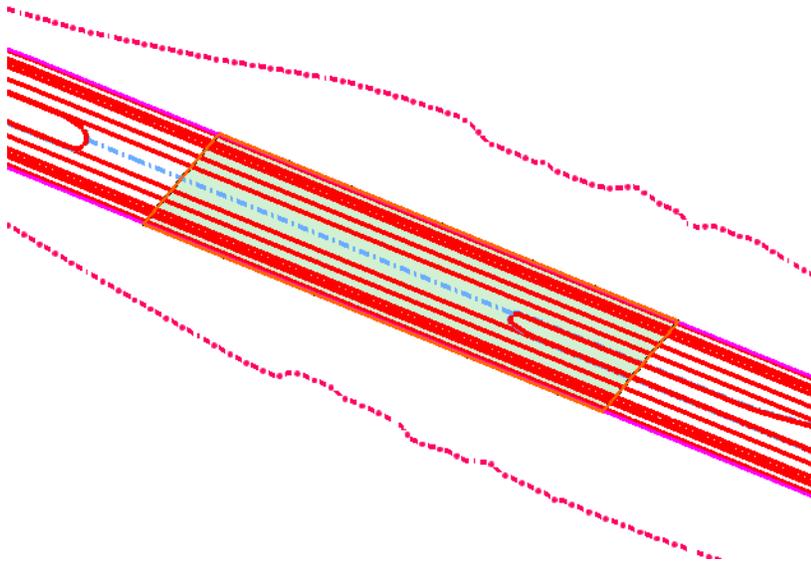14. **<R>** in the *Features* list box and choose **Select All** from the menu. This displays the selected features.
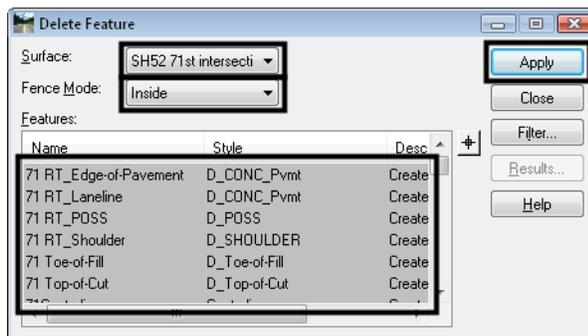
15. **<D> Close**.
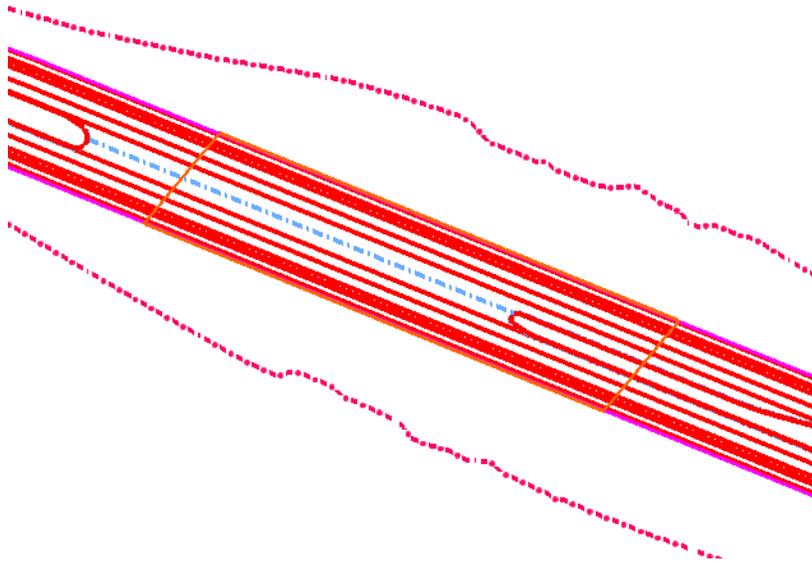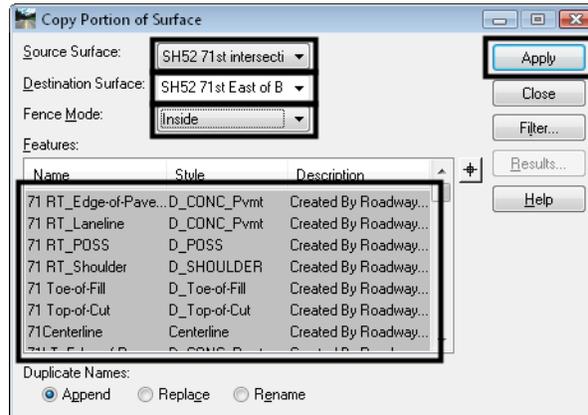
All of the features are shown in the file.

16. On the MicroStation main toolbar, select **Place Fence**.

17. In the *Tool Settings* dialog box, change the *Fence Type* to **Element**.

18. **<D>** on the bridge outline in the design file.

19. Select **Surface > Edit Surface > Delete Feature** from the InRoads main menu.

20. Set the *Surface* to **SH5271st Intersection**.

21. Set the *Fence Mode* to **Inside**.

22. **<R>** in the feature list and select **Select All**.

23. **<D> Apply**.

24. When prompted to *Delete selected feature(s)*, select **OK**.

25. **Close** the dialog box.

26. Clear the fence.

The features inside the bridge outline are removed from the surface. Next, the features on the East side of the bridge are copied to create a new surface.
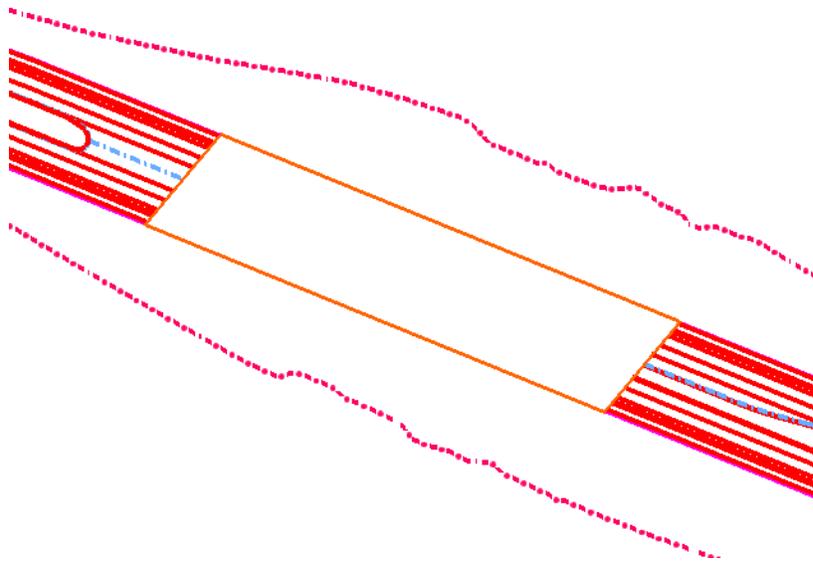

27. Select **Place Fence**.

28. In the *Tool Settings* box, change the *Fence Type* to **Block**.

29. Place a fence that encompasses all features East of the bridge as shown.
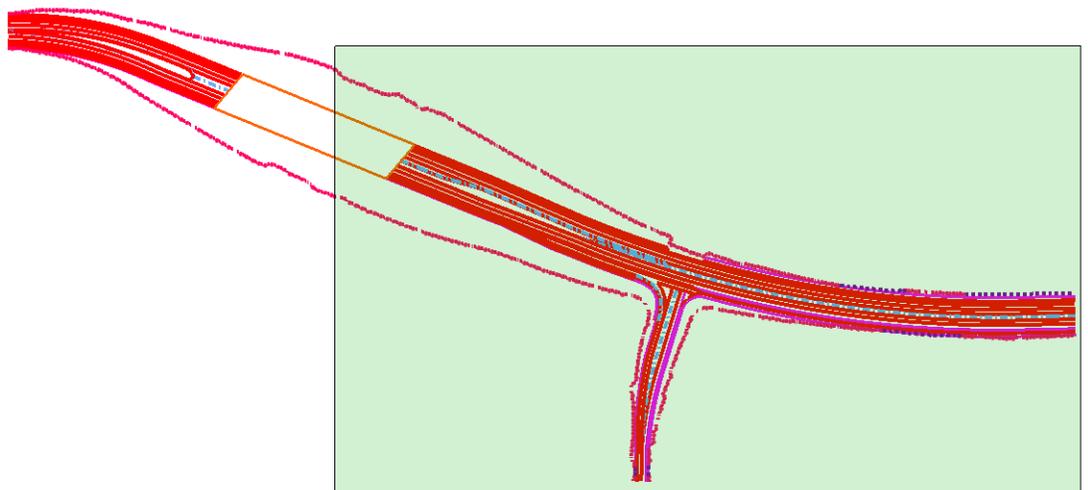
30. Select **Surface > Edit Surface > Copy Portion of Surface**.

31. Set the *Surface* to **SH52 71st intersection**.

32. Key in *SH52 71st East of Bridge* for the *Destination Surface*.

33. Set the *Fence Mode* to **Inside**.

34. If all Features are not highlighted, **<R>** in the feature list and select **Select All**.
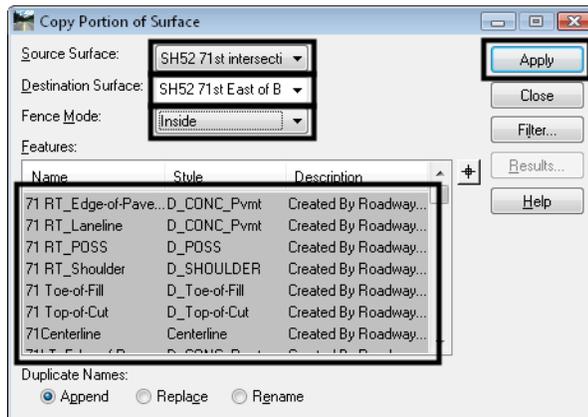
35. **<D> Apply**, then **Close** the dialog box.

36. Choose **File > Save As**.

37. Set the *Save As Type* to **Surfaces (*.dtm)**.

38. Use the drop-down to set the *Active Surface* to **12345 SH52 71st East of Bridge**.

    Note: If the file name is not listed, use the drop-down again to select the active surface and the same name will appear in the *Name* field. You can then add the 12345 prefix to the file name on the hard drive.

39. **<D> Save**.

40. Select **Surface > Update 3D/Plan Surface Display**.

41. **<R>** in the feature list and choose **Select None**.
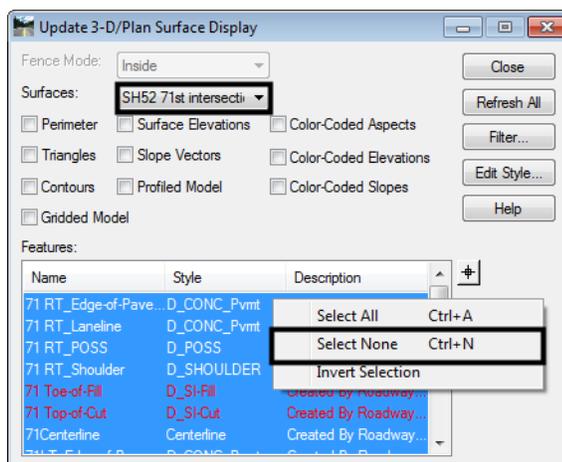
42. Select the **SH52 71st East of Bridge** surface from the *Surfaces* drop down menu.

43. **<R>** in the *Features* list box and choose **Select All** from the menu. This displays the selected features

44. **<D> Close**
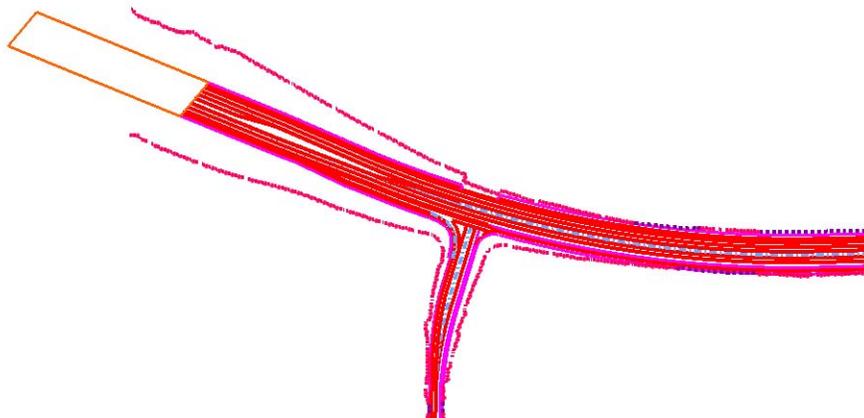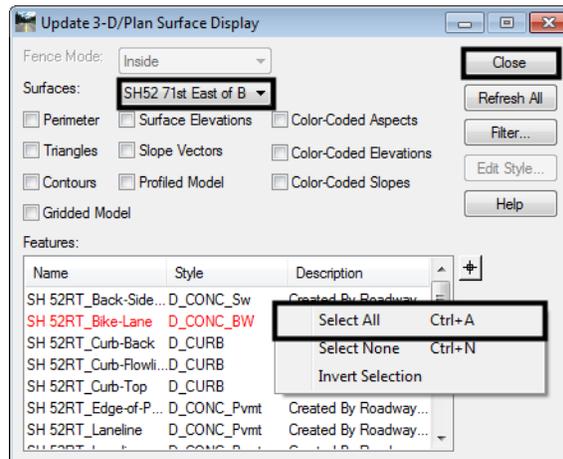
> ***Note:*** If there are any features in the area where the bridge was clipped, these shoud be deleted. Use the Surface > Edit Surface > Delete Feature command to remove these extra features.

Section Summary:

- A fence and the Delete Feature command are used to remove the design features from the bridge area.
- The design features on the east side of the bridge are saved as a separate surface. Design surfaces for each side of the bridge are required otherwise InRoads will triangulate the across the gap made for the bridge

Lab 22.2 - Create a Feature at the Bridge

In this section, a breakline feature is created to 'cap' the end of the roadway features where the bridge starts.

1. In the *Level Display* dialog box, toggle off the reference file level **BRDG_Outline-Bridge**.
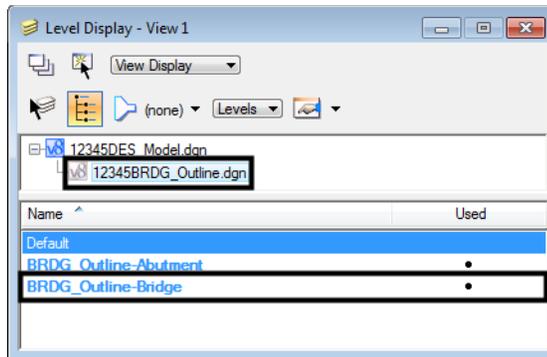
This line represents the path for the path that is used to create the abutment slope.

2. Select **Surface > Design Surface > Place Feature**.

3. Set the *Surface* to **SH52 71st East of Bridge**.

4. Key in *abutment1* for the **Feature Name**.

5. Key in a description if desired.

6. Set the *Feature Style* to **D_CONC_Pvmt.**
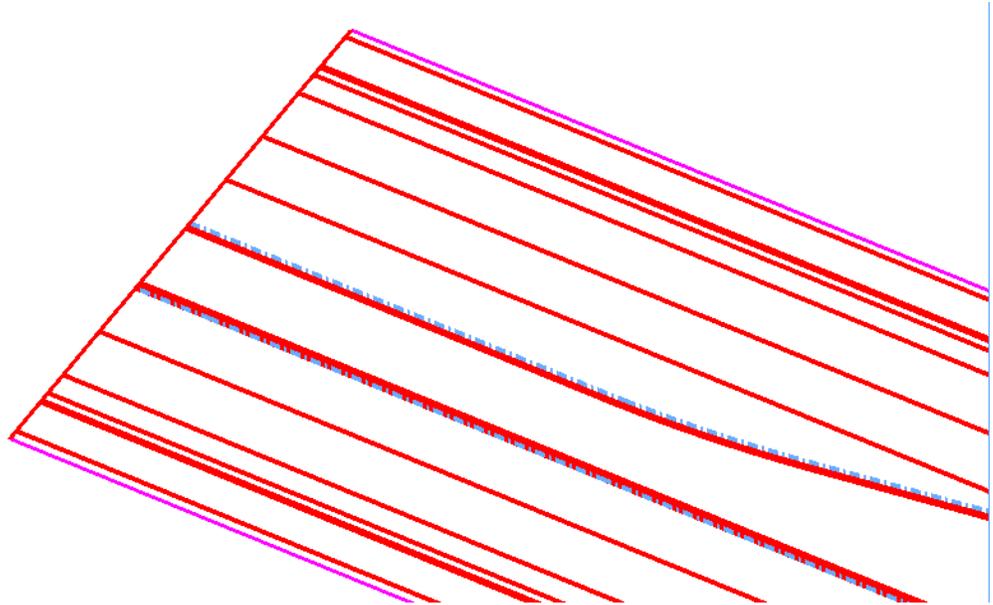
7. Set the *Point Type* to **Breakline**.
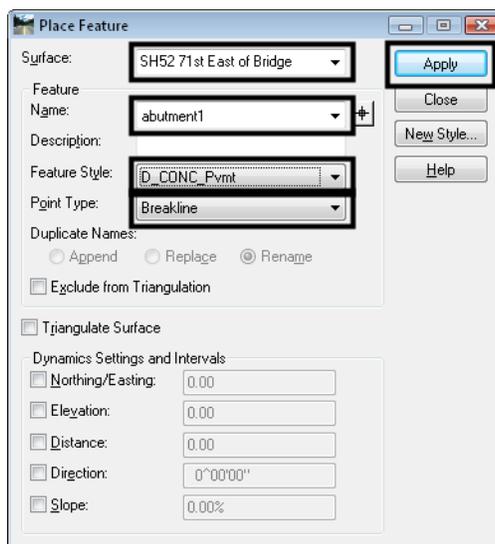
8. **<D> Apply**.

9. ***Do not*** toggle on either option on the ***Set Elevation*** dialog box that appears.
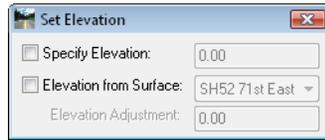
10. Snap to the end of each of the roadway features from POSS to POSS as shown.

> ***Note:*** If you want to use ***AccuSnap***, hold down your ***<Ctrl>*** and ***<Shift>*** keys and MicroStation's AccuSnap works while using InRoads commands.

11. **<R>** when done.

Section Summary:

- This feature defines the end of roadway/beginning of bridge in the design surface

Lab 22.3 - Create the Grading Surface

In this section, the ***Generate Sloped Surface*** command is used to create a grading surface from the roadway down to the existing ground, effectively under the bridge.

1. In the *Level Display* dialog box, toggle on the reference file level **BRDG_Outline-Abut-ment**.
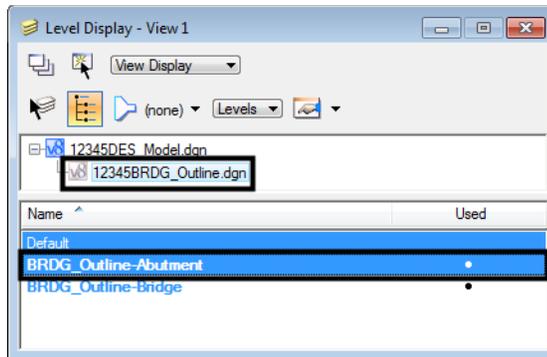

A green line displays that wraps around the edge of the roadway. This is the line from which the sloped surface is generated. It was created in a similar manner as the feature built in the last section, with the addition of the segments running parallel to the road. These additional segments allow the sloped surface to wrap around the entire front of the roadway.
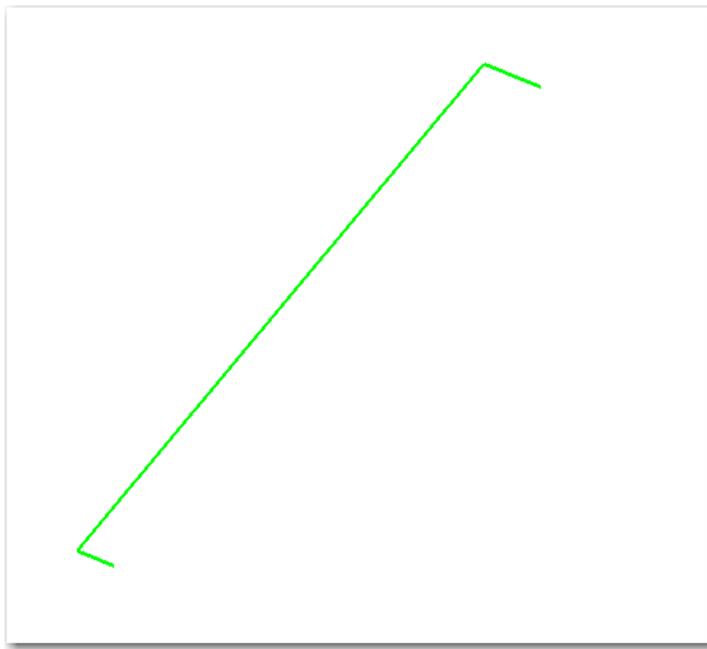

2. Select **Surface > Design Surface > Generate Sloped Surface**.

3. Make sure the *Locate Feature / Locate Graphics* lock is set to **Locate Graphics**.

4. Set the *Intercept Surface* to **12345 existing ground for interchange**.

5. Set the *Destination Surface* to **SH52 71st East of Bridge**.

6. Set the other options as shown in the illustration below. Be sure to toggle on and key in the feature names for the following:

    ♦ *Transverse - **Abut-Transverse***

♦ *Source -* ***Abut-Top***

♦ *Catch Point -* ***Abut-Toe-of-Fill***
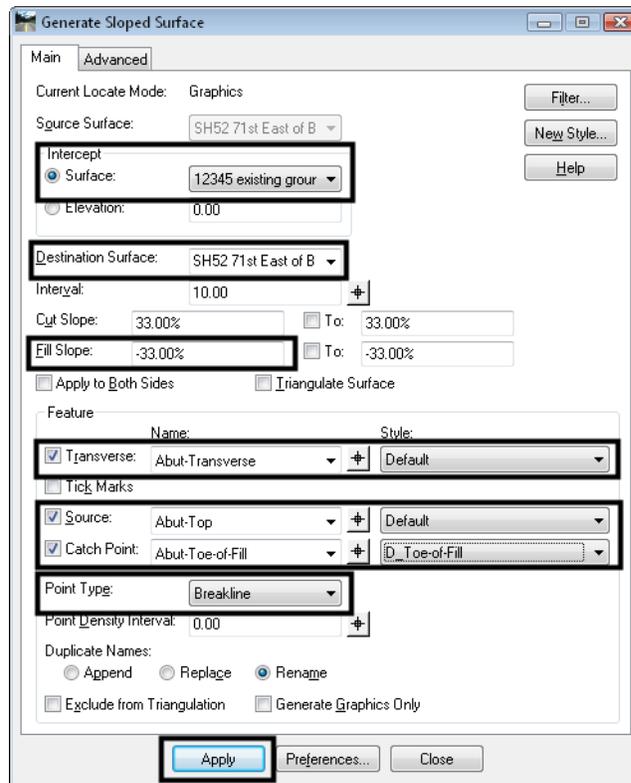

7. **<D> Apply**.

8. **<D>** to select the green line at the edge of the roadway.

9. **<D>** again to accept the line.
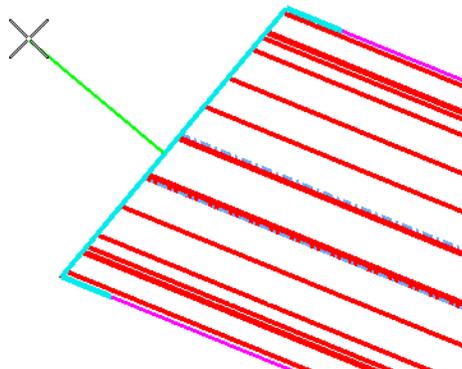
10. **<R>** to Reset for entire line.

The *Generate Sloped Surface* command can be used to create a slope from just a portion of the line, which is why the prompts allow specifying a *Start* and *End* location. Here, an **<R>** is used, since the slopes need to be created for the entire source line.

11. Move your cursor to the left of the line until you see the sideslopes form.
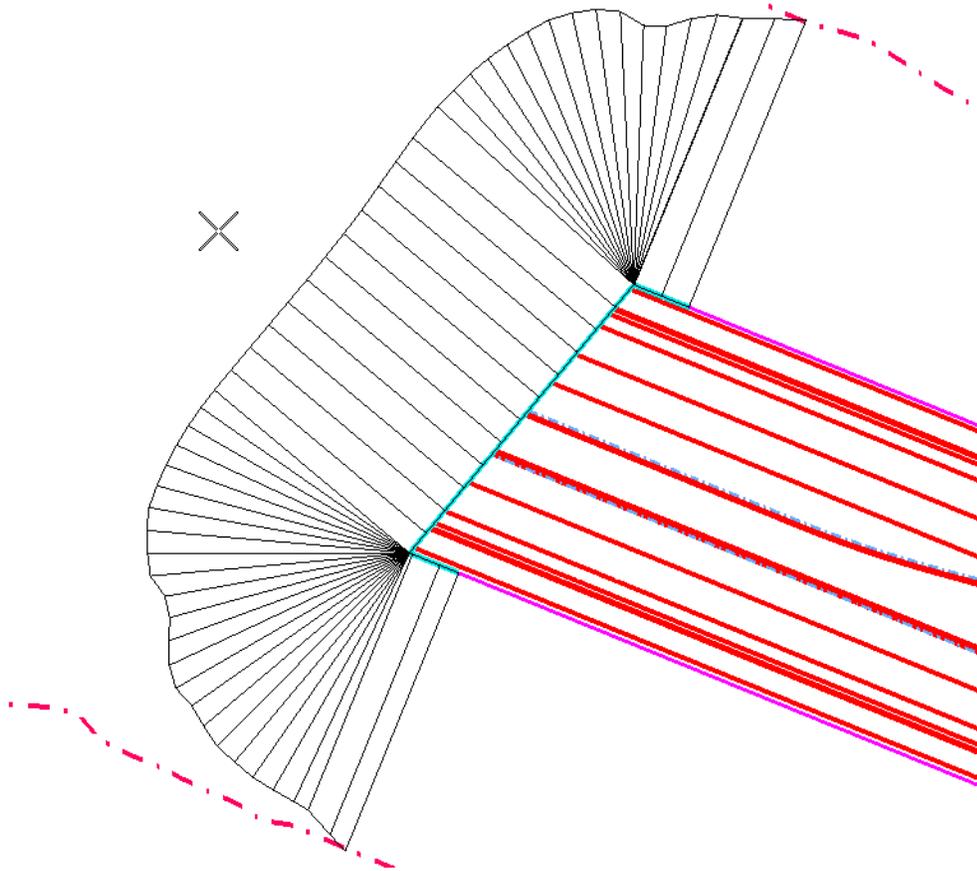
12. **<D>** to Accept the location.
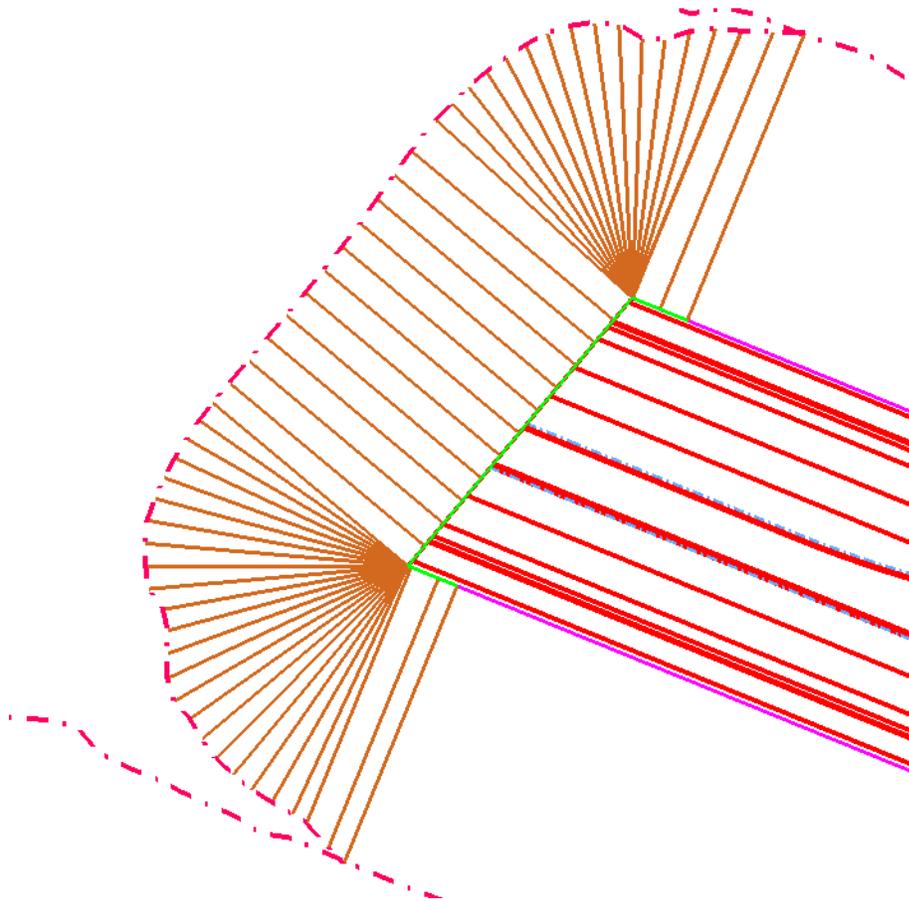
13. **<R>** to exit the command.

14. **<D> Close** to dismiss the dialog box.

15. Save the Surface.

16. Select **Surface > Edit Surface > Partial Delete** from the InRoads main menu.

   Note: *Partial Delete* is used just like the MicroStation *Partial Delete*, except it works on features. Here it is used to clean up the toes of slope that extend beyond the sloped surface.

17. **<D>** on the Toe-of-Fill on the North side of the roadway to select it as the feature to partial delete.

18. **<D>** on the left end to identify the **_Start Point_**, then again where the new toe and old toe come together as shown for the **_End Point_**.
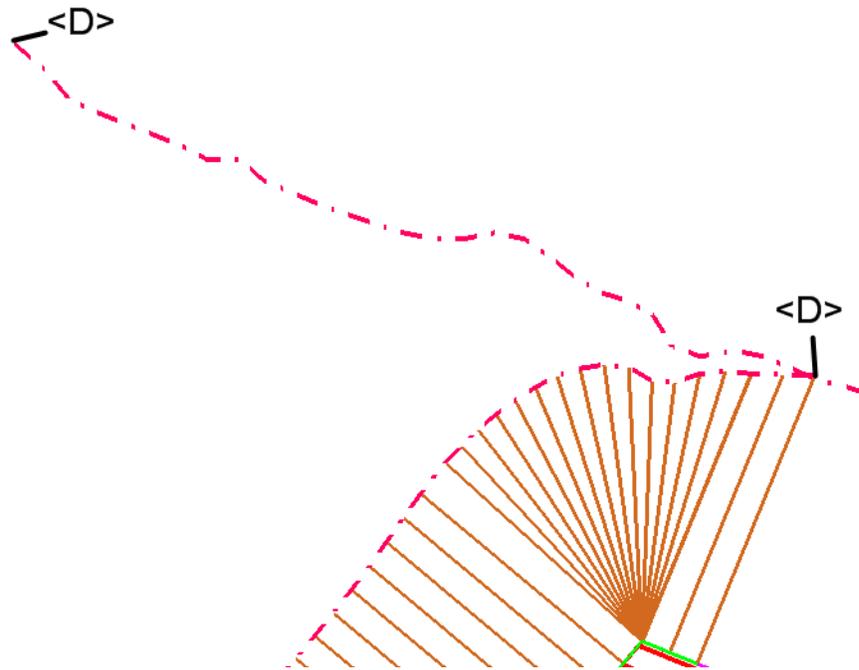
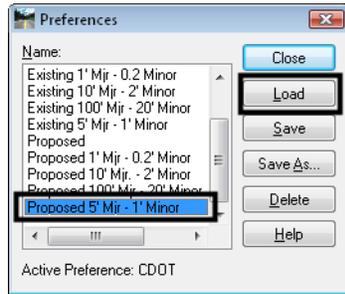19. Repeat for the Toe-of-Fill on the South side of the roadway.

Note: You may want to toggle off **_Line Styles_** under **Settings > View Attributes** to see the ends of the lines more clearly.

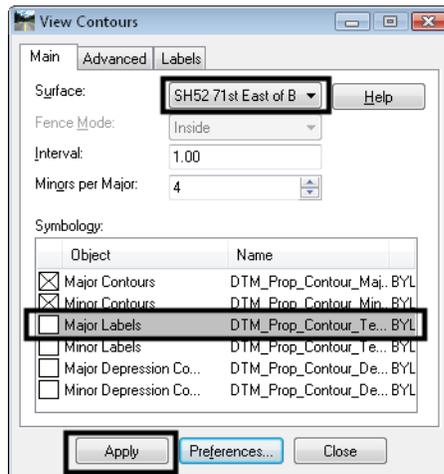20. Save the Surface.

21. Select **Surface > Triangulate Surface**.
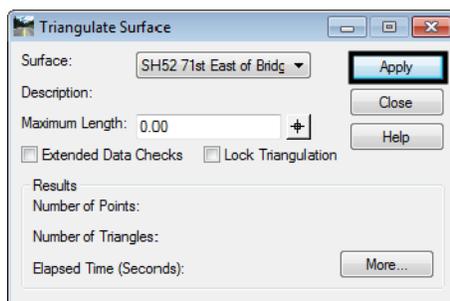
22. **<D> Apply** then **Close**.

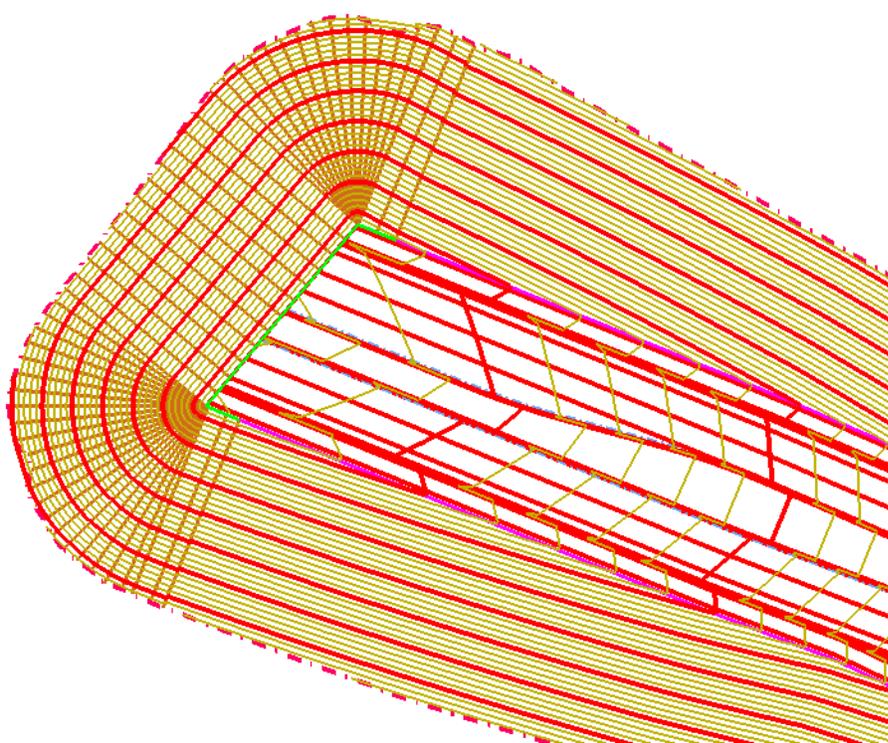23. Select **Surface > View Surface > Contours**.

24. **<D> Preferences** and highlight *Proposed 5' Mjr – 1' Minor*.

25. **<D> Load**, then **Close**.

26. Set the *Surface* to *SH52 71st East of Bridge*.

27. Toggle off *Labels* if desired.

28. **<D> Apply** to see the contours.

29. **<D> Close**.

30. Close InRoads and MicroStation.

Chapter Summary:

- The *Design Surface* and *Edit Surface* tools can be used to modify existing surfaces and add to them as necessary to accomplish your design model.

- Modeling the ends of a bridge can be accomplished using a base model of the roadway, and adding features to define the desired surface.