

Workflow MS 22 - Basic Rendering Techniques

This document guides you through the use of the MicroStation rendering tools. In this example, a roadway design project is rendered so that images can be created that are suitable for exhibits at a public meeting. These images give the general public a better idea of what the finished project will look like. This workflow uses both MicroStation and InRoads data, as well as aerial photos and other raster images.

When creating a rendering of a project, the existing surface outside of the construction area should be rendered along with the design surfaces. Because the design surface may be below the existing ground in some locations, the existing surface should be removed in the area of the project.

Once the surfaces are modified, the surface data is displayed in the drawing and materials are applied to give the surfaces a more natural appearance. Then, to enhance the appearance of the model, 3 dimensional cells that represent a variety of landscape and other features.

Workflow Outline

The following outline describes the steps needed to complete a rendered drawing along with a brief explanation of what each step does.

Modifying the Existing Ground - The first section describes how to create a modified existing ground surface that can be modified for the rendering.

- ◆ **Copy the Existing Ground DTM** - This workflow requires the existing ground surface to be modified. So that the surveyed dtm is not altered (which could adversely affect the design) a copy of the existing ground is made.
 - Command Used: **Copy Surface**.
- ◆ **Clip Out the Area Of the Design Ground** - Parts of the design surface may lie underneath the existing ground. These areas will not be visible in the rendering if the existing ground triangles are left intact. The design surface's perimeter is used to define an untriangulated area within the existing ground surface, thus exposing the entire design surface.
 - Commands Used: **View Perimeter** - Used to display the surface design perimeter.
 - **Import Surface From Graphics** - Used to incorporate the design perimeter into the existing ground surface and an Interior breakline.
 - **Triangulate Surface** - Used to recalculate the triangles of the existing ground surface so that triangles within the design perimeter are excluded.

Assigning Material to the Existing Ground - By themselves, rendered triangles look rather plain. by applying a natural looking material or an aerial photo to the triangles a more visually appealing appearance can be achieved. In this example an aerial photo is used.

- Commands Used - **View Triangles** - Used to display the triangles of the modified existing ground surface.
- **Raster Manager** - Used to attach the photo to the dgn file.
- **Assign Material** - Used to drape the aerial photo over the modified existing ground triangles.

Assigning Material to the Design Surface - There are a wide variety of materials that can be used to render a drawing. There are options that allow you to assign different materials to parts of your design model. For the majority of the design model surface components can be displayed and rendered. However, because of the way that side slope components are built in InRoads, these areas are better suited to having the triangles rendered.

- ◆ **Creating Side Slope Surfaces** - The components for cut and fill are not suitable for rendering because the components are not created in areas where the slope changes. (This does not affect volume calculations because the surface is still triangulated in these areas). Therefore a separate surface for these areas is created.
 - **Commands Used: View Features** - Used to display the POSS, Top of Cut, and Toe of Fill features that will be used to create the side slope surfaces.
 - **Place Smartline** - Used to connect the toe of slope features to the POSS feature. This defines the boundary for the new surface
 - **Create Complex Shape** - Used to create a single closed shape element from the toe of slope features to the POSS features. This will be used as the data and exterior boundary for the side slope surface.
 - **Import Surface From Graphics** - Used to create the new side slope surface and to add the data to it.
- ◆ **Displaying the Design Components and Surfaces** - The design components and side slope surfaces are displayed so that materials can be assigned to their levels.
 - **Commands Used: View Surface Components** - Used to display the surfacing and Z-Slope components.
 - **View Triangles** - Used to display the side slope surfaces. Remember to use a different preference than was used for displaying the existing ground triangles.
- ◆ **Assigning Material to the Design Surface** - This is done to make the rendered components and surfaces appear more lifelike.
 - **Commands Used: Assign Material** - Used to apply different materials to the components and side slope surfaces.

Adding Additional Details - Items other than the surfaces can be added to the rendering in order to better illustrate the impact of the proposed design.

- ◆ **3D Cells** - These are like other MicroStation cells except they are as 3 dimensional elements that can be rendered. An assortment of 3D cells is available from the landscape3d.cel library, delivered with MicroStation. Others can be found on-line.
 - **Commands Used: Attach Cell Library** - Used to make the cells in the library file available for placement in the drawing.
 - **3D Warehouse Import Model** - Used to obtain additional 3d cells from the internet.
 - **Place Cell** - Used to place the cell into the dgn file.
- ◆ **Using A Background Image** - A background image is used to replace whitespace with a more realistic looking image.
 - **Command Used: Design File Settings > Views** - Used to identify the raster image to be used for the background.
- ◆ **Lighting Adjustments** - These are used to make the rendering more visually appealing by adjusting brightness, lighting direction, and the definition of shadows. All of these adjustments are made in the Lighting Manager.
 - **Commands Used: Lighting Manager - Brightness** - Used to adjust the overall lighting for the rendering.
 - **Lighting Manager - Ambient** - Used to adjust the environmental lighting for the rendering. It is used to reduce the harshness of shadows.

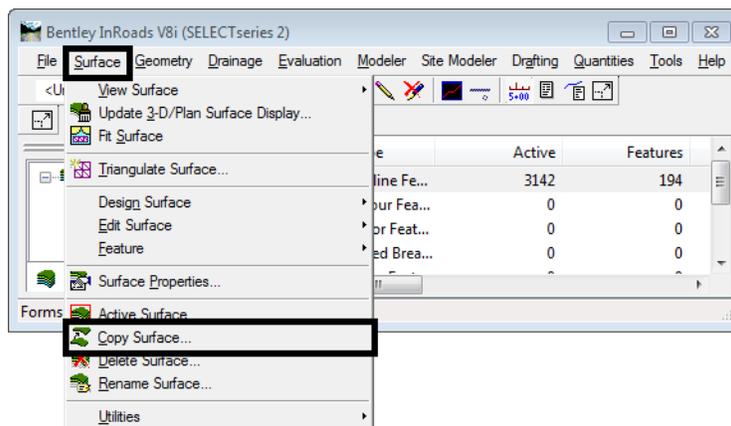
- Lighting Manager - Solar - Used to adjust the direction from which the light comes.

Modifying the Existing Ground

Copy the Existing Ground DTM

The first step in the rendering process is to clip out the existing ground in the area of the project. For this, a copy of the existing ground surface is made. Then the perimeter of the design surface is imported into this copy as an Interior Breakline. This will insure a seamless edge between the existing and design surfaces.

1. Open MicroStation and InRoads.
2. Load the appropriate InRoads data files. DTM the .alg file are required. (The .alg file is required below to display the design components.)
3. From the InRoads main menu, select **Surface > Copy Surface**.

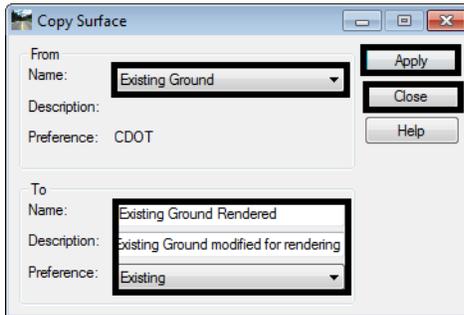


4. In the **Copy Surface** dialog box, verify that the existing ground surface is selected for the **Name** field in the **From** area.
5. In the **Name** field of the **To** area, key in the desired name. Existing Ground Rendered is used in this example.
6. In the **Description** field, key in the desired description.
7. Using the drop down menu, select the desired **Preference** for the surface.

Note: Be sure to make the name and description for this copy unique and specific to its use so that it isn't confused with the original existing ground surface when doing design work on the project.

8. <D> the **Apply** button. This writes the copy to memory and displays the surface in the InRoads Explorer.

9. <D> **Close** to dismiss the **Copy Surface** dialog box.

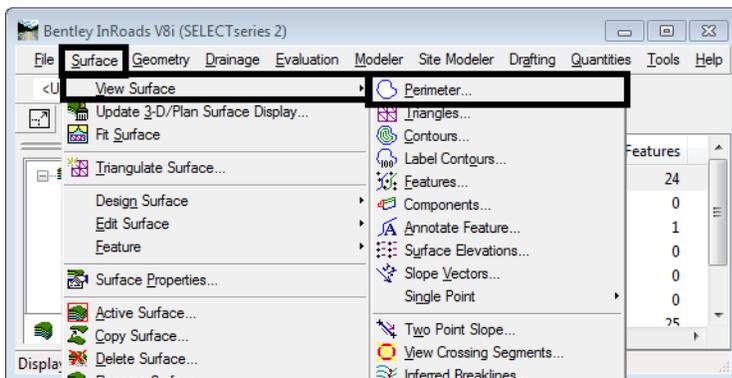


Note: You can close the original existing ground file if desired, to avoid accidentally modifying the wrong surface.

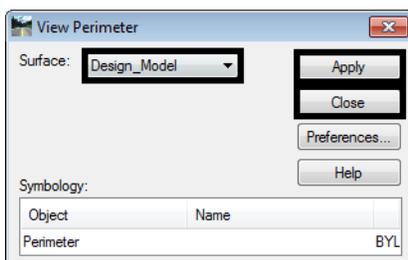
Clip Out the Area Of the Design Ground

Now that there is a working copy of the existing ground, it can be modified to exclude data within the limits of the design surface. The perimeter of the design surface is used to define the clipping area.

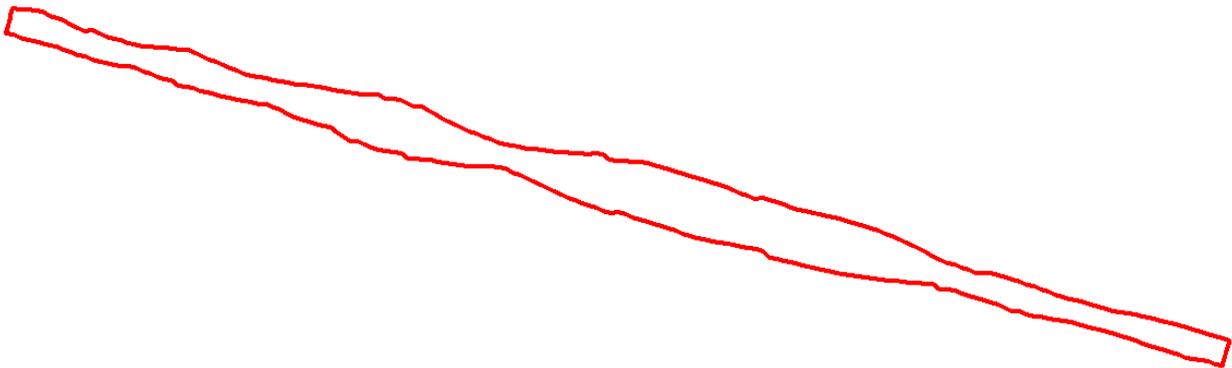
1. Set the **Design Surface** active. In this workflow Design_Model is used as the design surface.
2. From the InRoads Main menu, select **Surface > View Surface > Perimeter**. This displays the **View Perimeter** dialog box.



3. Verify that the Design Surface is selected as the **Surface**.
4. <D> the **Apply** button. This displays the perimeter in the dgn file.
5. <D> **Close** to dismiss the **View Perimeter** dialog box.

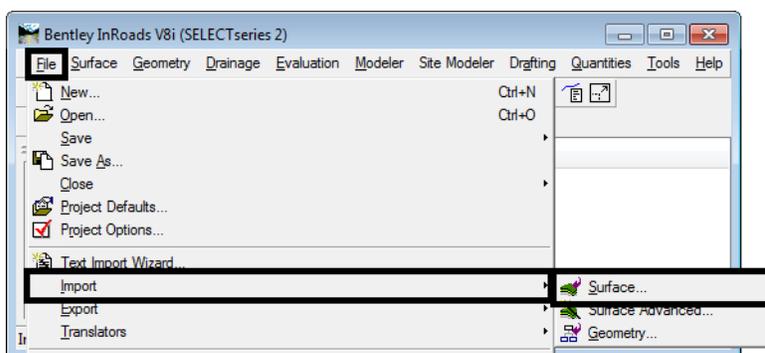


Below is an illustration of the results.



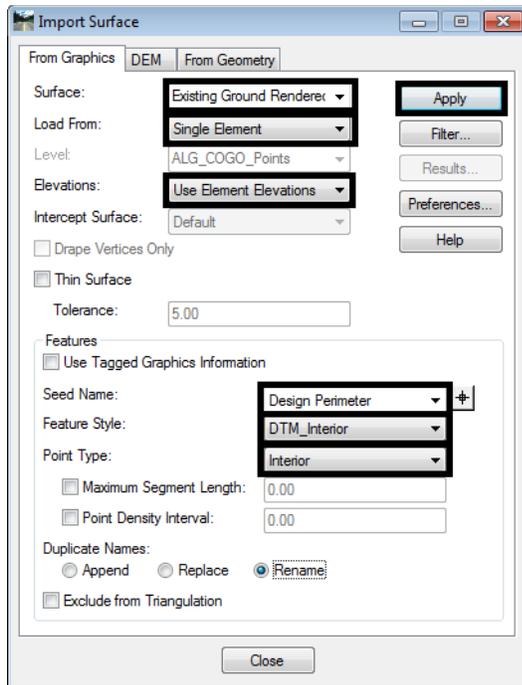
Next, the design surface's perimeter graphic is imported into the working existing ground dtm as an Interior breakline.

- From the InRoads main menu, select **File > Import > Surface**. The **Import Surface** dialog box is displayed.



- In the **Import Surface** dialog box, Set the **Surface to** the working existing ground dtm. (Existing Ground Rendered in this example)
- Set **Load From** to **Single Element**.
- Set **Elevations** to Use **Element Elevations**.
- In the **Features** area, key in a **Seed Name**. In this example **Design Perimeter** is used. Use a name that describes what the feature represents. This will make it easier to identify the feature if it needs to be modified in the future.
- Set the **Feature Style** to **DTM_Interior**. This matches the **Point Type** for the line being imported.
- Set the **Point Type** to **Interior**. The Interior point type excludes data from being triangulated within the boundary of the feature. This will prevent existing ground data from covering over design data in cut areas.

13. <D> the **Apply** button then <D> on the design perimeter line. <D> again in a blank area of the view to accept the element.



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

The working existing ground surface now has the cutout for the design surface. It needs to be retriangulated and have the triangles displayed.

15. Delete the perimeter that is currently displayed in the view. When the MicroStation **Display Style** is changed to show shading, the perimeter will be displayed filled, which can obstruct the view of the other design data.

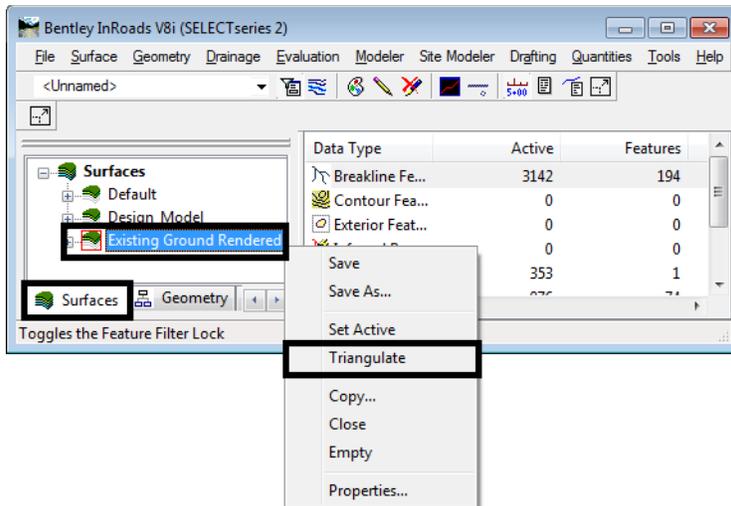
Applying Materials to the Surfaces

Materials are associated to levels and closed element on that level will take on that material. The process for assigning materials is the same for the existing ground surface as it is for the design surface. In this example, the existing ground surface uses an aerial photo as its material. For the Design surface, each component type will be assigned a different material from the available material libraries.

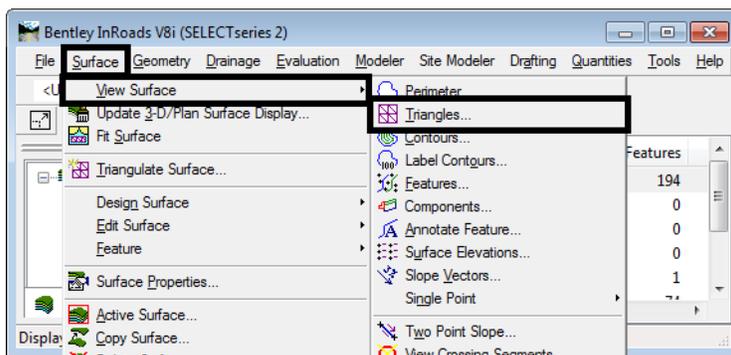
Assigning Material to the Existing Ground

1. In the InRoads Explorer pane, select the **Surfaces** tab.

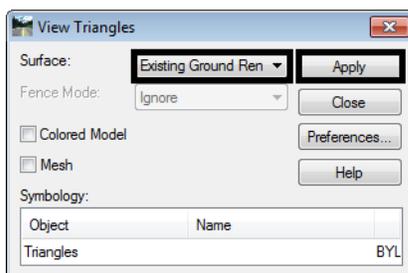
2. <R> on the working existing ground dtm and select **Triangulate** from the right click menu. This updates the triangles of the surface to incorporate design perimeter.



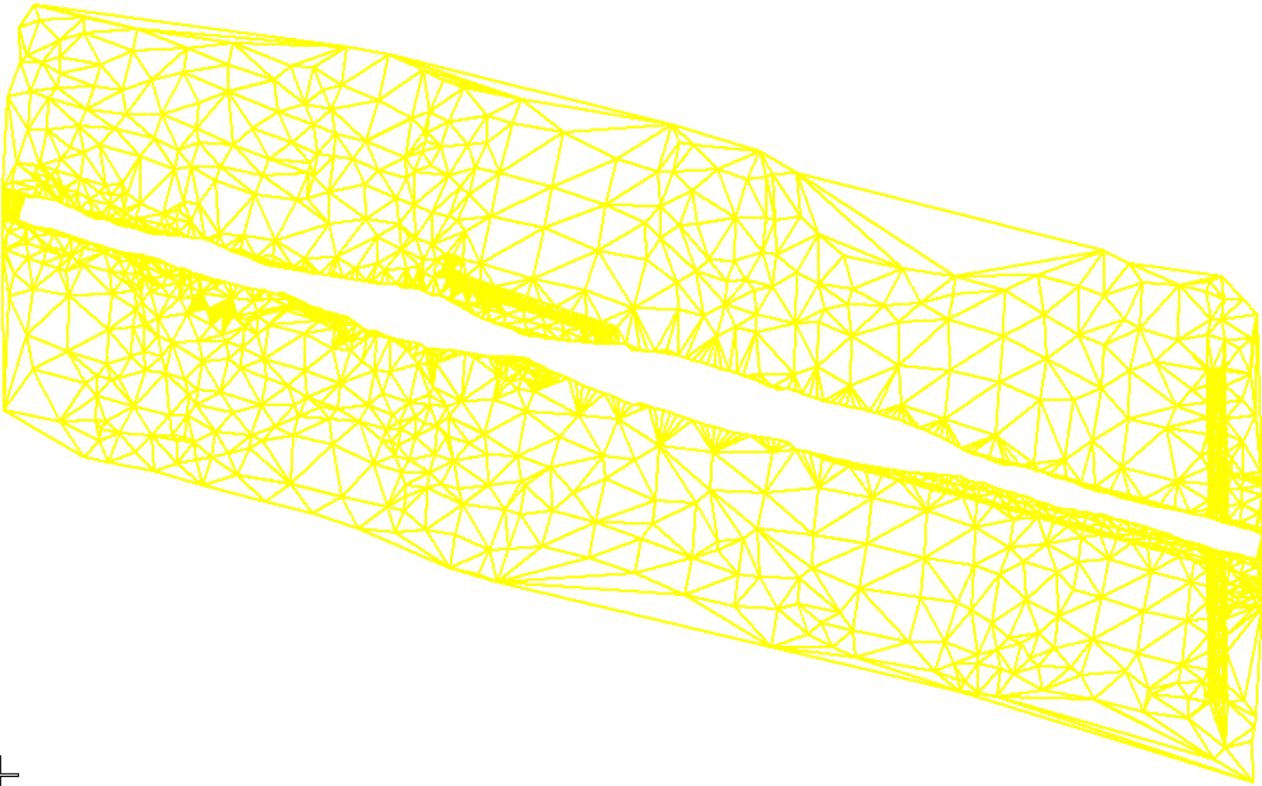
3. From the InRoads main menu, select **Surface > View Surface > Triangles**. This displays the **View Triangles** dialog box.



4. In the **View Triangles** dialog box, set the **Preference** to **Existing**.
5. Select the working existing ground dtm for the **Surface** and <D> the **Apply** button.



6. <D> **Close** to dismiss the **View Triangles** dialog box. Below is an illustration of the modified surface.



7. Follow the instructions in the CDOT Workflow Image Draping to apply the aerial photo to the existing ground surface. Other helpful workflows are: CDOT Workflow 5 - Raster Manager and CDOT Workflow 13 - Using Georeferenced Images in Raster Manager.

At the completion of the Image Draping workflow, the existing ground surface is shaded with the aerial photo. Notice that the area of the design surface is not shaded with the aerial photo.



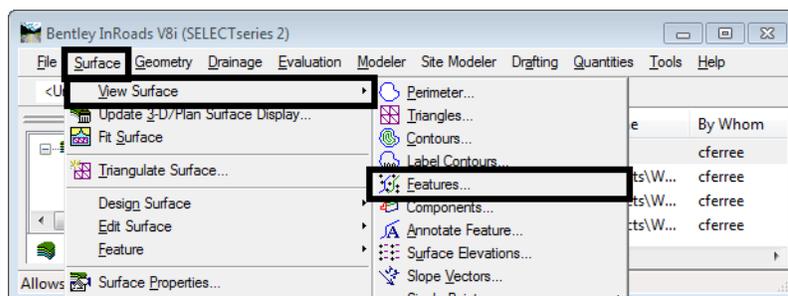
Assigning Materials to the Design Surface

In this section the components of the design surface are displayed and given a material. Because of the way Roadway Designer creates side slopes, those will have to be created a separate surfaces.

Creating Side Slope Surfaces

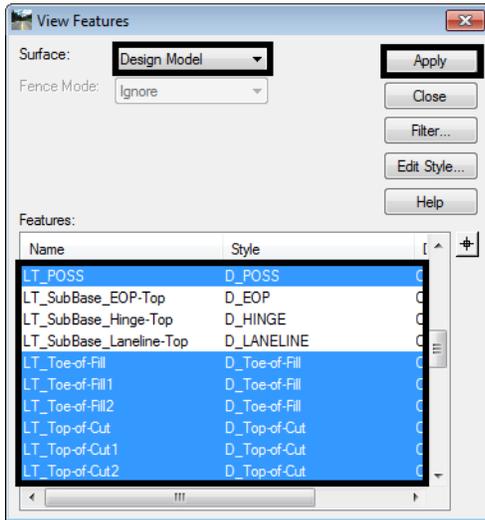
Side slope surfaces can be created from the Top of Cut, Toe of Fill, and POSS features from the design model.

1. From the InRoads main menu, select **Surface > View Surface > Features**.

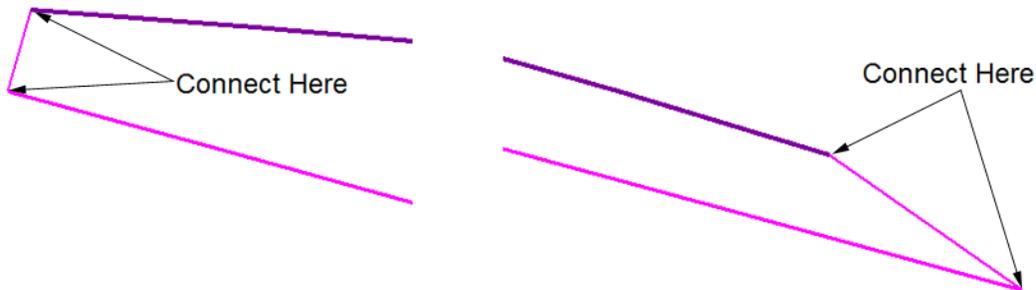


2. In the **View Features** dialog box, select the design surface from the **Surface** drop down menu.
3. In the **Features** list box, highlight all of the POSS and cut and fill features.

4. <D> the **Apply** button to display the features.

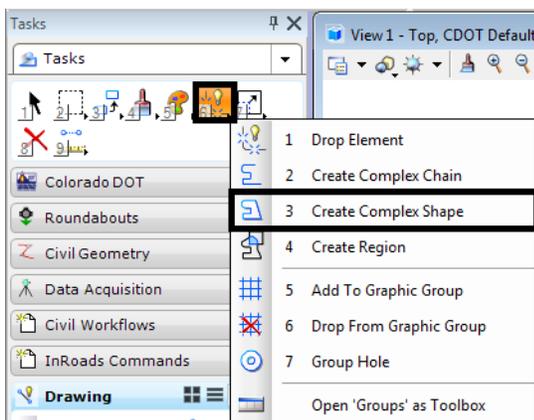


5. <D> **Close** to dismiss the **View Features** dialog box.
6. Using the MicroStation Place Smartline command, connect the POSS line to the toe of slope line on each end.



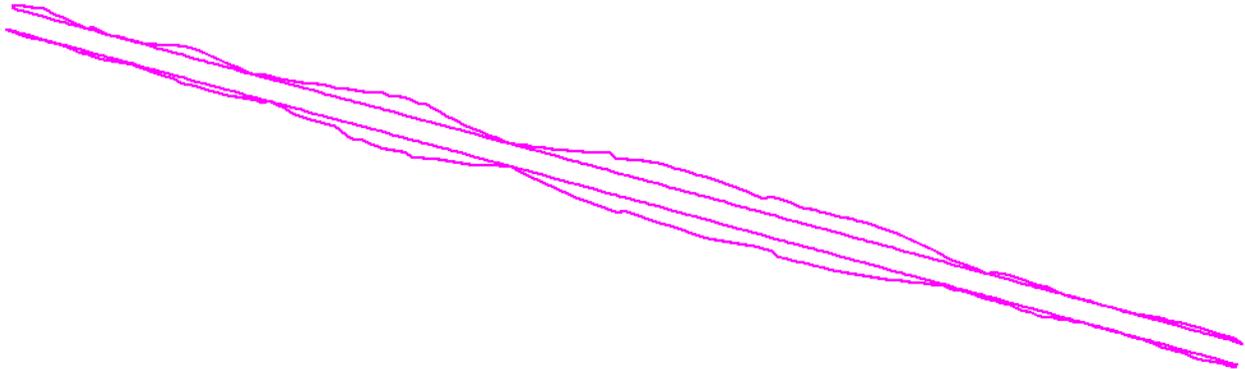
Next, these features are chained together to create a Complex Shape.

7. Select **Create Complex Shape** from the MicroStation Task menu.



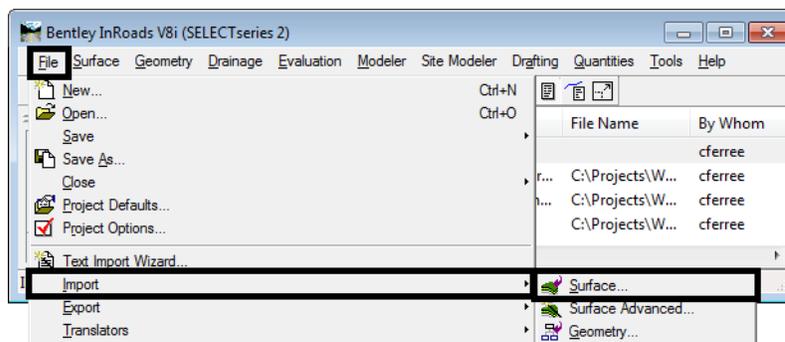
8. In the **Create Complex Shape** tool settings dialog box, set the **Method** to **Automatic**.

9. <D> on one of the elements then <D> in a blank area to create the chain.
10. Repeat steps 6 through 9 for the other side slope. An example of the result is shown below.



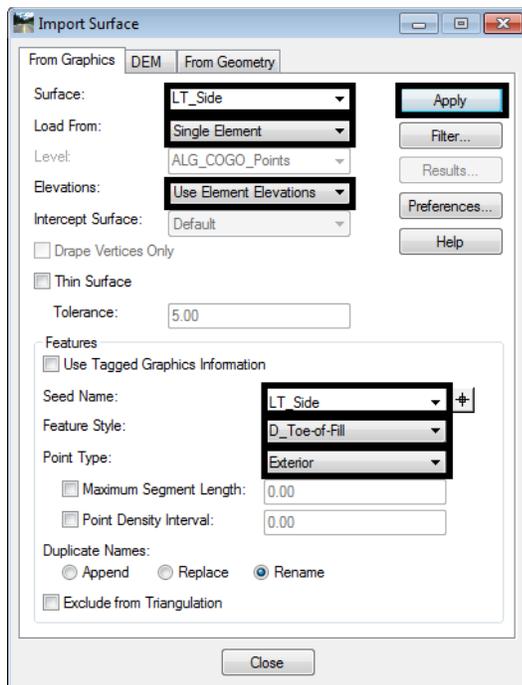
Finally, Each shape will be imported into a new surface.

11. From the InRoads main menu, select **File > Import > Surface**. This displays the **Import Surface** dialog box.



12. In the **Import Surface** dialog box, key in the desired name in the **Surface** field. **LT_Side** is used in this example.
13. Set **Load From** to **Single Element**.
14. Set **Elevations** to **Use Element Elevations**.
15. In the **Features** area, key in the desired name in the **Seed Name** field. **LT_Side** is used in this example.
16. Set the desired **Feature Style**. **D_Toe-of-Fill** is used in this example.

- Set the **Point Type** to **Exterior**. This feature type will allow all of the data to be triangulated but prevent triangles from being formed outside the data area.

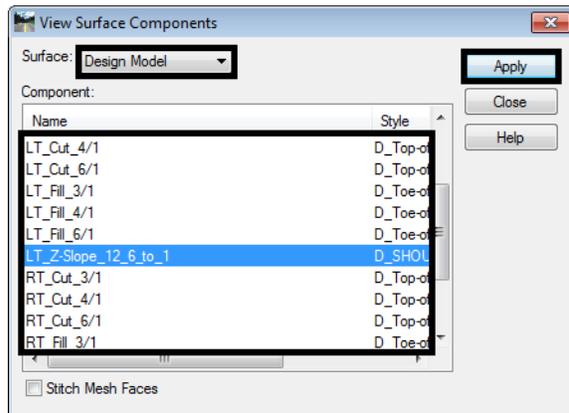


- <D> the **Apply** button then <D> on the appropriate shape. This creates the surface and imports the shape as data.
- Change the **Surface** name and **Seed Name** for the other side slope and import the other shape.
- <D> **Close** to dismiss the **Import Surface** dialog box.
- Delete the shapes that were just imported.

Displaying the Design Components and Surfaces

- Display the triangles for the two new surfaces. Be sure to use a different preference (this example uses the **Proposed** preference) than that used to display the existing triangles. If they are displayed on the level with the existing ground triangles, they will be rendered with the aerial photo.
- From the InRoads main menu, select **Surface > View Surface > Components**. This displays the **View Surface Components** dialog box.
- Set the **Surface** to the desired design model. (Design Model is used in this example)
- In the **View Surface Components** dialog box, select the desired design surface using the **Surface** drop down menu.
- In the **Component** area, highlight the desired components. These should be the topmost pavement components, curb and gutter components, Z-Slope components, etc. In this example **HMA_Lift 1**, **LT_Z-Slope_12_6_to_1**, and **RT_Z-Slope_12_6_to_1** are used.

6. <D> **Apply**. The components of the design surface are displayed in the hole in the existing ground.

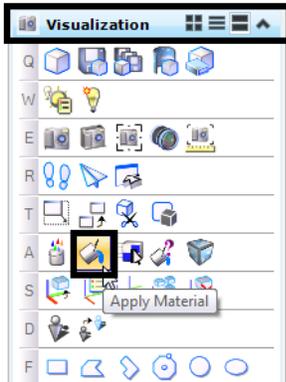


7. <D> **Close** to dismiss the the *View Surface Components* dialog box. Below is an example of the displayed components.

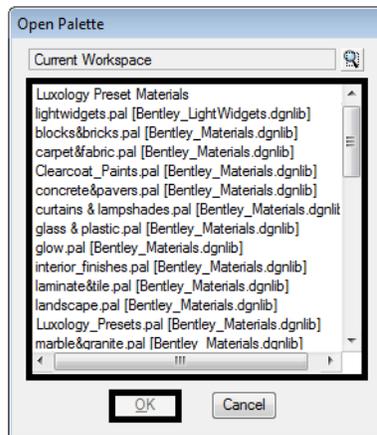
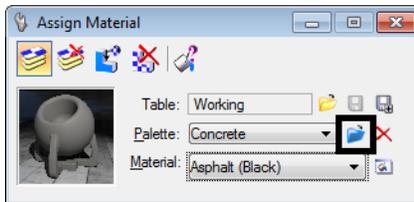


8. From the MicroStation task menu, select the *Visualization* tab.

9. <D> the **Apply Material** button. This will display the **Assign Material** dialog box.



10. In the **Assign Material** dialog box, <D> the **Open Palette** button and select the desired palette from the **Open Palette** dialog box. In this example, the concrete.pal is selected.
11. <D> **OK** to dismiss the **Open Palette** dialog box.



12. From the **Material** drop down menu, select the desired material. In this example Asphalt (Black) is used.
13. <D> the **Assign by Level/Color** button then <D> on the desired element. <D> in an open area to accept the assignment. In this example a surfacing component is selected.
14. Repeat steps 8 through 11 for the remaining components and the side slope surfaces.

The illustration below shows the design surface rendered.



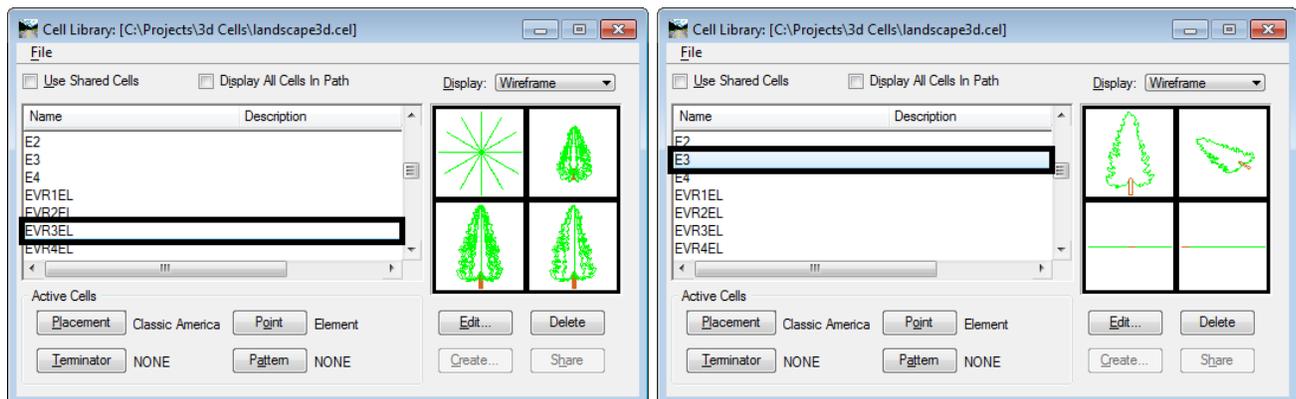
Adding Additional Details

3D Cells

There are a variety of cells that can be used to add interest to your rendering. MicroStation comes with a 3D landscape cell library (*landscape3d.cel*). This library has been copied to the following directory:

C:\Workspace\Workspace-CDOT_V8i\Standards-Global\MicroStation\Cell

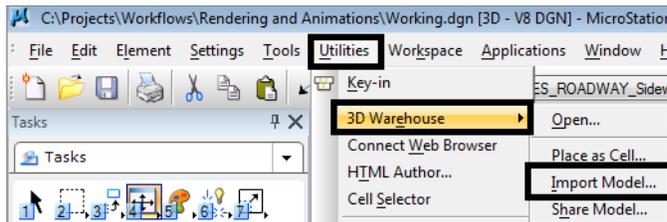
When selecting a cell, check the preview to be sure that the cell is a full 3D cell. The illustration below shows an example of two cells from the *landscape3d.cel* library; the cell on the left is a full 3D cell, the one on the right is not.



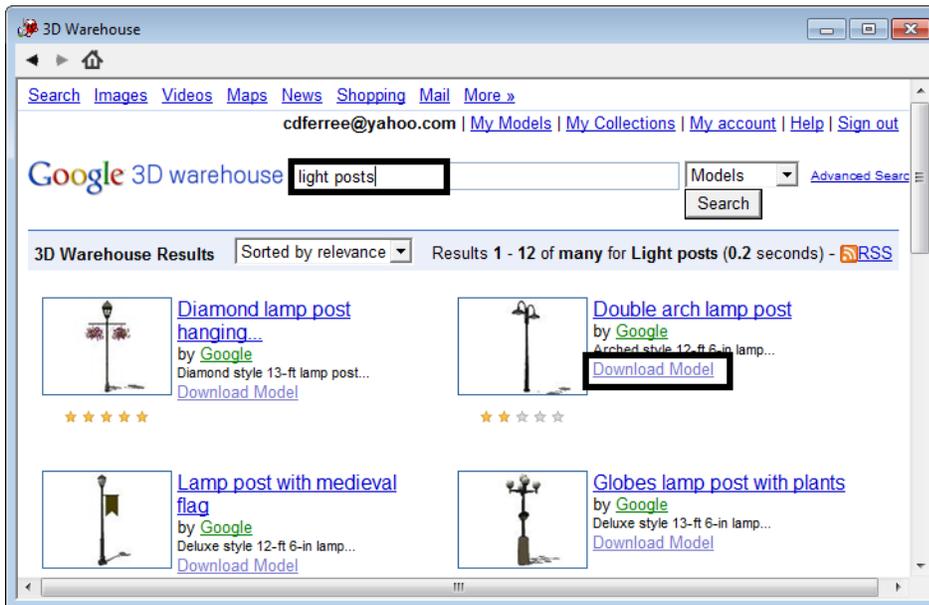
The origin of these cells is at the bottom center of the object. Therefore, they can be easily placed on the surface by tentative snapping to a triangle or component.

Another location for finding 3D cells to spruce up your rendering is the 3D Warehouse. To access the 3D Warehouse:

1. Open a blank drawing.
2. From the MicroStation main menu, select **Utilities > 3D Warehouse > Import Model**. This opens Internet Explorer to the Google 3D Warehouse web site.



3. In the search field, key in the item you are looking for. In this example, "light posts" was used.
4. When the desired item is found, <D> the **Download Model** link.

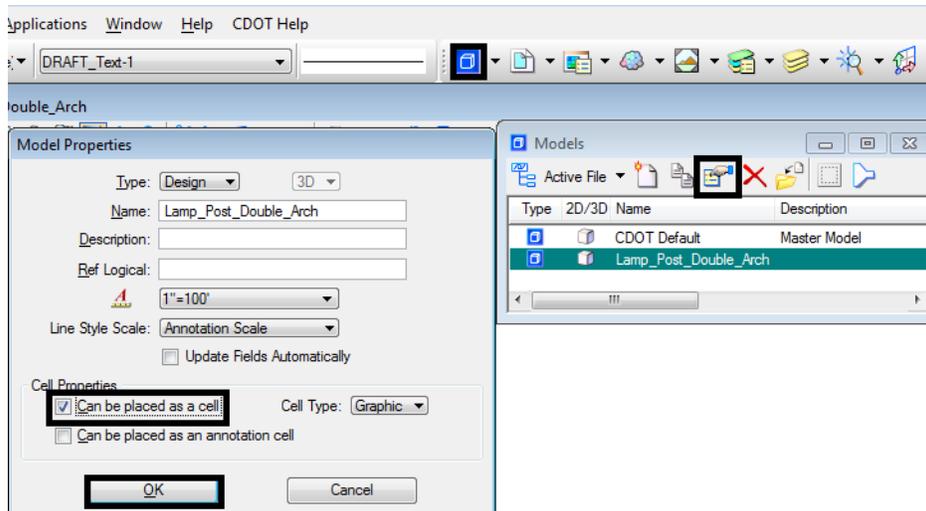


5. The item is added to the dgn as a new models or you can add additional models if desired.
6. Close the Internet Explorer when you have finished downloading models.

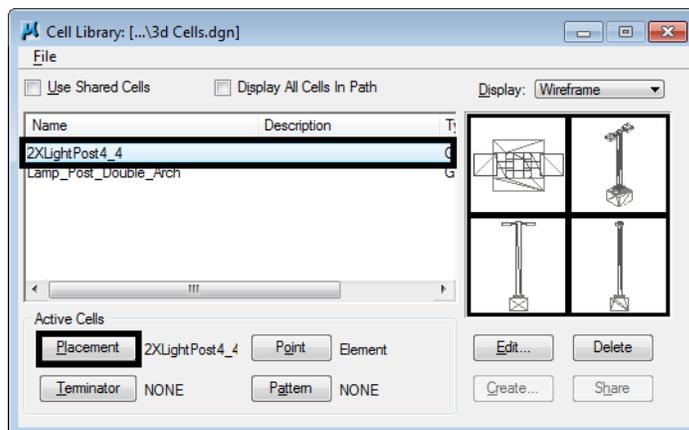
Note: Some of these models may require additional work after they are downloaded. A common problem with these cells is that their origin is not at 0,0,0.

7. While in the new model, open the **Model Properties** dialog box.

8. Toggle on **Can be placed as a cell**. <D> **OK** to accept the change and dismiss the Model Properties dialog box.



9. Open your rendering dgn file.
10. From the MicroStation menu, select **Element > Cells**. This displays the **Cell Library** dialog box.
11. In the **Cell Library** dialog box, select **File > Attach File**.
12. Navigate to the location of the 3D cell library created above highlight the filename and <D> **Open**. The cells are now ready for use.
13. To use a cell, highlight the cell name then <D> the **Placement** button in the **Cell Library** dialog box.

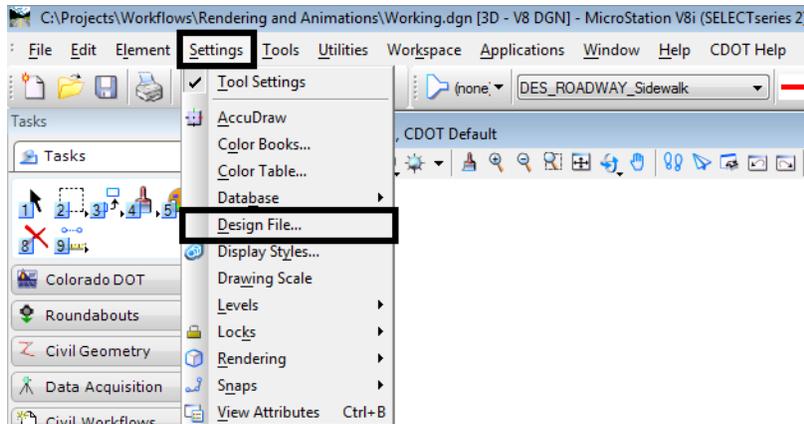


14. The **Cell Library** dialog box can be dismissed. Select the Place Cell command from the task menu and place the cell at the desired locations.

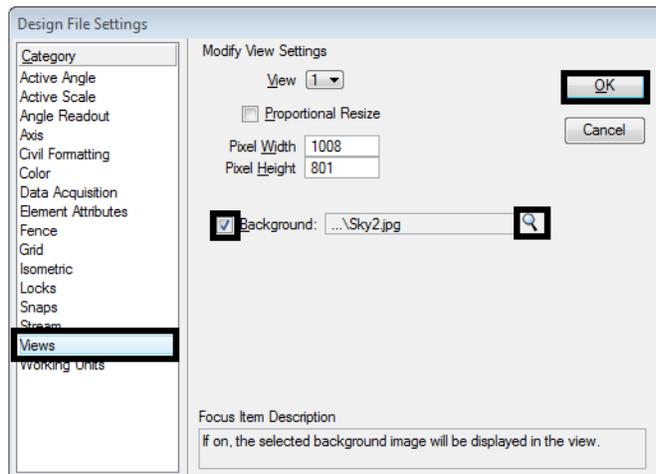
Using a Background Image

Adding a background image to your rendering can help bring the image to life. To add a background image:

1. From the MicroStation main menu, select **Settings > Design File**. This displays the **Design File Settings** dialog box.

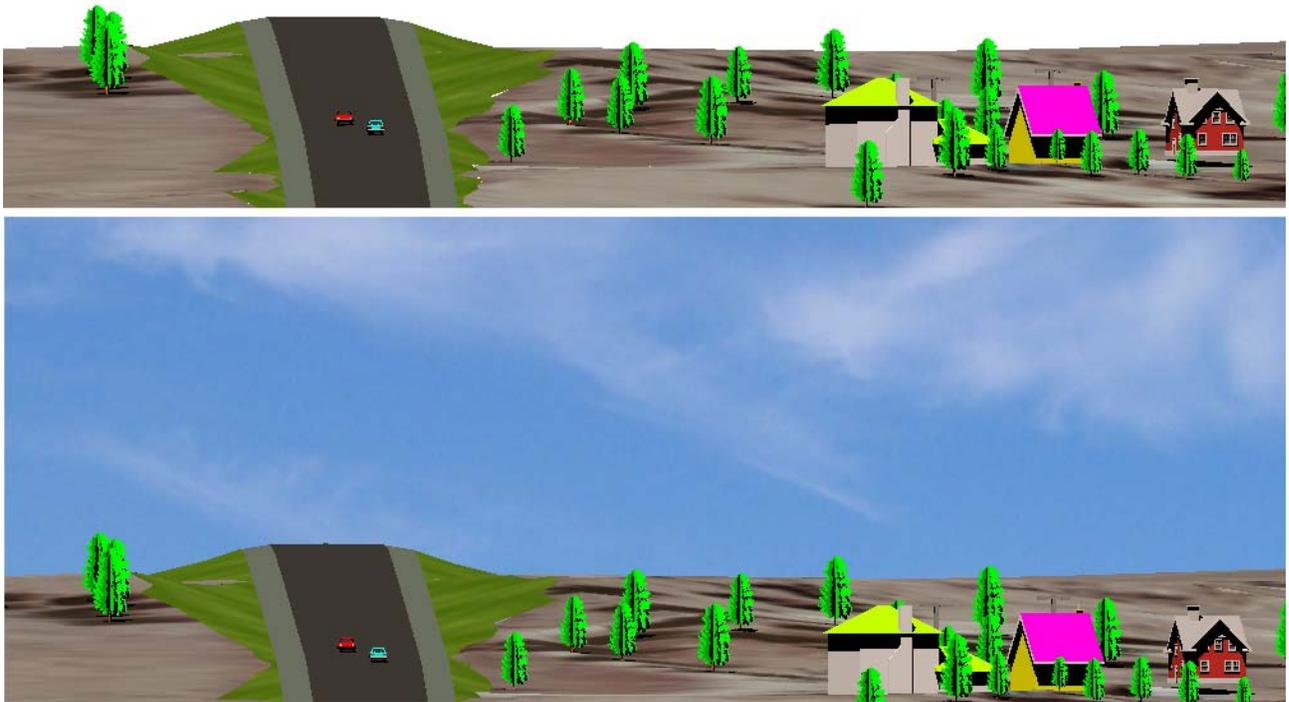


2. In the **Category** pane of the **Design File Settings** dialog box, <D> **Views**.
3. In the **Modify View Settings** area, toggle on **Background**.
4. Use the search icon  to locate and select the desired background image.



5. <D> the **OK** button to accept the changes. The background image is now displayed and the **Design File Settings** dialog box is dismissed.

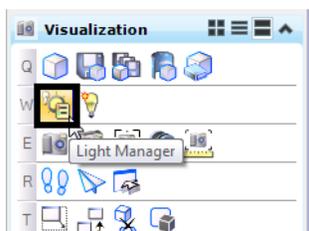
Below is an example of a rendering without the background on top and with the background on bottom.



Lighting Adjustments

Lighting is used to highlight your rendering and make it more visible. To adjust the lighting:

1. Select the **Light Manager** from the **Visualization** task tab. This displays the **Light Manager** dialog box.

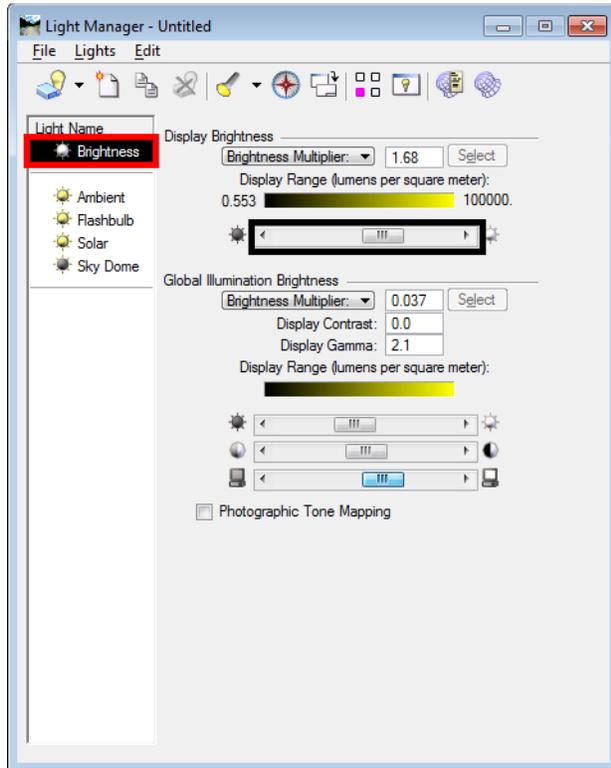


There are three areas that are generally used to adjust the lighting for the rendering. These are Brightness, Ambient, and Solar.

Brightness

This setting adjusts the overall lighting of the drawing.

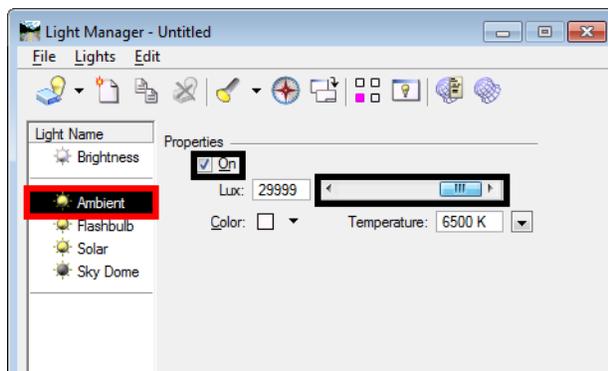
1. Highlight **Brightness** in the **Light Name** list.
2. Use the slider in the **Display Brightness** area to modify this setting.



Ambient

The Ambient settings can be used to reduce on increase the harshness of shadows.

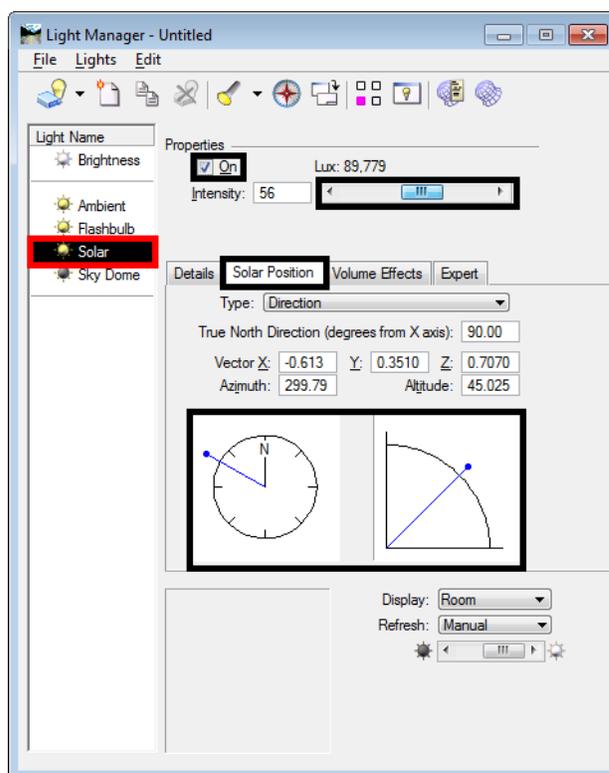
1. Highlight **Ambient** in the **Light Name** list.
2. In the **Properties** area toggle on the **On** check box.
3. Use the **Lux** slider to modify this setting.



Solar

The Solar settings can also adjust the overall brightness of the rendering. It is also used to orient the sun in relation to the drawing.

1. Highlight **Solar** in the **Light Name** list.
2. In the **Properties** area toggle on the **On** check box.
3. Use the **Intensity** slider to modify this setting. This adjusts the brightness of the rendering.
4. <D> on the **Solar Position** tab.
5. Use the **Azimuth** and **Altitude** dials to adjust the sun's orientation.



Below is an example of the finished rendering.

