

LAB 21 - Creating an Island

In this lab, an island with pedestrian ramps is constructed on the southeast corner of the intersection. Surface features of the island are built using various MicroStation commands and InRoads surface design and editing tools. The island model is added to the proposed intersection model to create a triangulated model of the finished grade surface. Because the island is constructed by feature modeling techniques, there are no components included in the model.

Chapter Objectives:

- Lay out the horizontal geometry of the island.
- Identify ramp locations.
- Add elevations to the island shape.
- Create curb and ramp features.

The following files are used with this lab:

- C:\Projects\12345\Design\Drawings\Reference_Files\12345DES_Intersec100SH86.dgn
- C:\Projects\12345\Design\InRoads\12345DES_Geometry-Islands.alg
- C:\Projects\12345\Design\InRoads\Intersection.dtm

The two roads of the intersection are 4 lane curb and gutter. Each has an additional lane through the intersection for a turn bay and acceleration lane. The island protects the right turn lane from through traffic on SH 86.

The SE Curb Return alignment (in the quadrant of the island) represents the edge of pavement for the right turn lane. The features constructed for the island represent the gutter flowline around the island and the pedestrian ramps leading on to the island.

Lab 21.1 - Layout the Island Geometry

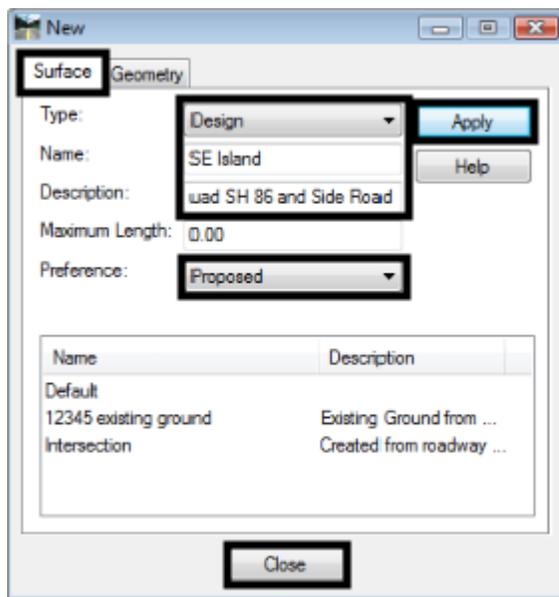
Section Objectives:

- Use horizontal alignment graphics to create the basic outline of the island.
- Define the radii for the island corners.
- Layout the initial geometry for the pedestrian ramps.

The basic outline of the island is created by offsetting the alignment graphics. This is done by displaying the alignments from InRoads then using the MicroStation Move Parallel command to copy the graphics to the desired locations. Construct Circular Fillet is used to create the rounded corners for the island. The pedestrian ramps are laidout with a variety of MicroStation tools like, Place Smartline, Construct Line at Active Angle, Extend Element to Intersect, etc.

1. Open MicroStation and InRoads with the
C:\Projects\12345\Design\Drawings\Reference_Files\12345DES_Intersec100SH86.dgn file.
2. Verify that the **C:\Workspace\Workspace-CDOT_XM\Standards-Global\InRoads\Preferences\CDOT_Civil.xin** is loaded.

3. Open the following InRoads files (they are all in the *C:\Projects\12345\Design\InRoads* folder):
 - ◆ 12345DES_Geometry-Islands.alg
 - ◆ Intersection.dtm
4. From the InRoads menu bar, select **File > New**.
5. Select the **Surface** tab in the *New* dialog box.
6. Set the *Type* to **Design**.
7. Key in **SE Island** for the *Name*.
8. Key in **Island for SE quad SH 86 and Side Road** for the *Description*.
9. Set the *Preference* to **Proposed**.
10. <D> **Apply** then <D> **Close**.

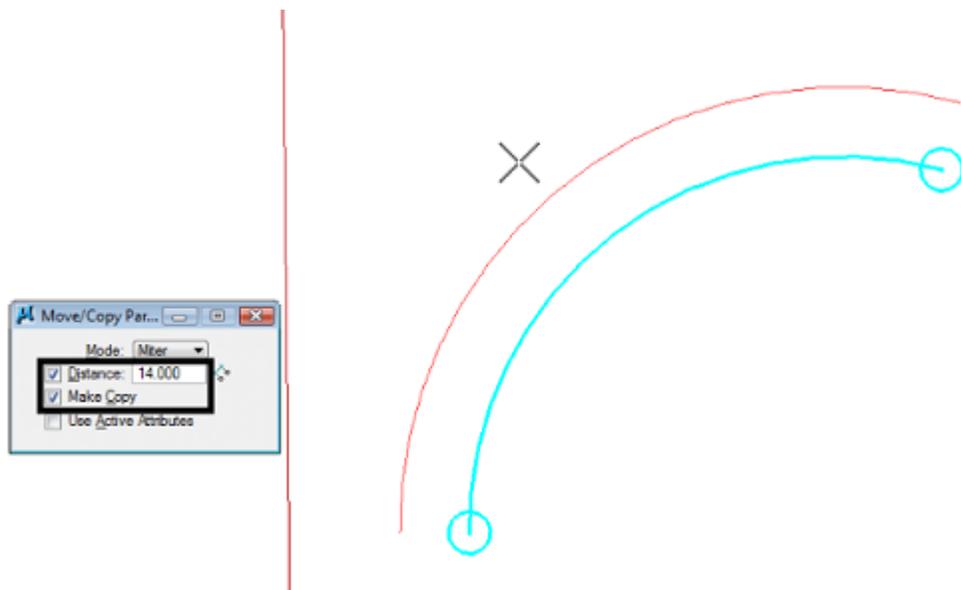


This surface is used to store the island surface data as its being created. It also protects the data in the Intersection.dtm from being accidentally modified while editing the island surface features.

11. In the InRoads Explorer, expand the **12345DES_Geometry** geometry project.
12. <R> on the **SH 86** horizontal alignment and select **View** from the menu.
13. Repeat the process for the **SideRoad** and **SE Curb Return** horizontal alignment

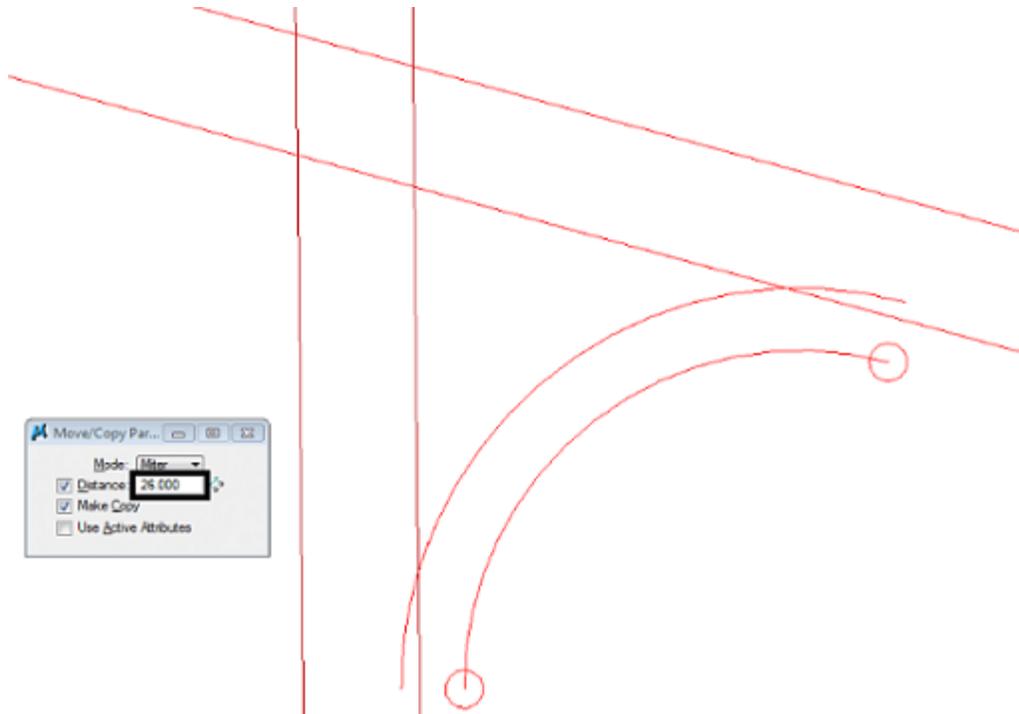
The MicroStation Move Parallel command is used to offset these lines. The SE Curb Return line is offset 14' (12' for the driving lane and 2' for the gutter) to the left to form one side of the island. The SH 86 and SideRoad lines are offset 26' (24' for the driving lane and 2' for the gutter) to the right to form the other two sides.

14. From the MicroStation *Main* toolbar, select **Move Parallel**.
15. In the *Move/Copy Parallel* tool settings box, toggle on *Distance*.
16. Key in **14** for the value.
17. Toggle on **Make Copy**.
18. <D> on the **SE Curb Return** line.
19. Move the cursor to the left of the line and <D> to make the copy. <R> to exit the command.



20. In the *Move/Copy Parallel* tool settings box, key in **26** for the value.
21. <D> on the **SH 86** line the <D> to the right of the line. <R> to exit the command.

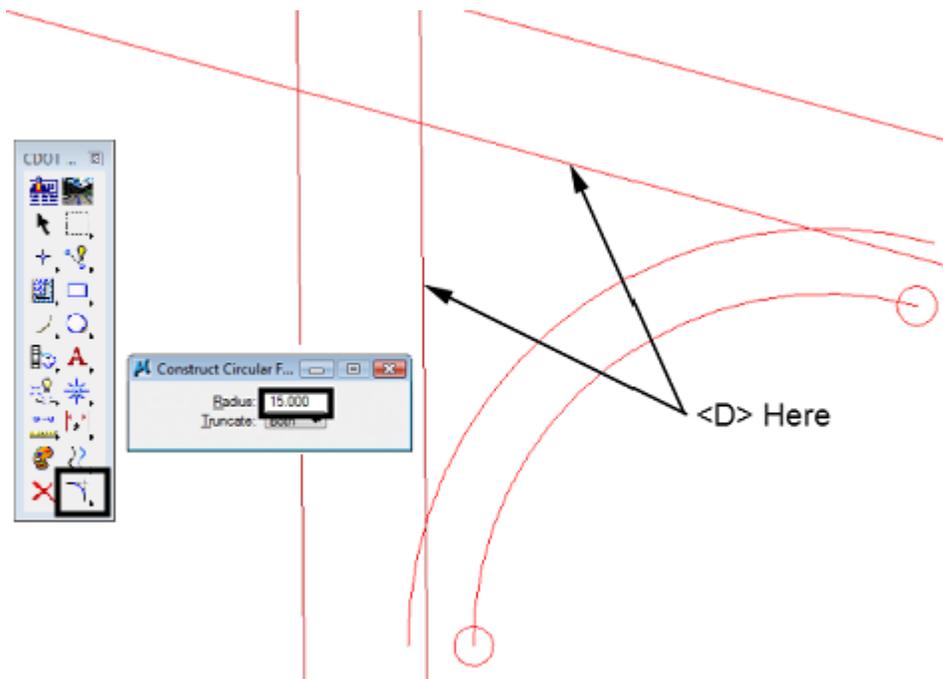
22. <D> on the **SideRoad** line the <D> to the right of the line. <R> to exit the command. The illustration below shows the results.



Next the radii for the island corners are added. The corner facing into the intersection has a 15' radius. The other two have a radius of 5'. These are placed using the Construct Circular Fillet command.

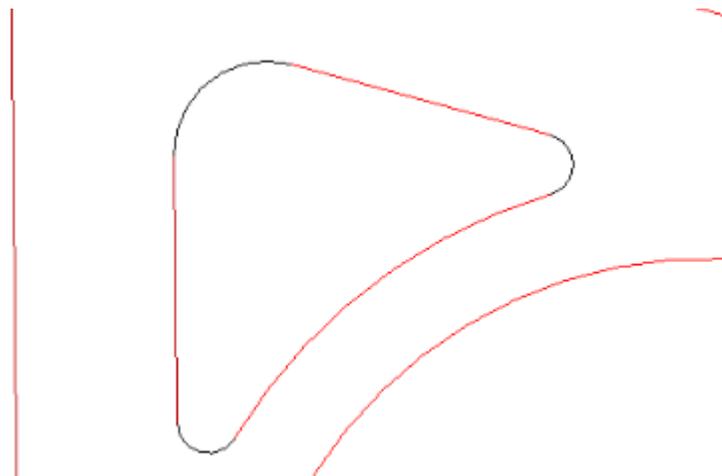
23. Select the **Construct Circular Fillet** command from the MicroStation Main toolbar.
24. In the tool settings box, key in **15** for the **Radius**.
25. Set **Truncate** to **Both**.

26. <D> on the lines as shown in the illustration below.



27. In the tool settings box, key in **5** for the **Radius**.

28. Place the other two fillets as done in step 25. The illustration shows the results.

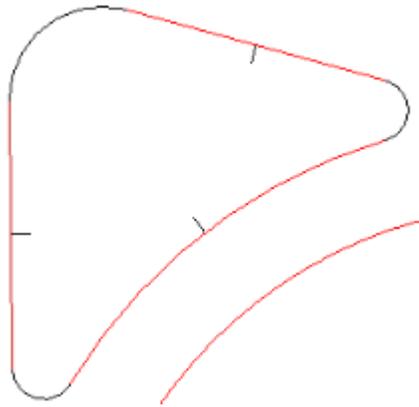


With the outline of the island in place, the pedestrain ramps can be located. These are placed in the center of each side of the island. The MicroStation Construct Line At Active Angle command is used to place the ramp centerline perpendicular to the island side.

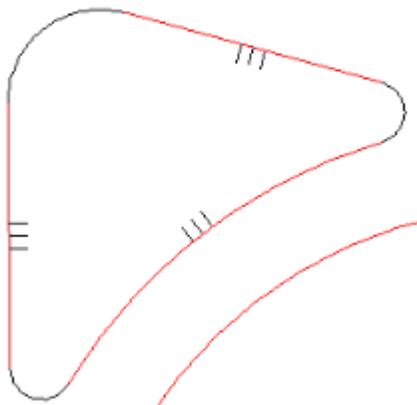
Note: The dimensions for the pedestrain ramp are taken from the M-608-1 Curb Ramps standard, page 104 of the M & S Standards July 2006 edition.

29. Select the **Construct Line At Active Angle** command from the MicroStation Main toolbar.

30. In the tool settings dialog box, set the **Method** to **From Point**.
31. Set the **Active Angle** to **90^00'00"**.
32. Toggle on **Length** and key in **3** for the value. This is the length of the 20:1 slope at the mouth of the ramp.
33. <T> to the center of a side of the island, move the cursor inside the island and <D>.
34. Repeat step 32 for the other two sides. The illustration shows the results.

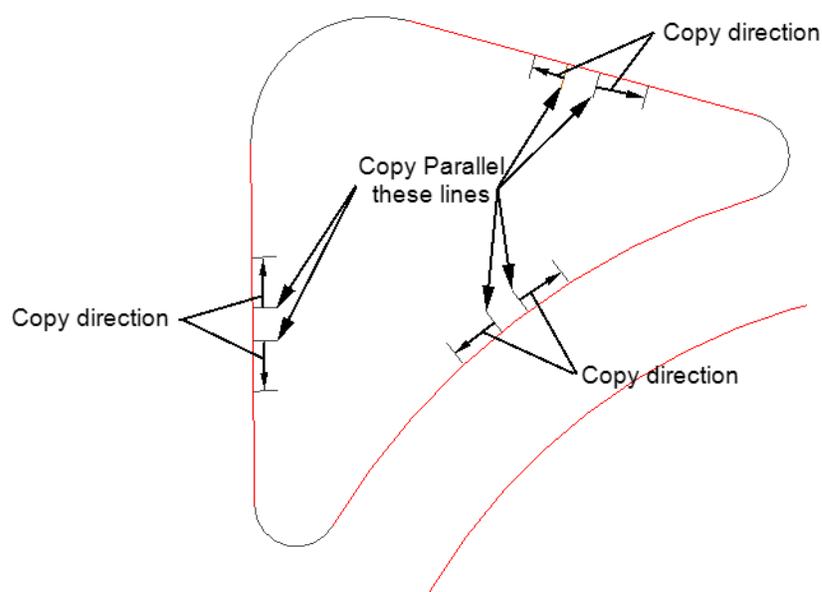


35. From the MicroStation **Main** toolbar, select **Move Parallel**.
36. In the **Move/Copy Parallel** tool settings box, toggle on **Distance**.
37. Key in **2** for the value.
38. Copy each of the ramp centerlines to either side of itself. These will make up the edges of the ramp tread. The illustration shows the results.



39. Delete the ramp centerline elements, they will not be used again.
40. From the MicroStation **Main** toolbar, select **Move Parallel**.
41. In the **Move/Copy Parallel** tool settings box, toggle on **Distance**.
42. Key in **6** for the value.

43. Copy each of the ramp edge lines to the outside of itself. These lines are used to create the ramps “wings”. The illustration shows the results.



Section Summary:

InRoads was used to display the alignments that are the basis of the island. These were copied to their exact XY location using the MicroStation Move Parallel command. Rounded corners were added to the island using the Construct Circular Fillet command. The initial parts of the pedestrian ramps were added using the Construct Line At Active Angle command.

Lab 21.2 - Create Ramp and Curb Graphic Elements

The outline of the island is complete. Now this outline needs to match the elevations in the design surface. The Drape Surface and Import Surface From Graphics commands are used to create dtm features of the island at the desired elevations. The ramp elements are draped to set the initial elevation, then Generate Longitudinal Feature is used to apply the proper slope to the element.

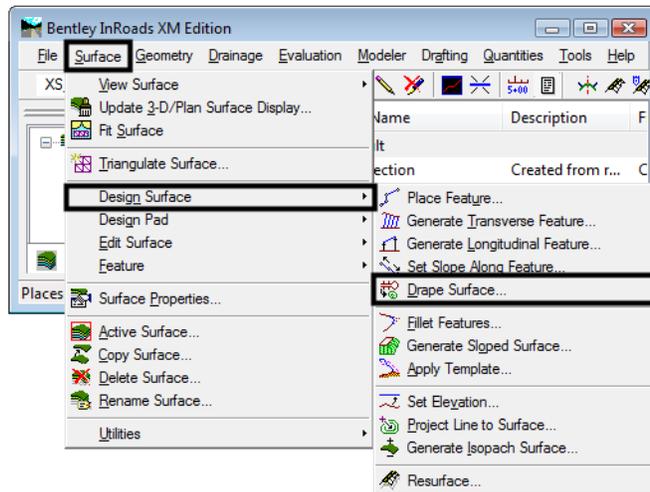
Section Objectives:

- Create graphic elements of the island at the design surface elevation.
- Modify slope on ramp landing elements.
- Create curb elements.
- Modify the curb elements for the ramp wings.
- Add the ramp wing elements.

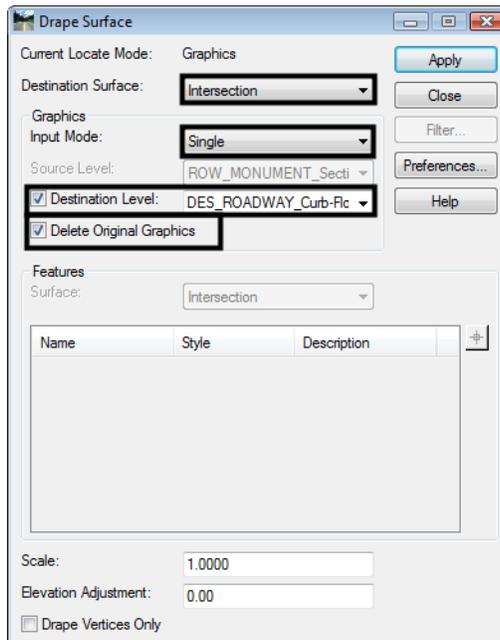
All of the graphic elements that make up the island and curb ramps are draped to the intersection surface. This sets the graphic elements of the island outline to the proper elevation. It also sets the initial elevations for the curb ramp features.

1. Highlight all of the elements that make up the island and ramp.

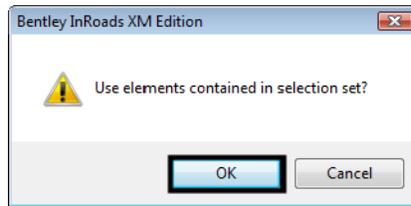
2. Select **Surface > Design Surface > Drape Surface** from the InRoads main menu. This displays the Drape Surface dialog box.



3. In the **Drape Surface** dialog box, set the **Destination Surface** to **Intersection** (this is the surface whose elevations are going to be matched).
4. Set the **Input Mode** to **Single**.
5. Toggle on **Destination Level** and select **DES_ROADWAY_Curb-Flowline** from the drop down menu.
6. Toggle on **Delete Original Graphics**.



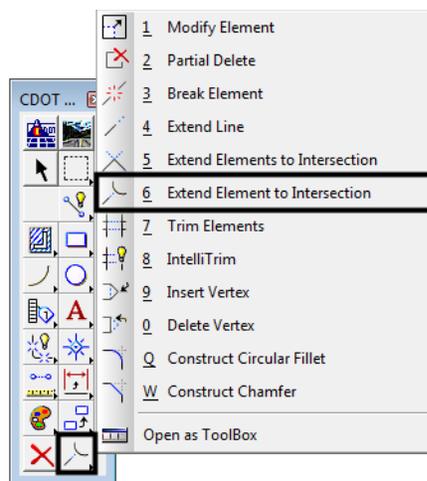
7. <D> **Apply**. This displays a message window asking, “Use elements contained in selection set?”. <D> **OK** to complete the processing.



8. <D> **Close** to dismiss the *Drape Surface* dialog box.

The result of the command is that the graphic elements selected are redrawn at the elevation of the intersection surface. Next, the lines representing the pedestrian ramps are given the proper slope. These elements represent the landing pad of the pedestrian ramp and have a 20:1 slope.

9. Zoom In around the ramp lines on the long arc of the island.
10. Select **Extend Element to Intersection** from the MicroStation main menu.



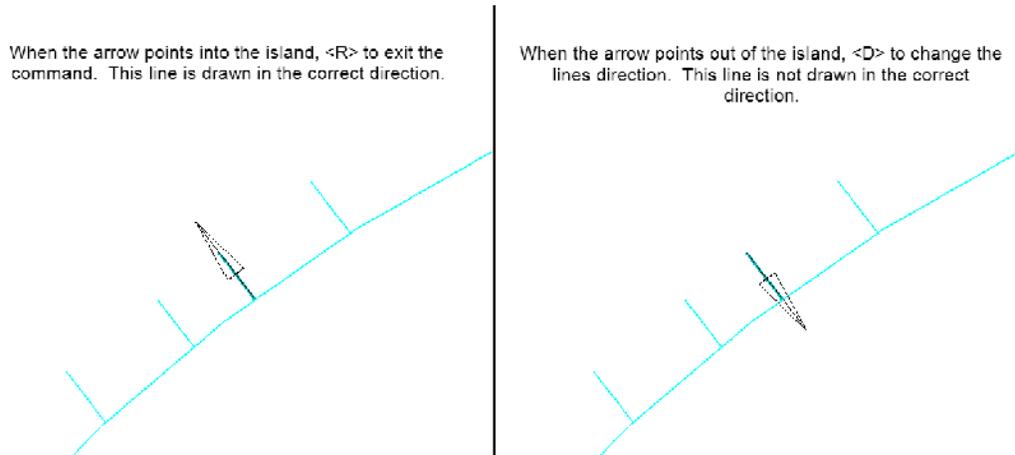
11. Extend the outside ramp line to meet the Island line.

Next, check the direction of the lines. This will affect how the Generate Longitudinal Feature command operates.

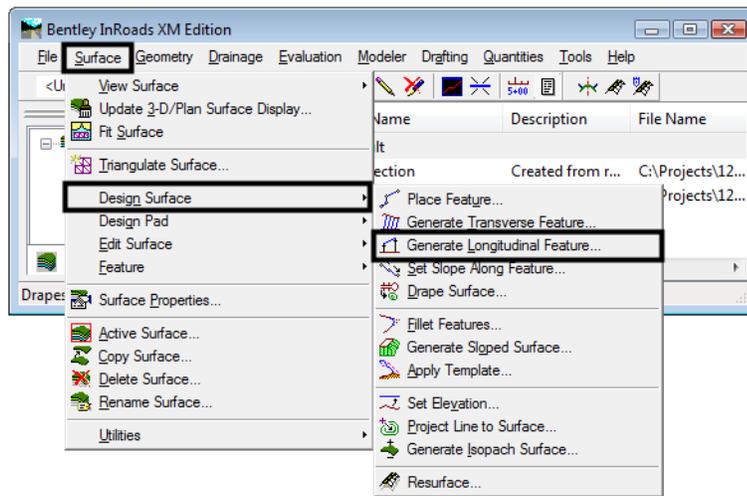
12. <D> the **Change Element Direction** tool from the Misc. Tools bar. The toolbar is usually docked at the top of the MicroStation window. If it is not docked, select **CDOT Tools > Misc. Tools** from the CDOT Menu menu bar.



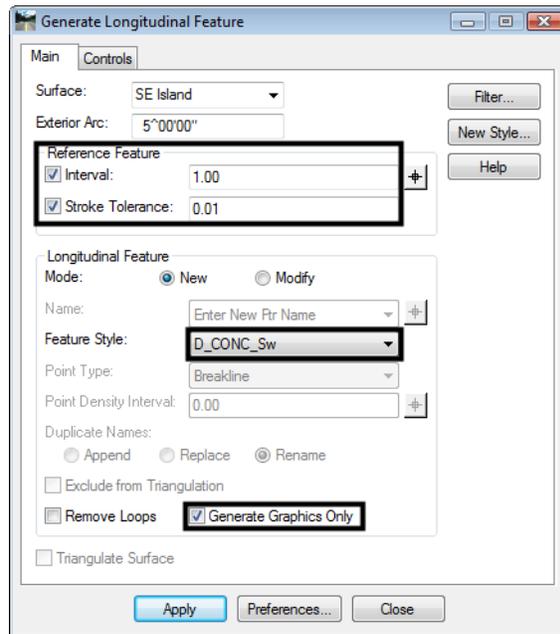
13. <D> on one of the ramp landing edge lines. An arrow appears on the line.



14. Repeat step 13 for each of the ramp lines
15. Select **Surface > Design Surface > Generate Longitudinal Feature** from the InRoads main menu. This displays the *Generate Longitudinal Feature* dialog box.



16. On the *Generate Longitudinal Feature* dialog box **Main** tab, Toggle on **Interval** and set the value to **1.00**.
17. Toggle on **Stroke Tolerance** and set the value to **0.01**.
18. Use the *Feature Style* drop down menu and select **D_CONC_Sw**.

19. Toggle on **Generate Graphics Only**.20. <D> the **Controls** tab.

21. Set the **Horizontal Method** to **Offset From Primary Feature**. Leave the **Start** and **Stop** values at **0.00**.

22. Set the **Vertical Method** to **Elevation/Longitudinal Slope**.

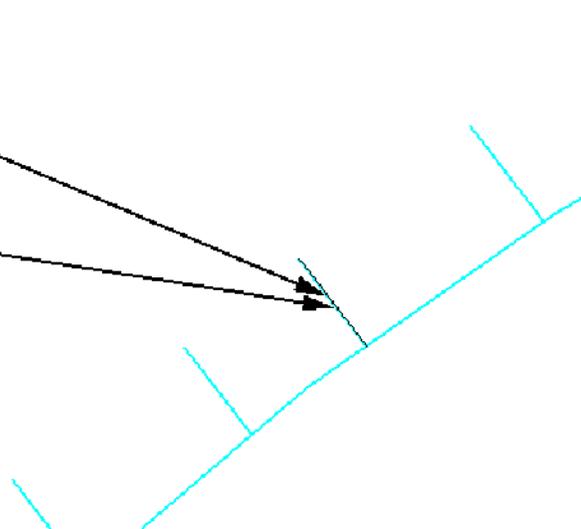
23. <D> the 'target' button for **Start Elevation**, then <T> to the ramp landing line where it intersects the island outline and <D> to accept.

24. Key in **5.00%** (1:20) for the **Longitudinal Slope**.

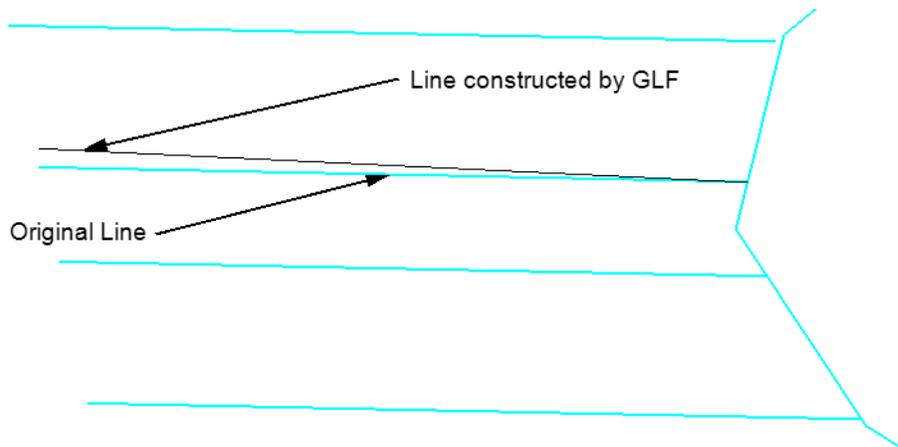
25. **<D> Apply.** Follow the prompts located in the lower left corner of the MicroStation window. Use the same line for the Primary and Secondary element. The illustration below lists the prompts and the action taken.

```

> Identify Primary Element
<D> on this line
> Accept/Reject
<D> Anywhere
> Identify Reference Element
<D> on this line
> Accept/Reject
<D> Anywhere
> Identify beginning/Reset for Entire
<R> to use the whole line.
> Identify location
<D> Anywhere
    
```



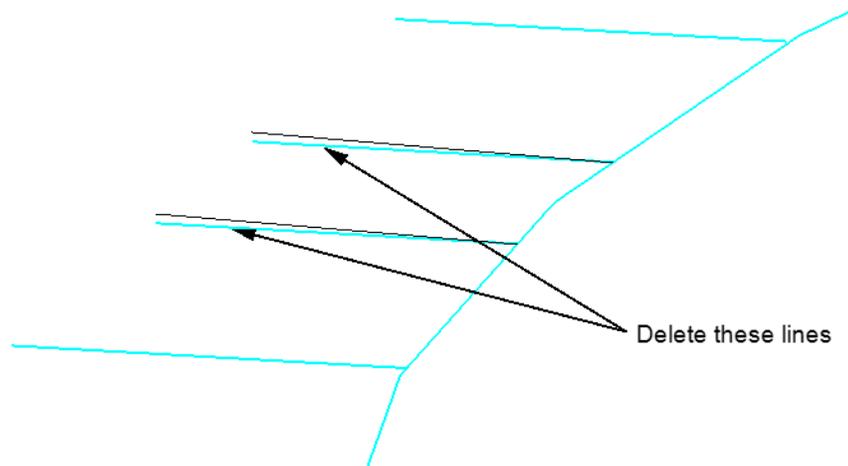
The illustration below shows the results of the *Generate Longitudinal Feature* command in a rotated view.



26. Repeat steps 23 through 25 for the remaining ramp landing lines (there are 5 more).

27. Rotate the view so the the originl ramp tread lines can be seen under the new lines.

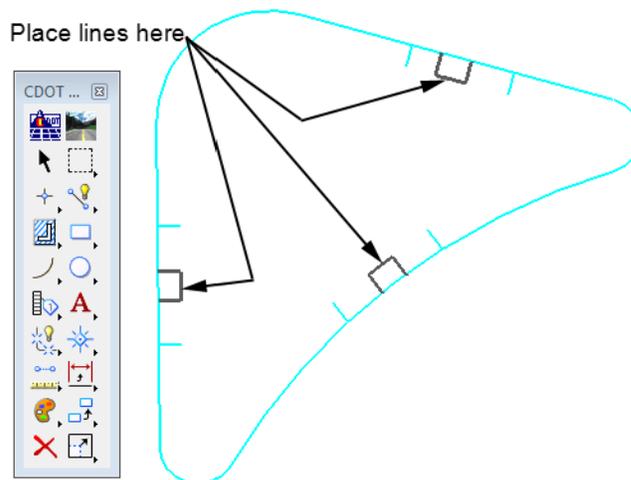
28. Delete the original ramp tread lines from each ramp.



29. Rotate the view back to a **Top** view.

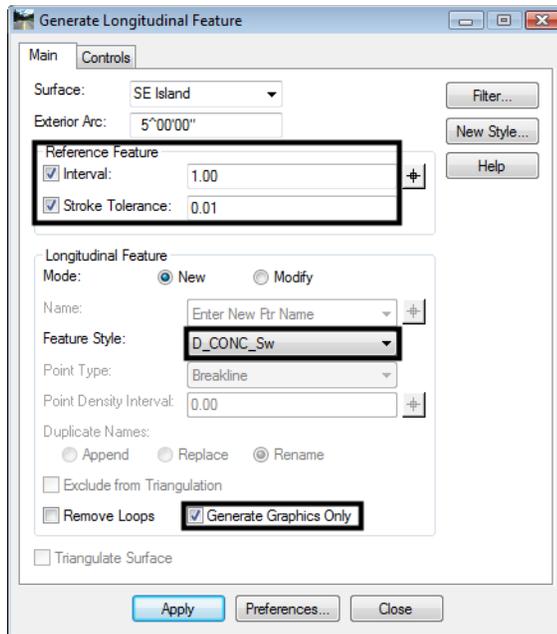
30. Select the MicroStation **Place Smartline** command.

31. Place a line connecting the back of each ramp tread line. Be sure to <T> to the end of of each line so that the elevation of the new line will be correct.



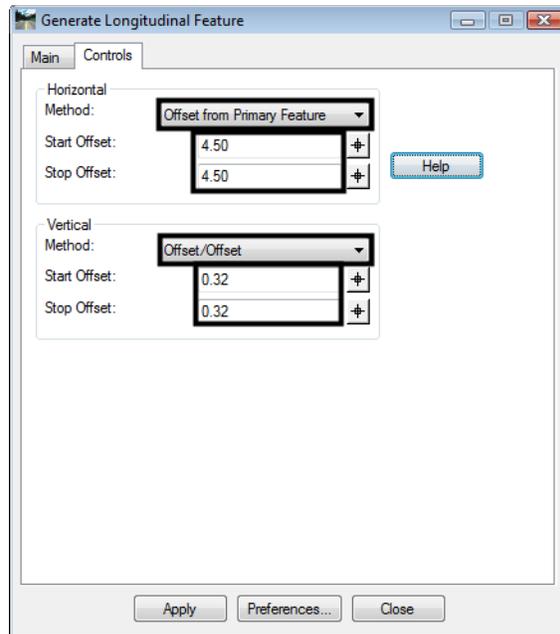
Next, the generate longitudinal feature command is used to create the back of the pedestrian ramps.

32. From the InRoads main menu, select **Surface > Design Surface > Generate Longitudinal Feature**. The settings on the Main tab are the same as those set earlier.



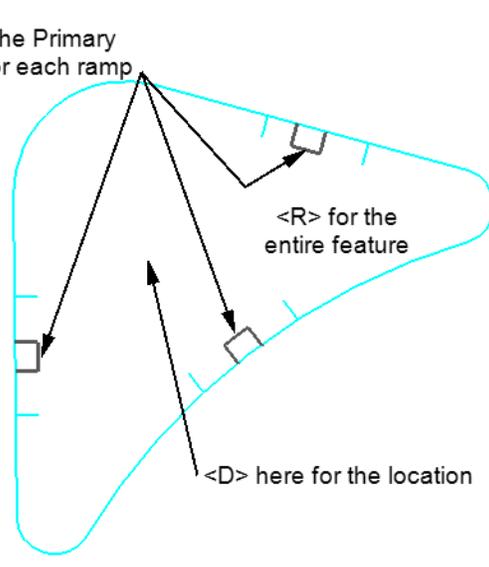
33. <D> the **Controls** tab.
34. In the *Horizontal* area, set the *Method* to **Offset from Primary Feature**.
35. Key in **4.50** for the *Start Offset* and *Stop Offset*. This is the minimum length for this section of the ramp according to the M & S Standard.
36. In the *Vertical* area, set the *Method* to **Offset/Offset**.

37. Key in **0.32** for the **Start Offset** and **Stop Offset**. This is the difference in height from the end of the 20 to 1 tread slope to the top of the curb.

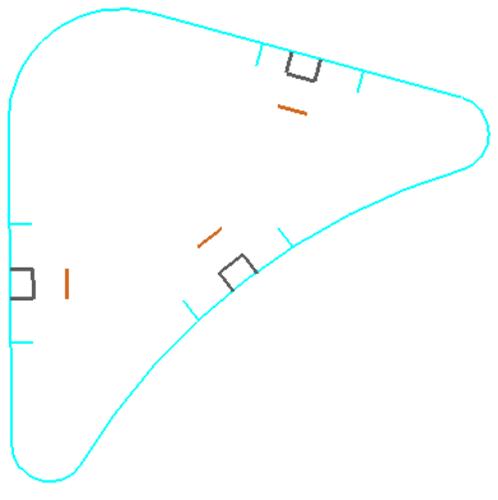


38. **<D> Apply**. Then follow the prompts. Use the ramp tread end line as the primary and reference element. **<R>** to use the entire line. **<D>** in the middle of the Island for the location.

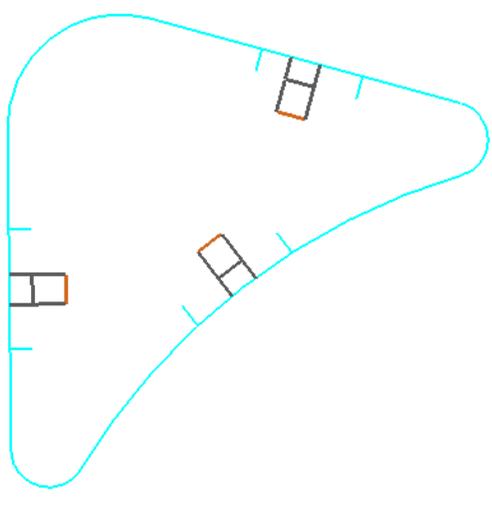
Use these lines as the Primary
and Reference line for each ramp



39. Repeat step 38 for each ramp. The illustration below shows the results. Dismiss the **Generate Longitudinal Feature** dialog box when finished.



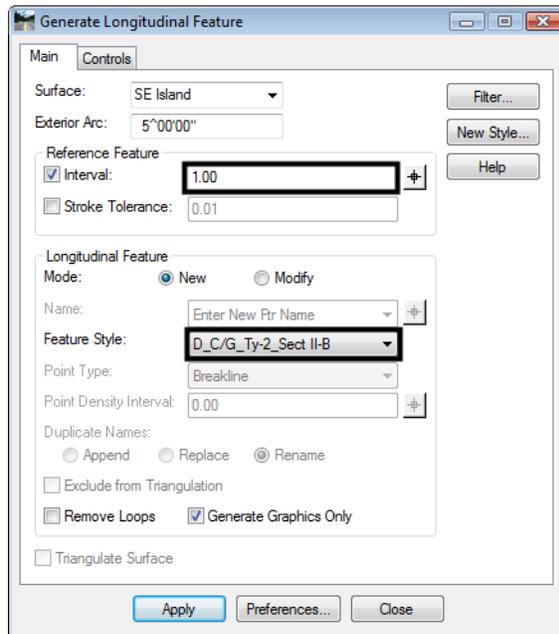
40. Select the MicroStation **Place Smartline** command.
41. Place a lines to complete the sides of each ramp tread. Be sure to <T> to the end of of each line so that the elevation of the new line will be correct. The illustration below shows the results.



Next, elements defining the curb are added. The **Generate Longitudinal Feature** command is used for this.

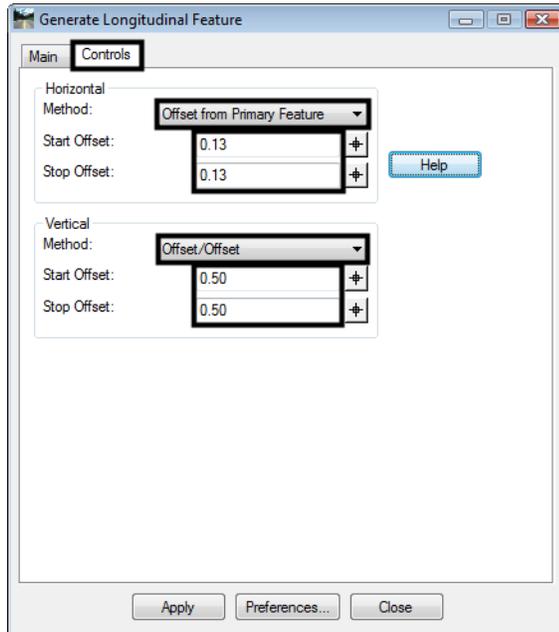
42. From the InRoads main menu, select **Surface > Design Surface > Generate Longitudinal Feature**.
43. On the **Main** tab, key in **1.00** for the Interval.

44. Set the *Feature Style* to **D_C/G_Ty2_Sect II-B**. The other settings remain as set.

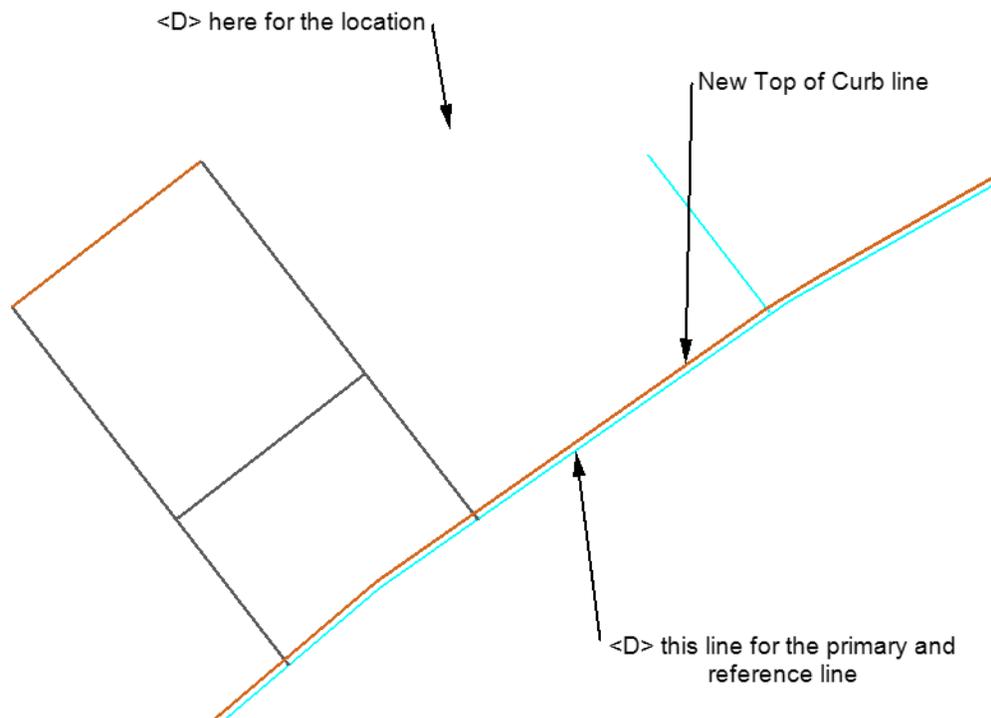


45. <D> the **Controls** tab.
46. Verify that the *Horizontal Method* is set to **Offset from Primary Feature**.
47. Key in **0.125** for the *Start Offset* and *Stop Offset*. This is the horizontal distance from the gutter flowline to the top front of the curb according to the M & S Standard. Note: the entry will be rounded to 0.13 in the dialog box.
48. Verify that the *Vertical Method* is set to **Offset/Offset**.

49. Key in **0.50** for the *Start Offset* and *Stop Offset*. This is the height of the curb.

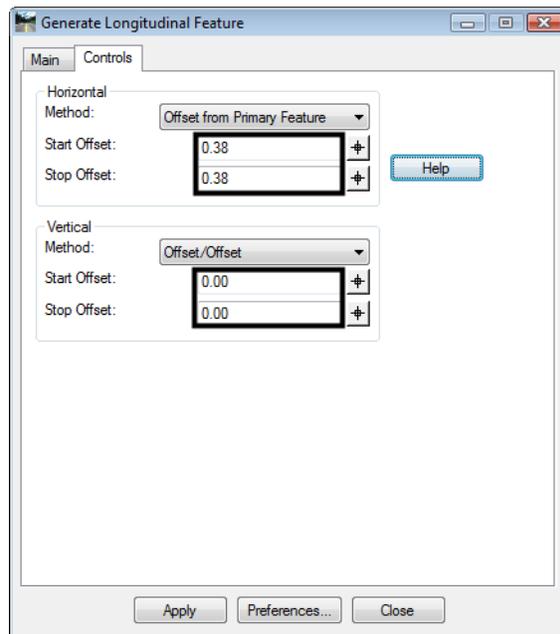


50. **<D> Apply**. Then follow the prompts. **<D>** an island outline element for the primary feature and use the same one for the reference feature. **<D>** in the middle of the Island for the location. The illustration shows an example of the results.

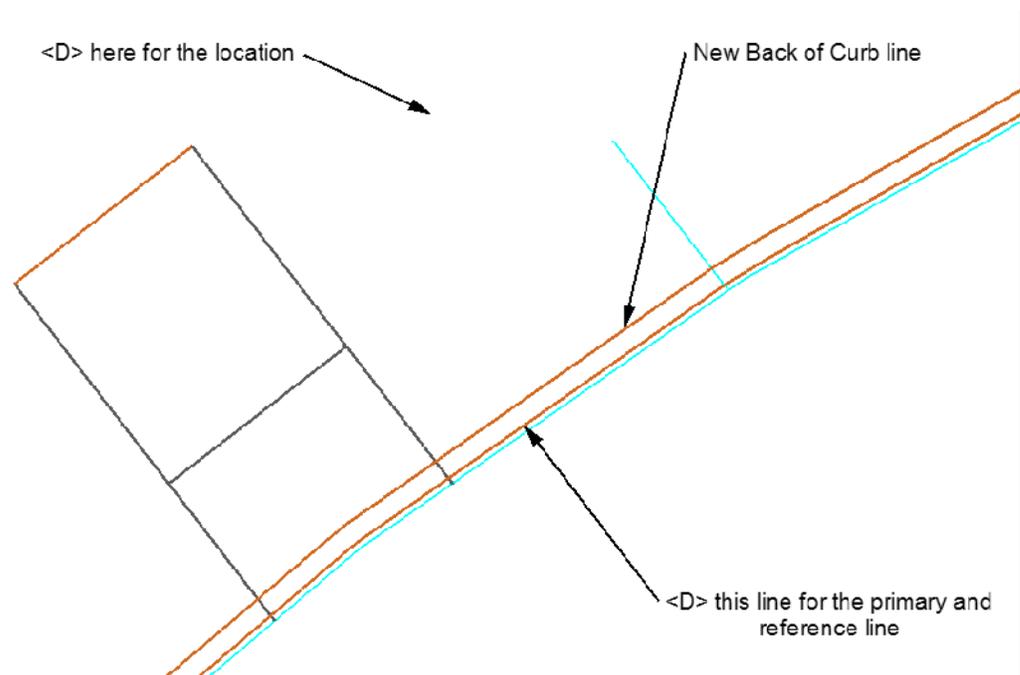


51. Repeat step 49 for each element in the island outline.

52. On the Generate Longitudinal Feature's **Controls** tab, key in **0.375** for the **Horizontal Start Offset** and **Stop Offset**. This is the width of the curb top. Note: the entry will be rounded to 0.38 in the dialog box.
53. In the **Vertical** area, key in **0.00** for the **Start Offset** and **Stop Offset**.



54. **<D> Apply**. Then follow the prompts. **<D>** a top of curb element for the primary feature and use the same one for the reference feature. **<D>** in the middle of the Island for the location. The illustration shows an example of the results.



55. <D> **Close** to dismiss the *Generate Longitudinal Feature* dialog box.

The final step, before importing the graphics into the surface is to modify the curbs and add the ramp wings. This includes partial deleting the top of curb lines in the area of the ramps and drawing lines for the wings.

56. Zoom in around one of the ramps so that the wing lines and each of the curb lines are visible.

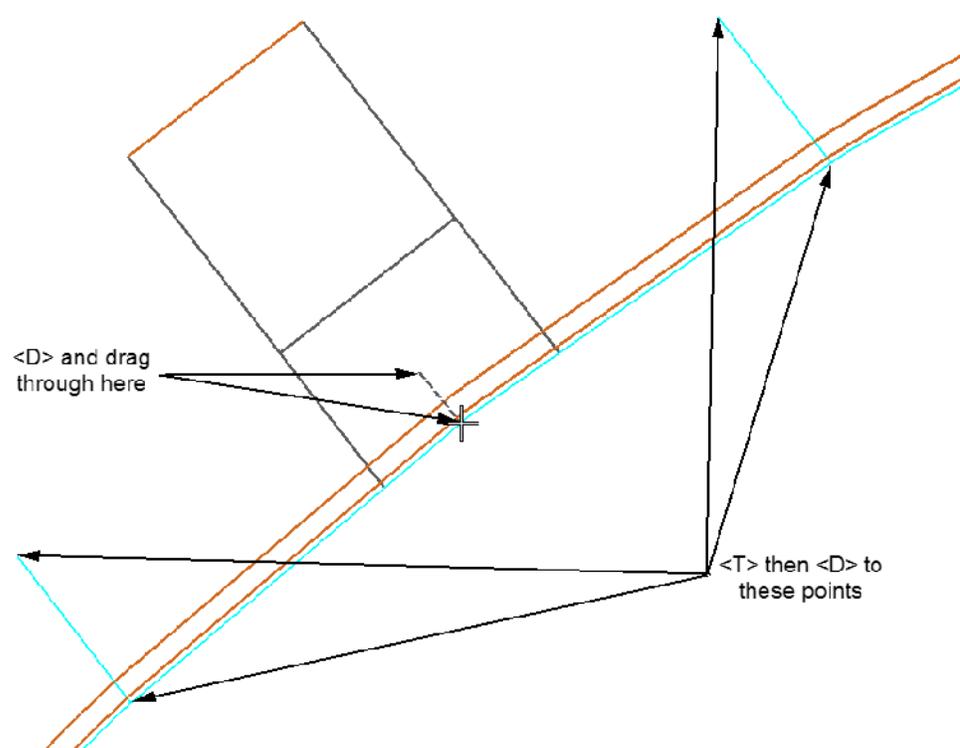
57. From the MicroStation main toolbar, select the **IntelliTrim** command.

58. In the tool settings dialog box, set the *Mode* to **Quick**.

59. Set the *Operation* to **Cut**.

60. <T> the <D> on the ends of each of the wing lines. This cuts the curb top lines in these locations.

61. <D> and **drag** through the curb top lines inside the ramp tread as shown in the illustration below.



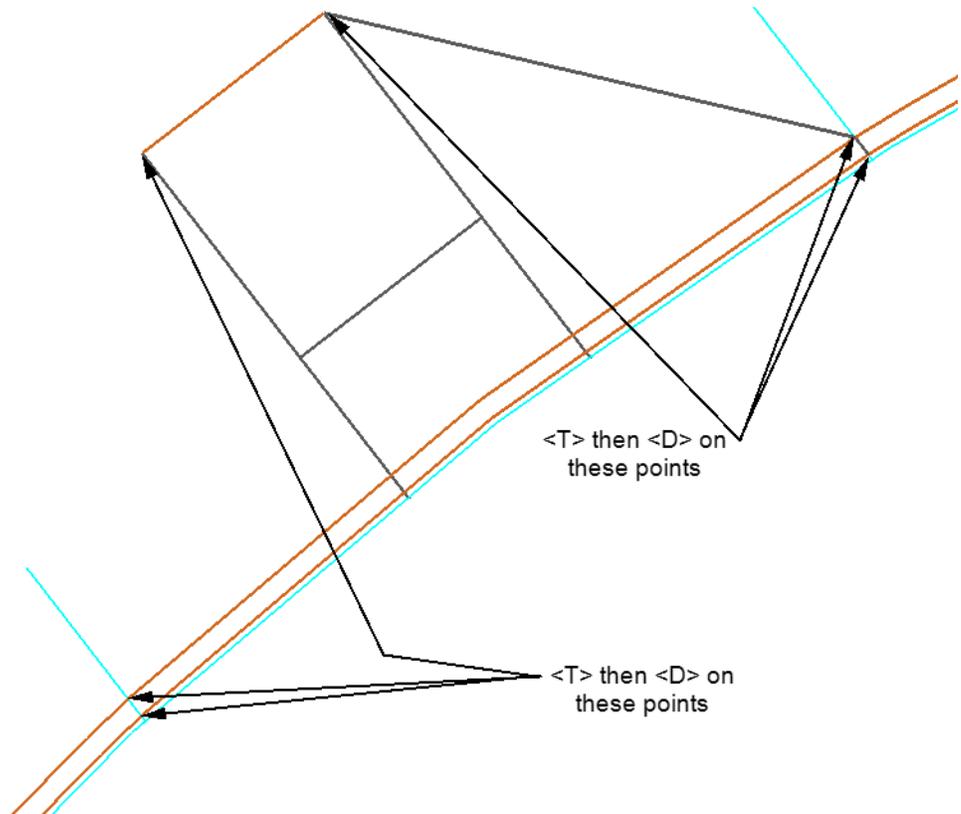
This has broken each of the curb top lines into four sections. The sections inside the ramp area will be modified after they are imported into the surface. Those outside will be left as is.

Next the lines representing the ramp wings are drawn.

62. From the MicroStation main toolbar, select the Place SmartLine command.

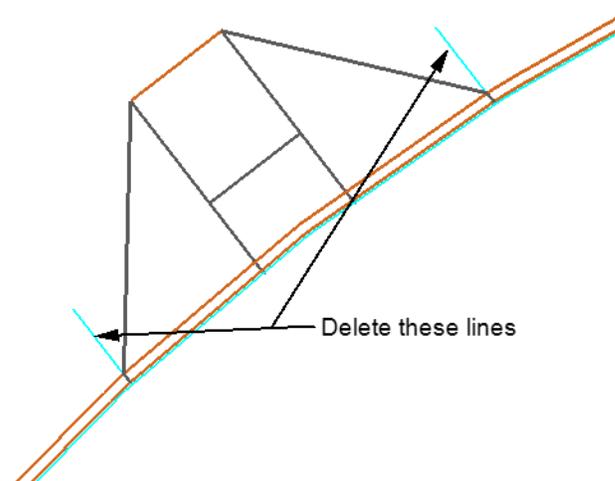
63. <T> then <D> to the points indicated in the illustration below.

Important! Be sure to snap to the curb top lines. Snapping to any other line in this area will result in the wing being placed at the wrong elevation.

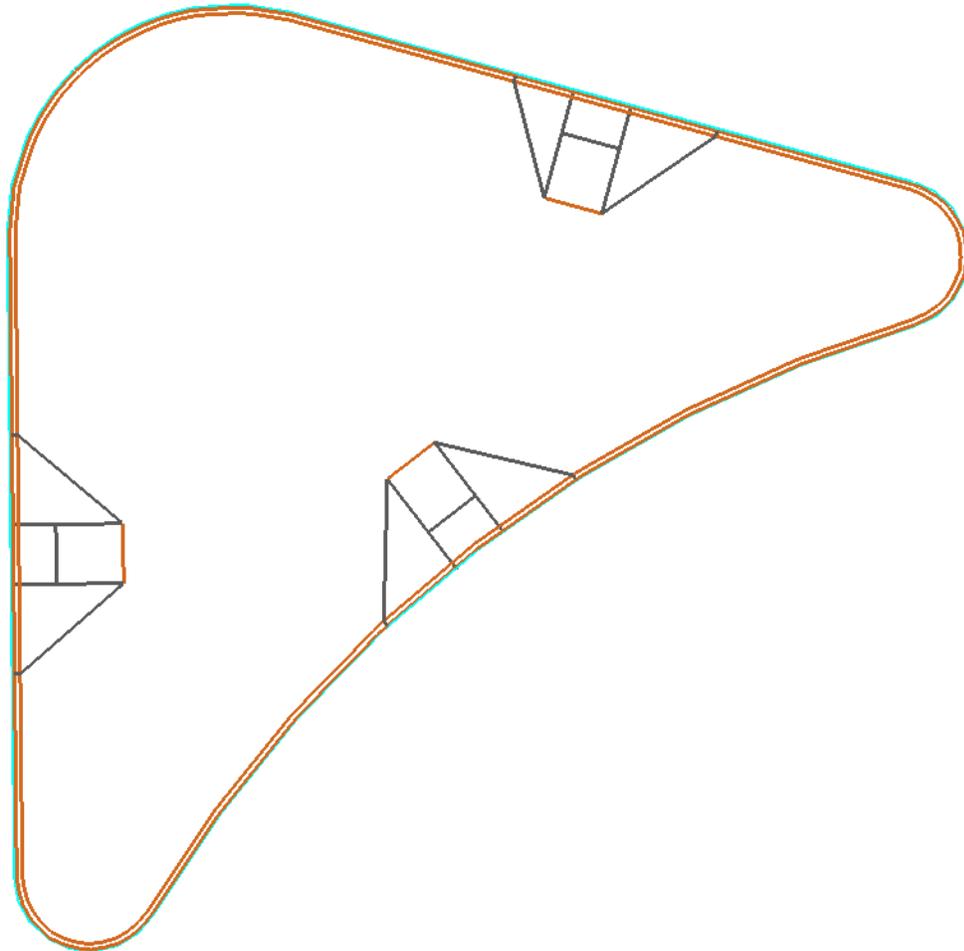


64. Select the MicroStation Delete command.

65. Delete the wing position lines.



66. Repeat steps 56 through 65 for the other two ramps. The illustration below shows the island and ramps completed to this point.



Section Summary:

- ◆ The InRoads Generate Longitudinal Feature command is used to provide elevation to graphic elements.
- ◆ When creating additional elements to be imported into a surface, snapping to elements at the proper elevation creates additional elements at the proper elevation.

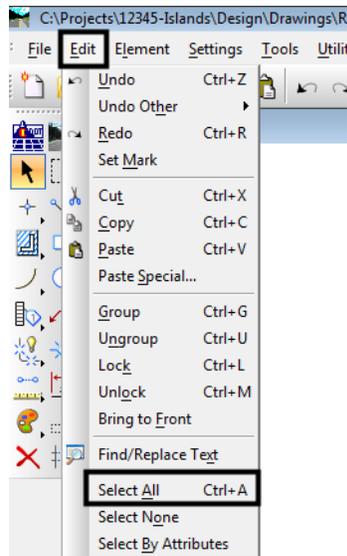
Lab 21.3 - Importing Graphics to Surface and Modifying Features

With the exception of the curb top lines inside the ramp areas, the graphic elements for creating the island surface are in place. In this section, the graphic elements are imported into a surface and InRoads tools are used to modify the curb features inside the ramp areas.

Section Objectives:

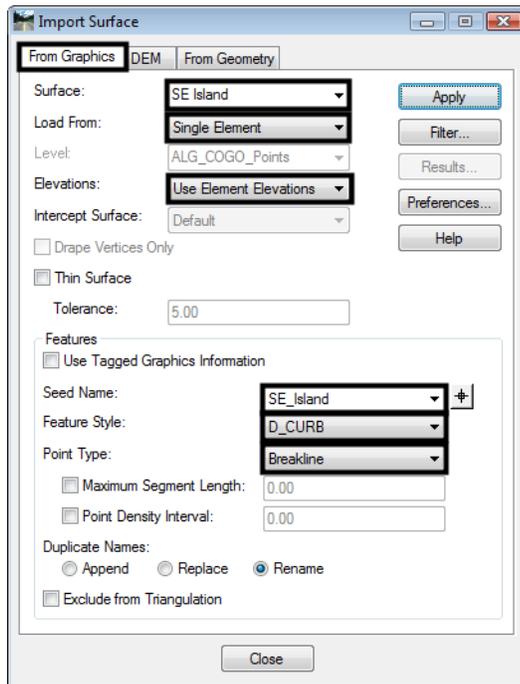
- ◆ Import Graphics to create a surface.
- ◆ Use Trim Feature to modify curb top features in the ramp areas.
- ◆ Use Edit Feature Point for the final cleanup of the curb top features.

1. Zoom out in the MicroStation view so that the entire Island can be seen.
2. On the MicroStation menu bar, select **Edit > Select All**. This highlights all of the elements in the drawing.

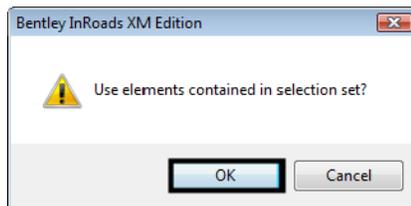


3. From the InRoads menu bar, select **File > Import > Surface**.
4. In the **Import Surface** dialog box, verify that the **From Graphics** tab is selected.
5. Select **SE Island** for the **Surface**.
6. Verify that **Load From** is set to **Single Element**.
7. Verify that **Elevations** is set to **Use Element Elevations**.
8. In the **Seed Name** field, key in **SE_Island**.
9. Set the **Feature Style** to **D_Curb**.

10. Verify that the *Point Type* is set to **Breakline**.



11. <D> **Apply**.
12. <D> **OK** on the “*Use elements contained in selection set?*” message window.

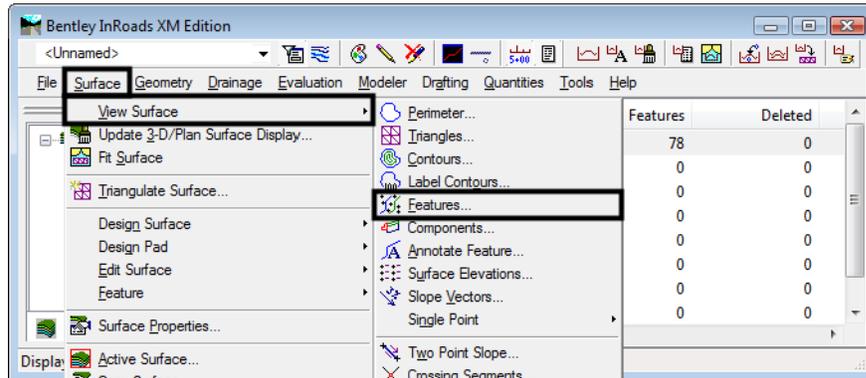


13. <D> **Close** to dismiss the *Import Surface* dialog box.

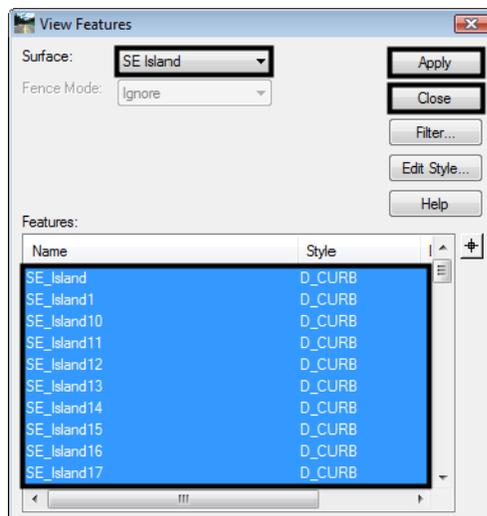
All of the graphic elements have been save into the dtm (surface). The elements used to create the surface are deleted because they will be in the way when performing the next steps. The feature editing commands will automatically update displayed feature graphics but not the MicroStation elements originally used to create those features.

14. Select the MicroStation **Delete** command or press the **Delete** key to delete the graphic elements.

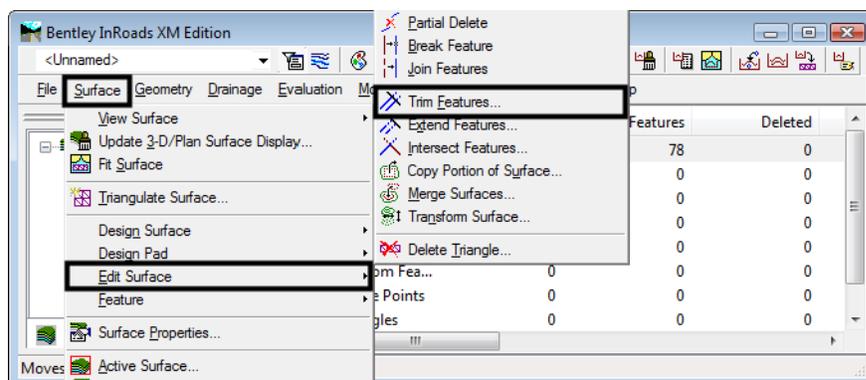
15. Select **Surface > View Surface > Features** from the InRoads menu bar.



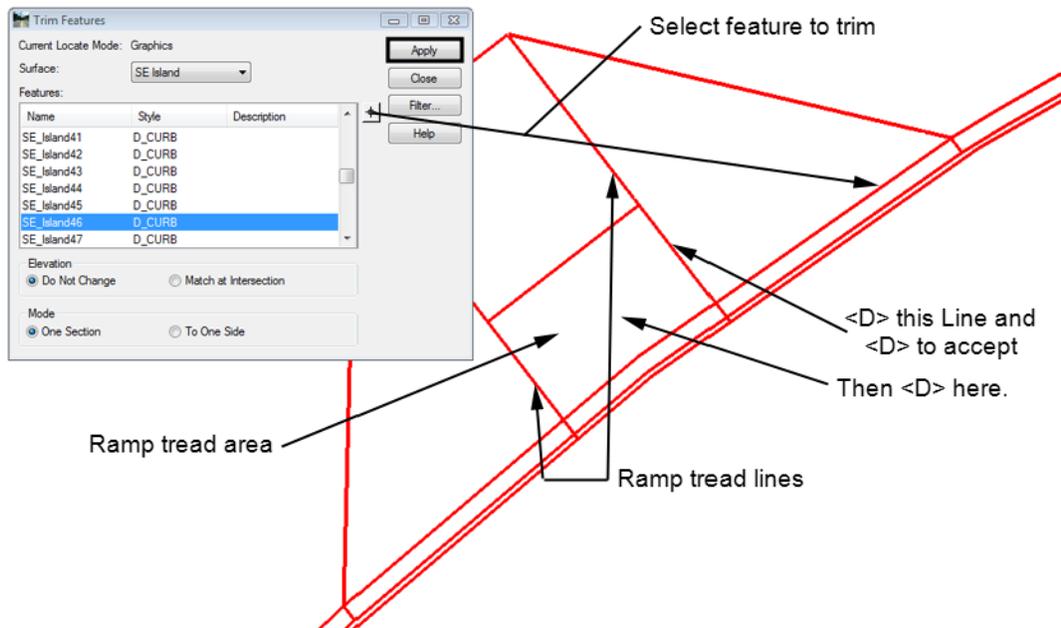
16. In the **View Features** dialog box, verify that the **Surface** is set to **SE Island**.
17. Verify that all of the features are highlighted.
18. <D> **Apply** then <D> **Close** to dismiss the View Features dialog box.



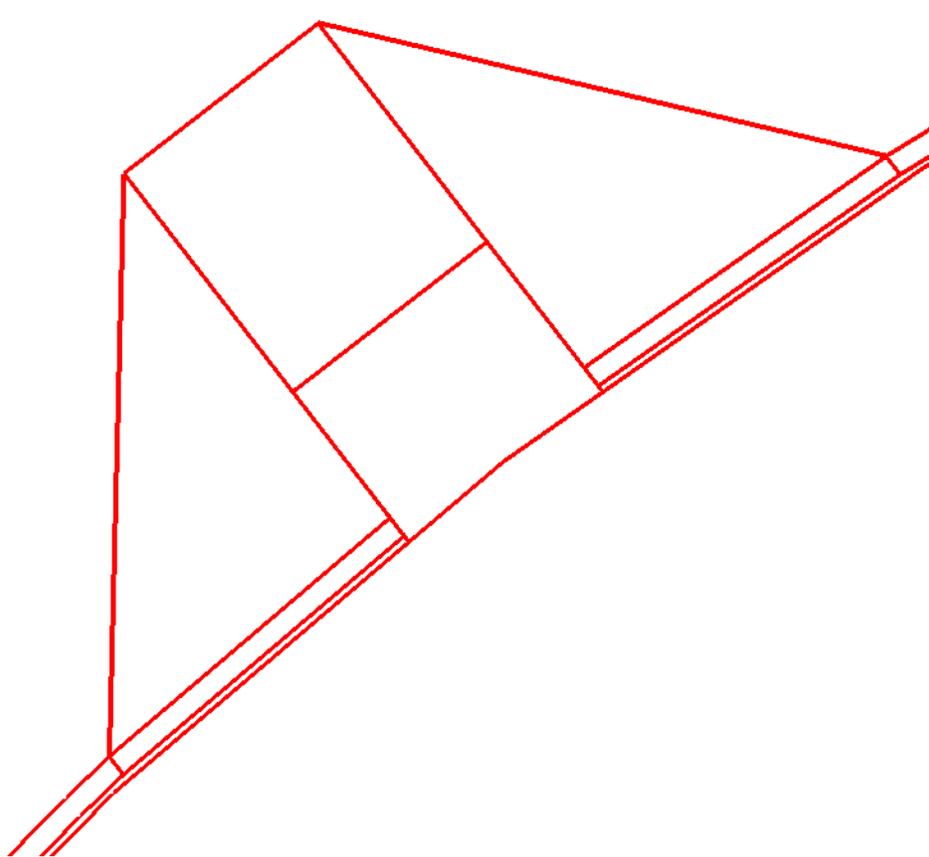
19. In the MicroStation view, zoom in on one of the ramps.
20. From the InRoads menu bar select **Surface > Edit Surface > Trim Features**.



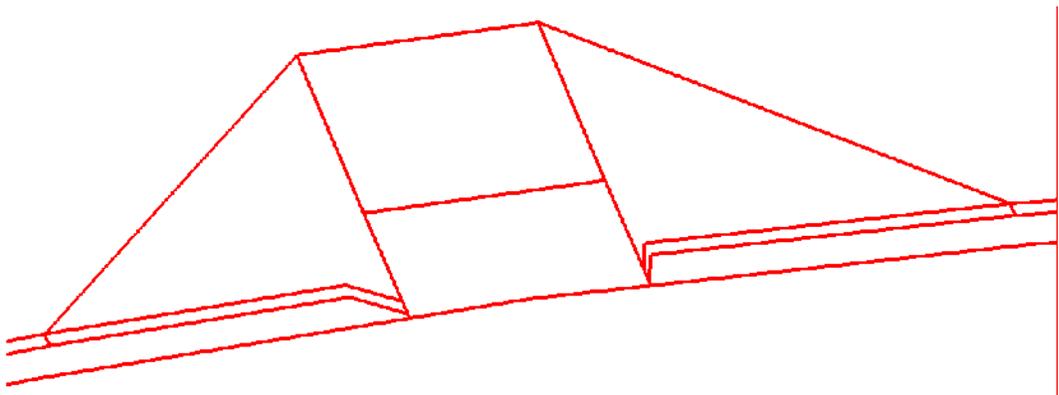
21. In the **Trim Features** dialog box, in the **Elevation** area, toggle on **Match at Intersection**.
22. <D> the target button  Then <D> the curb back line. This highlights that feature in the list.
23. <D> **Apply** then <D> to **Accept**.
24. <D> the ramp tread line then <D> again to accept it.
25. <D> inside the tread area to accept the command and trim the curb feature.



26. Repeat steps 22 through 25 for the other curb top features in the ramp area. The illustration shows the results.



In a rotated view, notice that the curb top lines do not slope consistently from the wing to the tread. This is because the Trim Feature command matches the elevation from the intersection of the features to the next vertex in the trimmed feature.

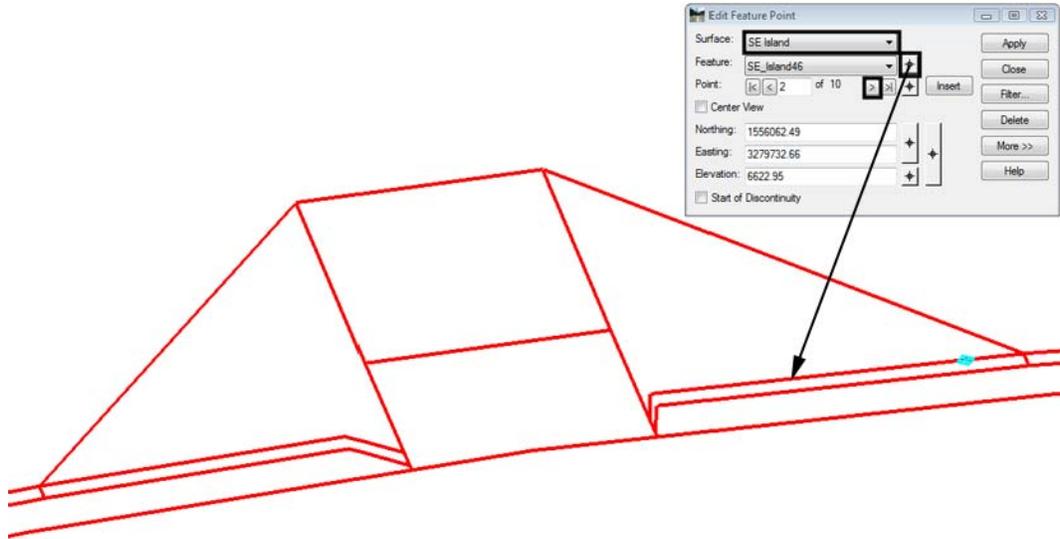


To correct this, the feature points between the beginning and end point are deleted.

27. From the InRoads menu bar, select **Surface > Edit Surface > Edit Feature Point**.
28. Verify that the *Surface* is set to **SE Island**.

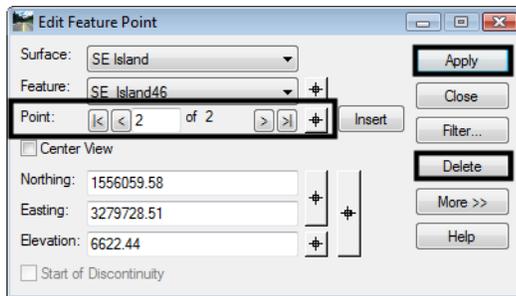
29. <D> the target button for **Feature**, then <D> on the curb back line.

30. <D> the advance point button  to select point 2 on the feature.

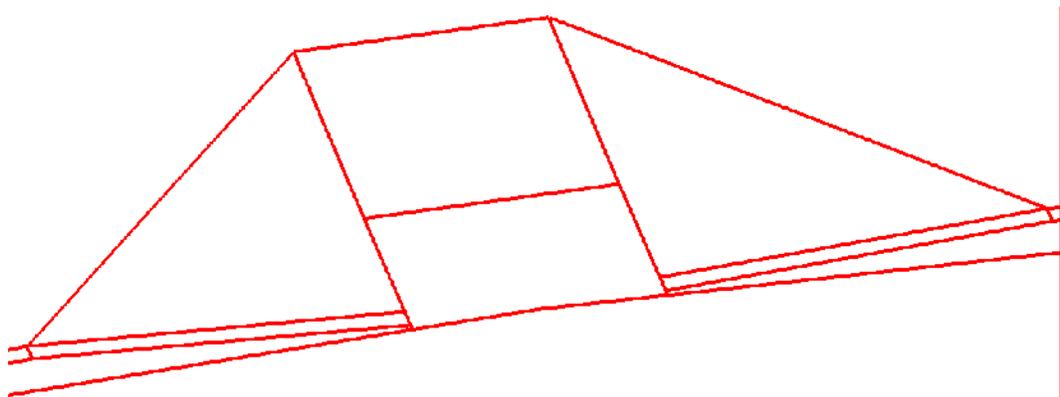


31. <D> the **Delete** button then <D> **Apply**.

32. Repeat step 31 until only two points are left in the feature.



33. Repeat steps 29 through 32 to the remaining curb top features within the ramp area. The illustration below shows a completed ramp.



34. Repeat steps 19 through 33 for the other two ramps.

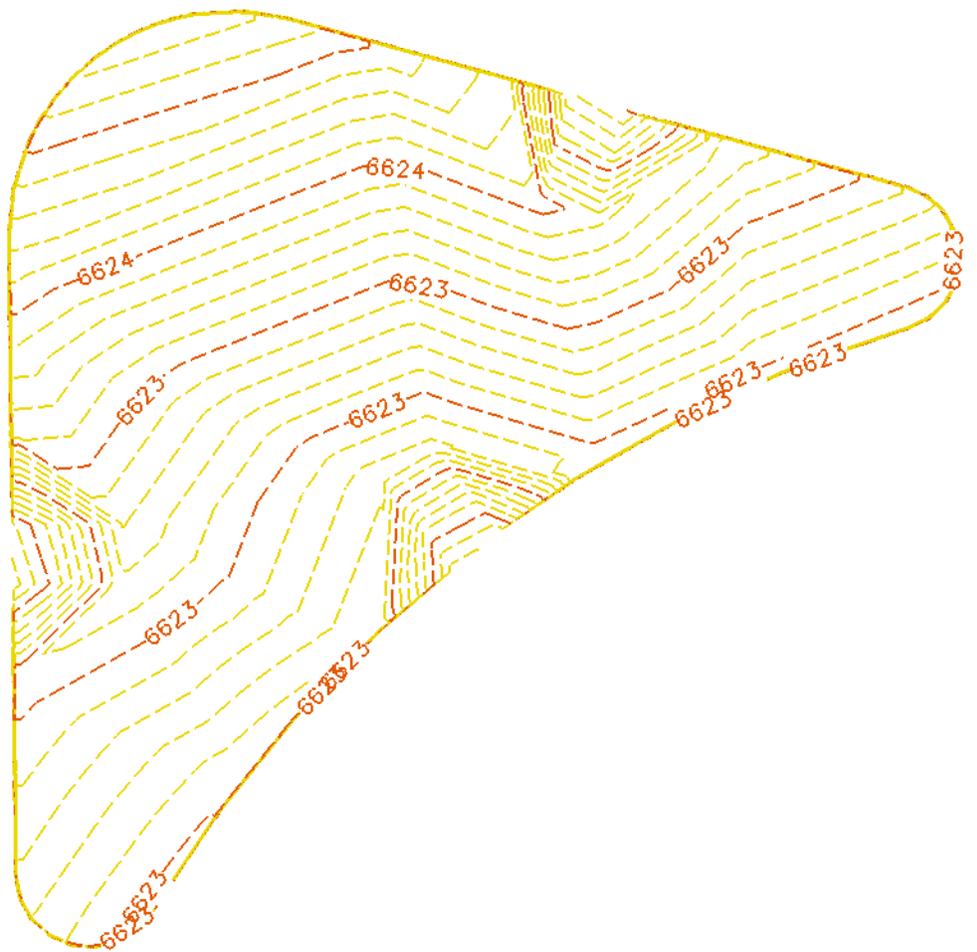
Important! Be sure to rotate to a Top view when performing the Trim Feature command. This will make it easier to identify the trim location.

35. In the InRoads Explorer, <R> on **SE Surface** and select **Triangulate** from the right click menu.

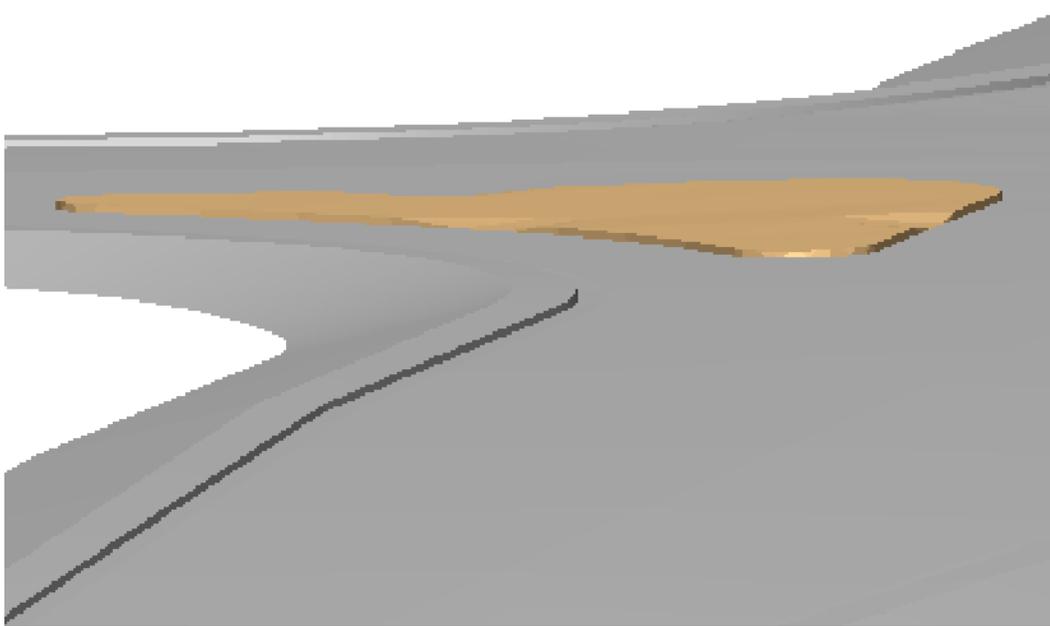
36. <R> on **SE Surface** and select **Save**.

37. Exit InRoads and MicroStation.

The illustration below shows the contours for the island.



Below is a rendering of the Island surface on the Intersection surface.



Section Summary:

- ◆ When importing graphic elements into a surface, if the elements are not selected ahead of time, each element can be given a unique name.
- ◆ Use the Trim Feature command in a top view. This helps when indicating which part of the feature to trim.
- ◆ Use the Edit Feature Point command to remove points from a feature. Delete Feature Point only works with Random points.

Chapter Summary:

- The island was created using MicroStation commands and InRoads surface editing commands.
- Because it was created as surface features only, there are no components in the island surface.
- The Drape Surface and Generate Longitudinal Feature commands were used to create graphic elements that were edited before they were imported into the surface.