OpenRoads Designer User Manual

Chapter 17

FEATURE DEFINITIONS
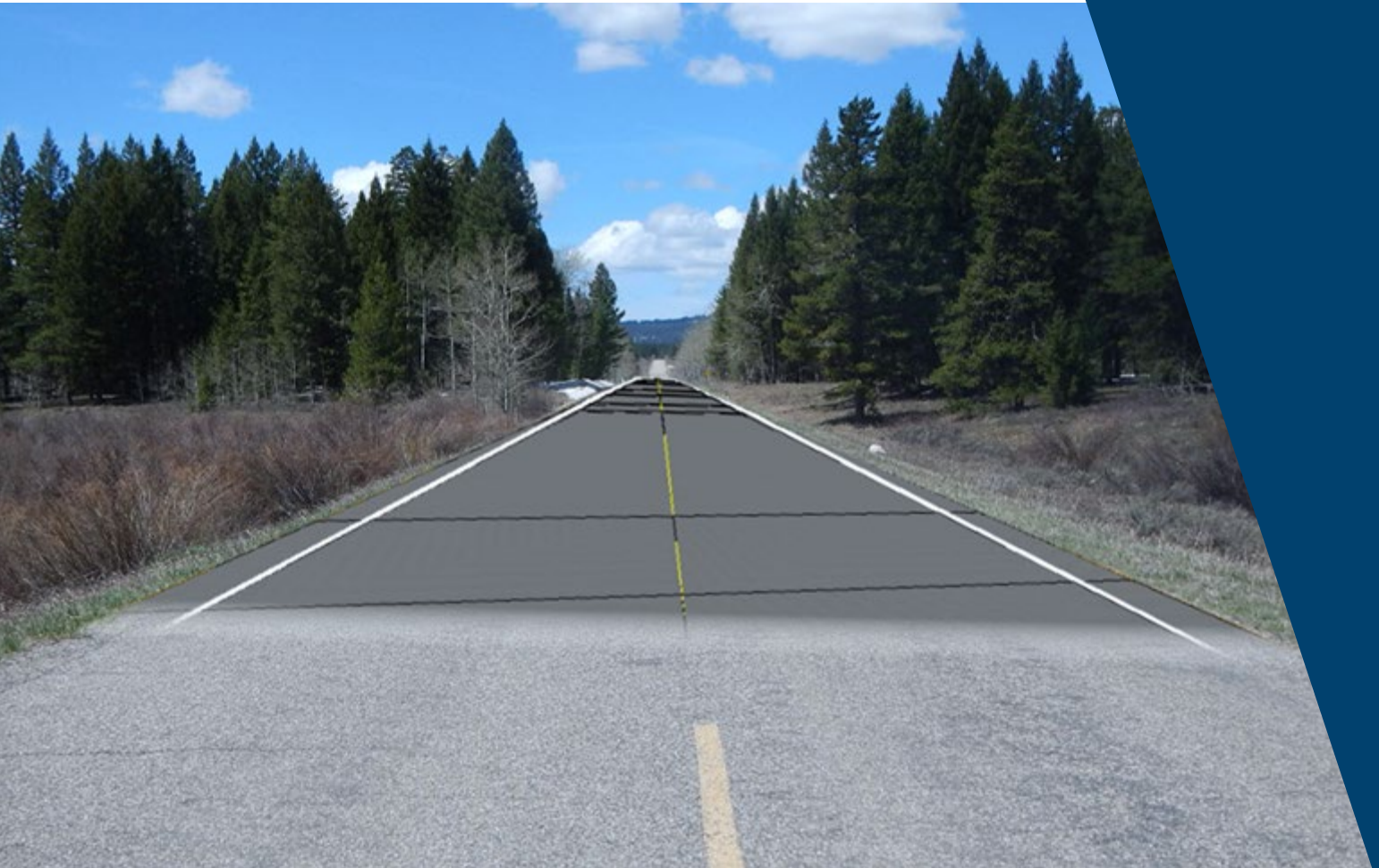
Chapter 17   Feature Definitions

Feature Definitions are used in drafting, 3D modeling, and quantity calculations. This chapter explains the various types of Feature Definitions used in the ORD software, as well as editing and creating new Feature Definitions.

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17A – INTRODUCTION TO FEATURE DEFINITIONS

Feature Definitions are assigned to ORD geometry elements, Terrain Models, Corridors and many other element types. Feature Definitions are used to organize elements based on their material type or function in 3D modeling and drafting. When quantities are calculated, all elements of the same Feature Definition are summed together in the quantities report.

> **NOTE:** MicroStation Elements (i.e., Smart Lines, Line Strings, and Complex Chains) do NOT contain a Feature Definition or Feature Name. However, a MicroStation Element can be manually assigned a Feature Definition with the *Set Feature Definition* tool.

A Feature Definition is a set of attributes that affect the Level, symbology (Color, Line Style, Weight), behavior, and functionality of an element. For example, changing the Feature Definition for a Terrain Model affects which component elements (i.e., contours, boundary, triangles) are shown.

The behavior and functionality of Feature Definitions depends on the element type. For example, **Linear** Feature Definitions are relatively simple and primarily affect the Level, Color, and Line Style of an element. In contrast, **Corridor** Feature Definitions affect modeling and display settings for the Corridor, such as the density (Template Drop interval multiplier) of the Corridor model.

Feature Definitions are shown and switched in the Properties 🔲 box.
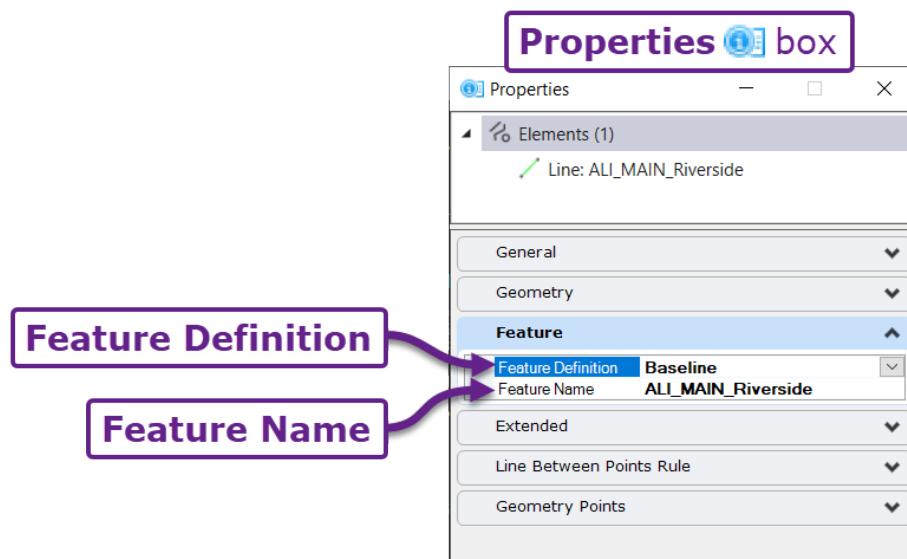
Feature Name: Every element with a Feature Definition also contains a Feature Name. The Feature Name conforms to the FLH Feature Naming Convention. The FLH Feature Naming Convention is shown in 3F – *Naming Convention for Proposed ORD Features*. In general, assign significant geometrical elements a logical and appropriate Feature Name. Name all Baselines (Centerline), Profiles, Culverts, Terrain Models, Corridors, Linear Templates, and Surface Templates.

The Feature Name is assigned in creation of the element. If a Feature Name is NOT manually entered, then a default name is automatically assigned based on the name of the Feature Definition.

Elements should always be assigned a logical Feature Name for the following reasons:

- When Alignment, Profiles, Corridors, and Terrain Models are exported as **Physical Data** for construction staking, the Feature Name is embedded in the exported file.

- If Feature Names are NOT assigned, then it is very difficult to distinguish between elements in the **OpenRoads Modeling** drop-down found in the Explorer 🔍.

17A.1   Feature Definitions and Levels

The Feature Definition controls the Level, Color, Line Style, Weight and other graphical properties of the element. Changing the Feature Definition will automatically change the Level and other graphical properties.

WARNING: If an element is assigned a Feature Definition, do NOT manually change the Level. When the element is edited, the Level will automatically revert to the Feature Definition's default Level.

BACKGROUND INFORMATION: Each Feature Definition is assigned an Element Template. An Element Template is a set of properties and attributes, such as Level, Color, Line Style, Weight, and Material. To view the Element Template and other properties assigned to a Feature Definition, see *17C.2 Edit an Element Template*.

17A.2   Featurized Elements in the Explorer (OpenRoads Model)

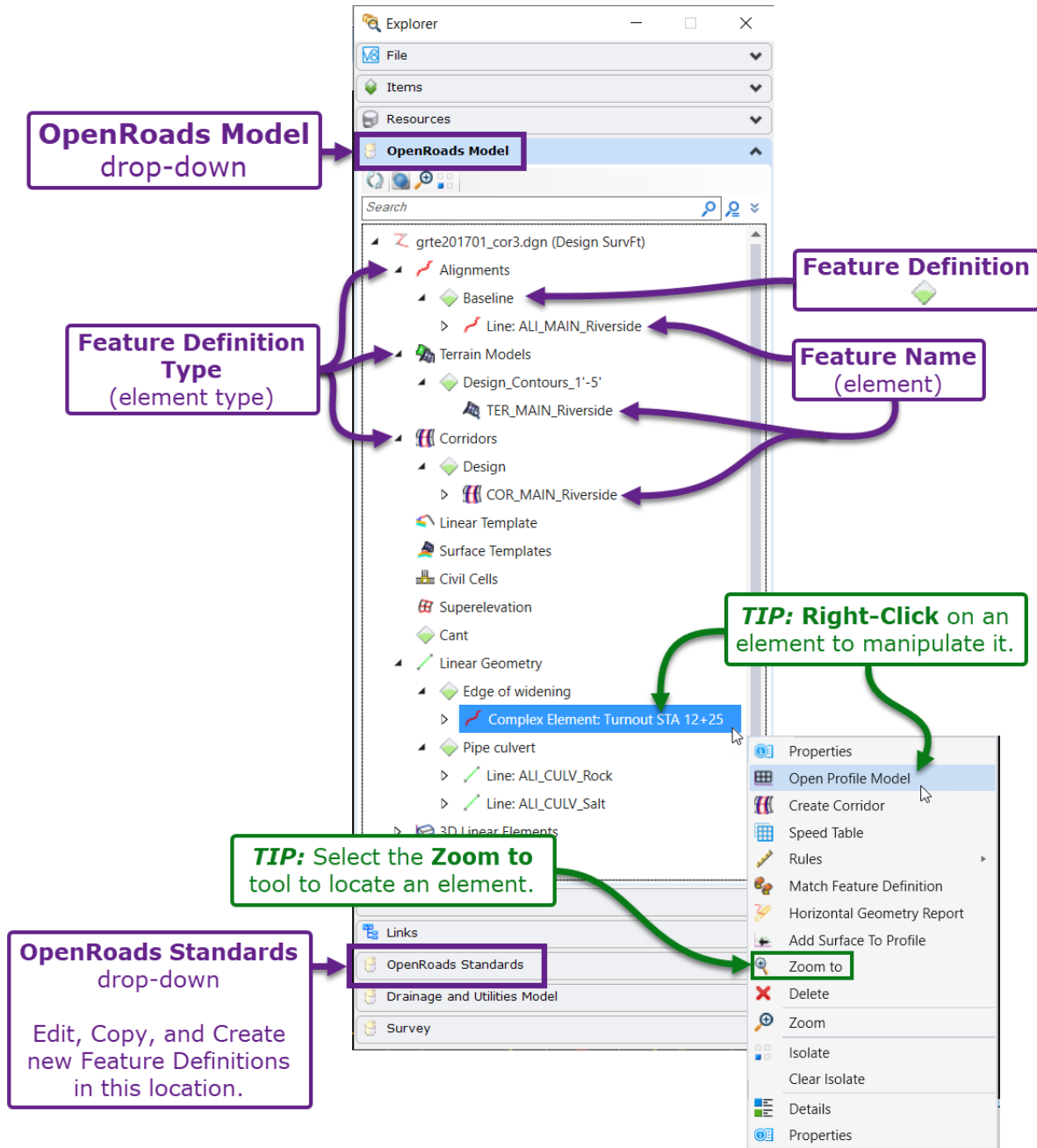Every element that contains a Feature Definition is shown and organized in the Explorer 🔍 under the **OpenRoads Model** drop-down. Also, elements can be directly manipulated from this location.

The OpenRoads Model drop-down is organized by:

Feature Definition Type → Feature Definition → Feature Name (element)

NOTE: The **OpenRoads Model** drop-down (shown above) is for organizing and manipulating elements created in the current ORD File. The **OpenRoads Standards** drop-down shows all Feature Definitions in the FLH Workspace and can be used to edit or create a new Feature Definitions.

NOTE: Always assign featurized elements an appropriate Feature Name. If Feature Names are NOT assigned, then it is difficult to distinguish between elements in the OpenRoads Standards drop-down.

TIP: For Alignments and Linear Geometry, the corresponding Profile element can be seen by expanding the horizontal element.
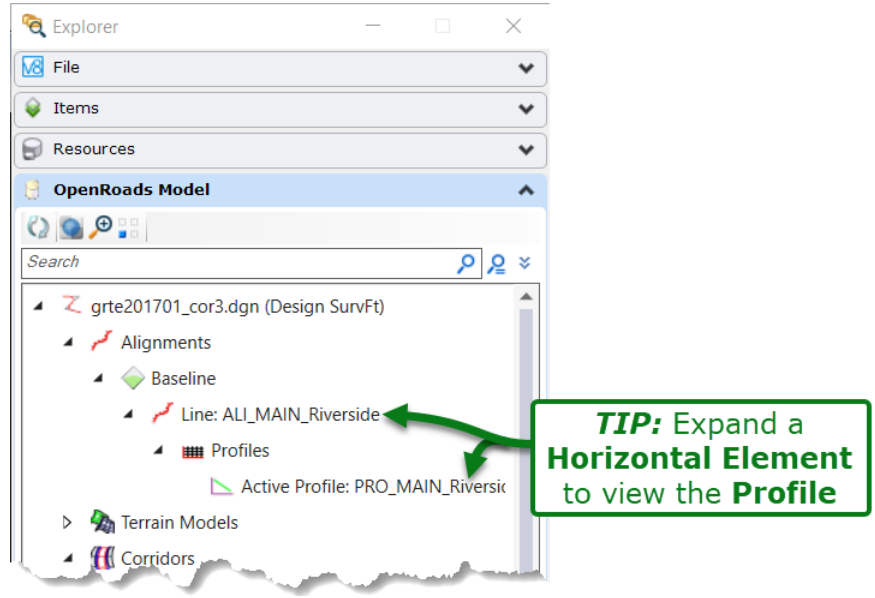
TIP: Expand a Corridor to view all Linear Elements (Features) and Components (Meshes) that are generated by the Corridor.
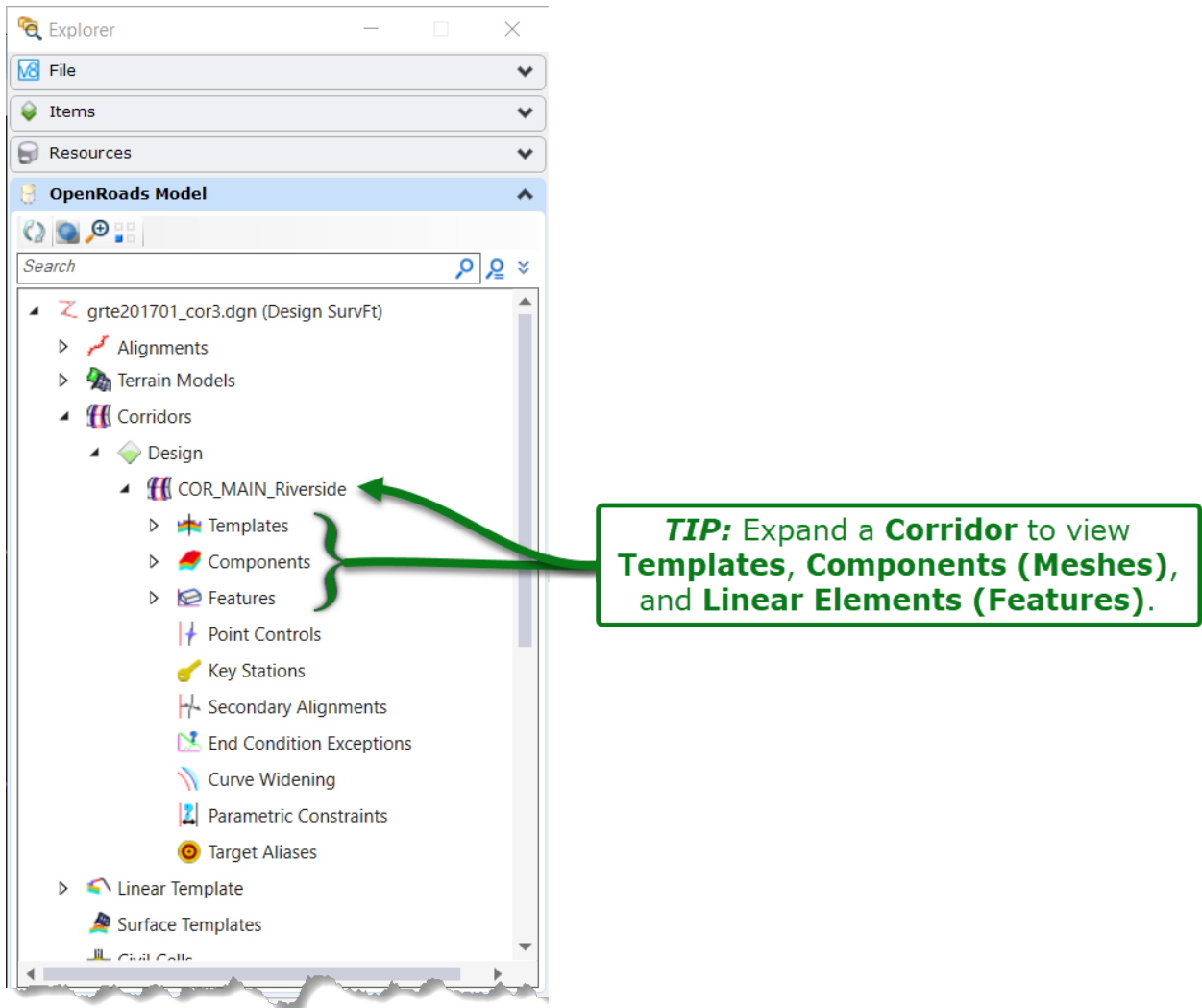
17A.3   Feature Definitions in the Explorer (OpenRoads Standards)

Feature Definition are shown and edited in the OpenRoads Standards drop-down in the Explorer.

The OpenRoads Standards drop-down is organized into two parts: the Libraries drop-down and Current ORD File drop-down.
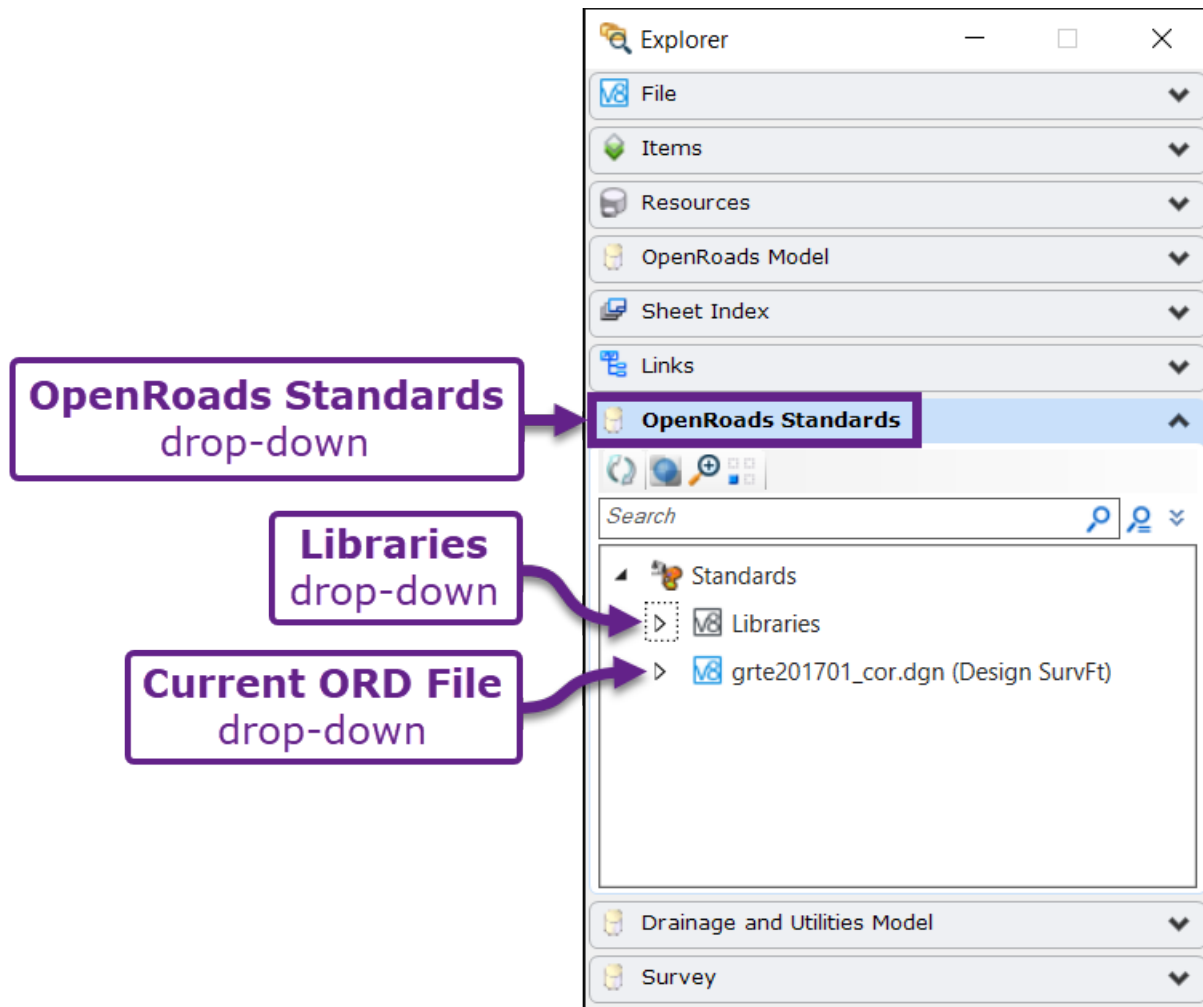
Libraries: All Feature Definitions in the FLH WorkSpace are shown in the Libraries drop-down. However, Feature Definitions CANNOT be edited from the Libraries location.

Current ORD File: The second drop-down is named after the current ORD File. Only Feature Definitions that are used in the current ORD File are shown in this location. Any Feature Definition found in this drop-down can be edited.

Libraries: Under the Libraries drop-down, there are two Feature Definition Libraries.

Feature Definition Library #1: Features_Settings_Annotations_Levels_Elem Temp.dgnlib – This library contains the vast majority of Feature Definitions in the FLH Workspace.

Feature Definition Library #2: DU_Features_Settings_Annotations_Elem Temp.dgnlib – This library ONLY contains Feature Definitions used in Drainage and Utilities (SUDA) modeling.
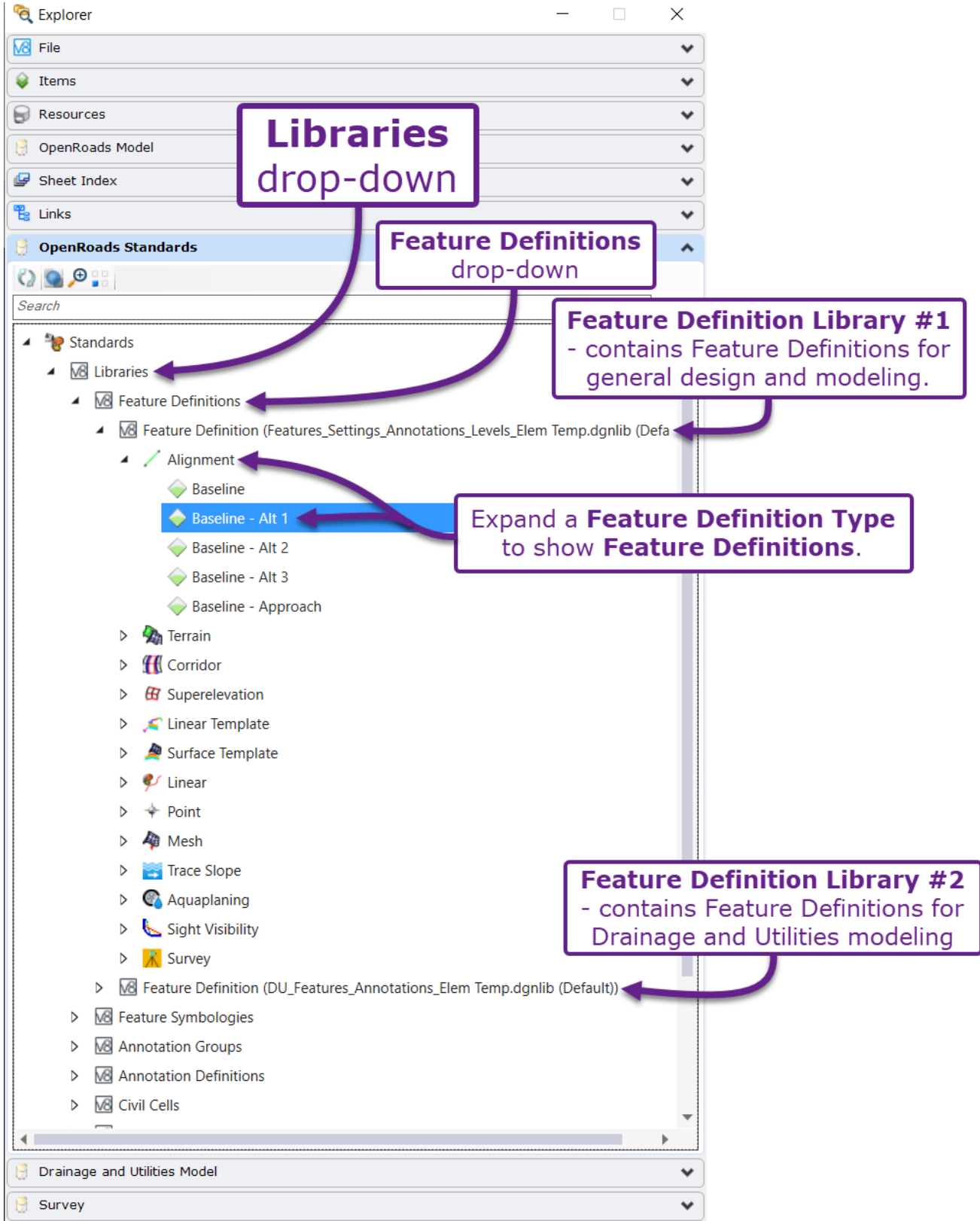
Current ORD File: Only Feature Definitions used in the current ORD File are shown in this location.

Current ORD File
drop-down

Feature Definitions
drop-down

Feature Definitions used
in the **Current ORD File**
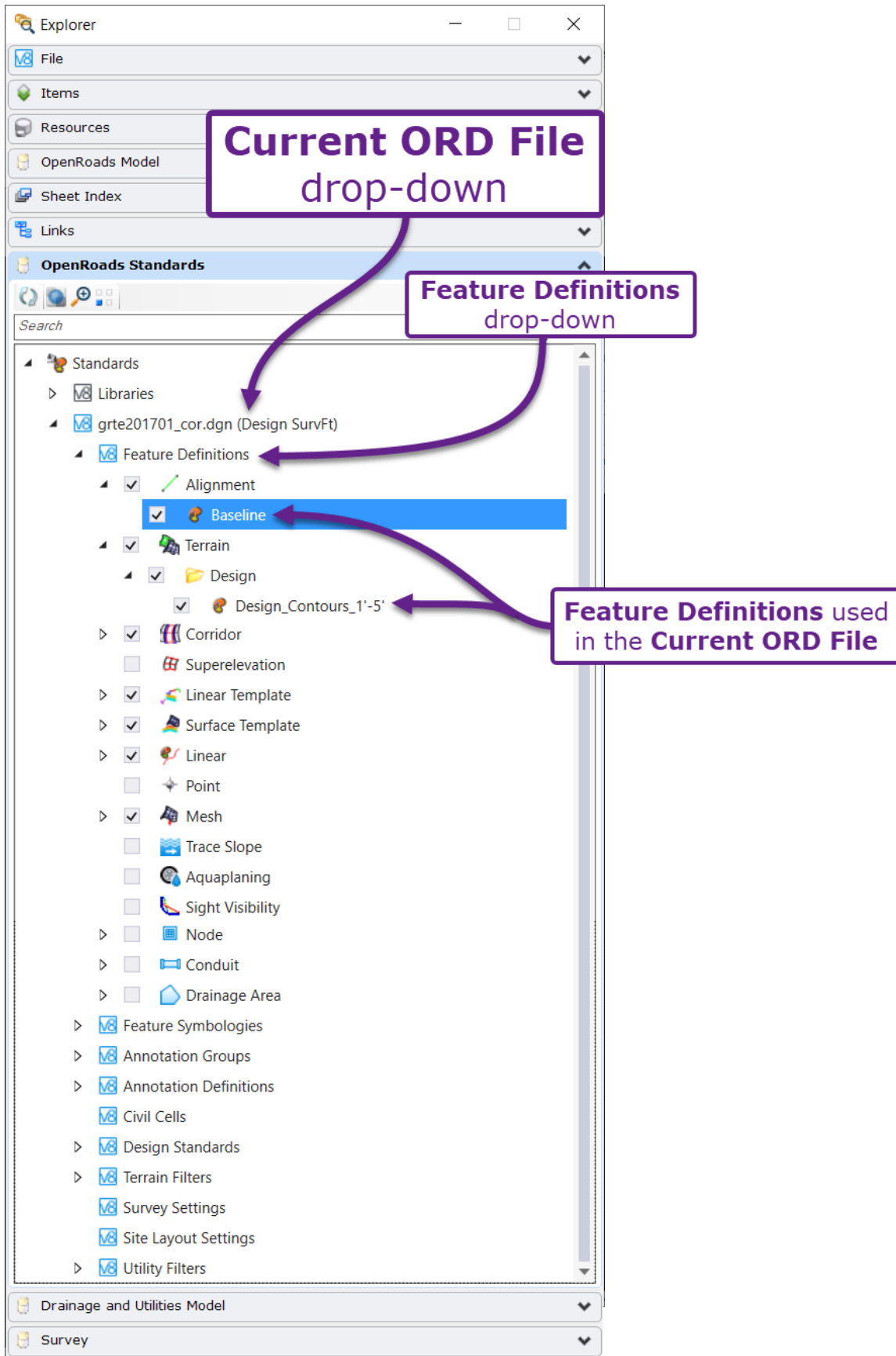
TIP: To view and edit properties of a Feature Definition, right-click on it and select *Edit Feature Definition*.

Feature Definition libraries are sorted by element type. The graphic below shows all Feature Definition types used in the FLH WorkSpace.
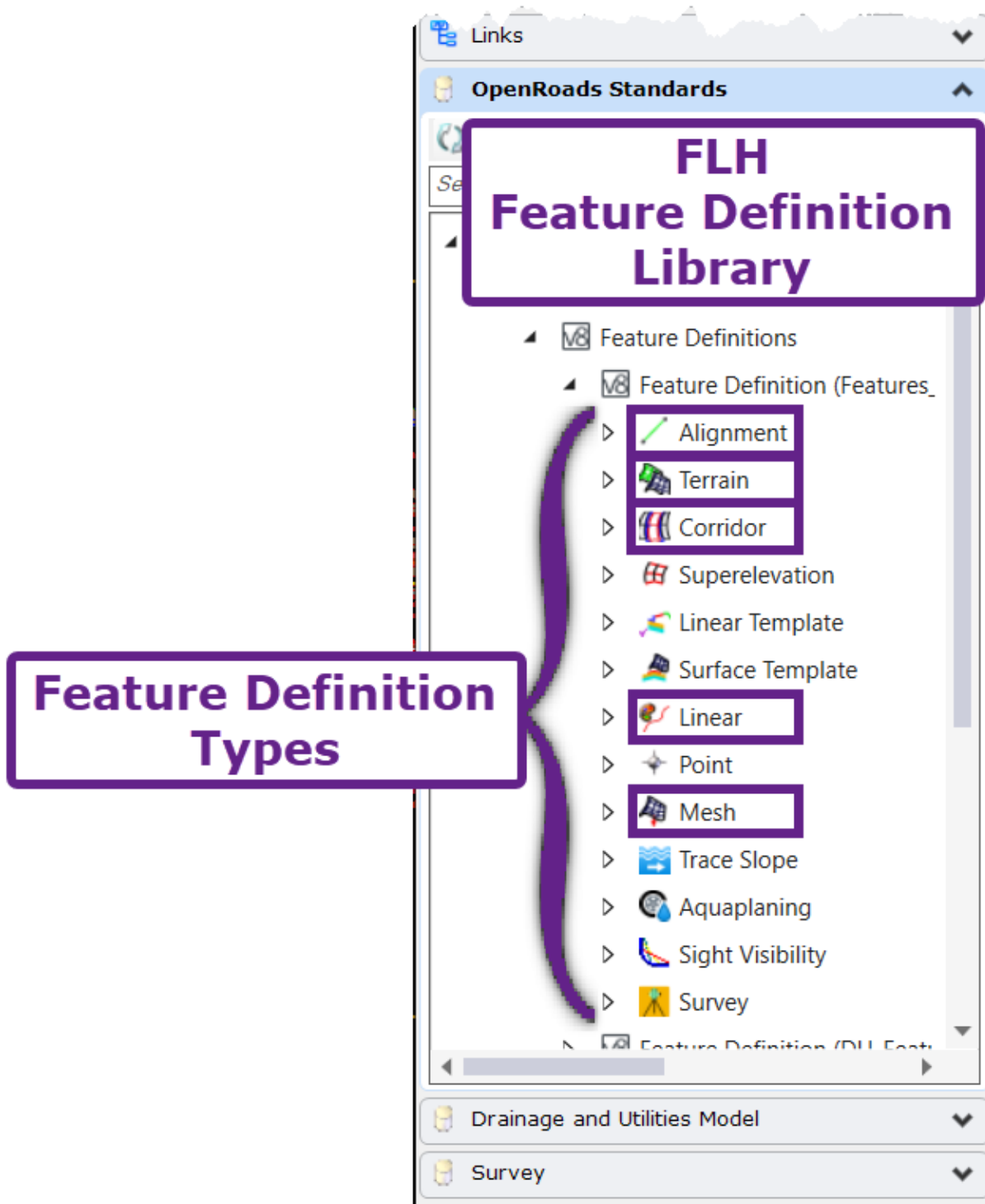
The following Feature Definition Types are commonly used: Alignment, Terrain, Corridor, Linear, and Mesh.

Understanding the functionality of these Feature Definition Types is necessary for modeling and quantities calculation operations.

17B.1   Alignment and Linear Feature Definitions

The **Alignment** and **Linear** Feature Definitions are used to draw Horizontal and Vertical (profile) ORD Elements.

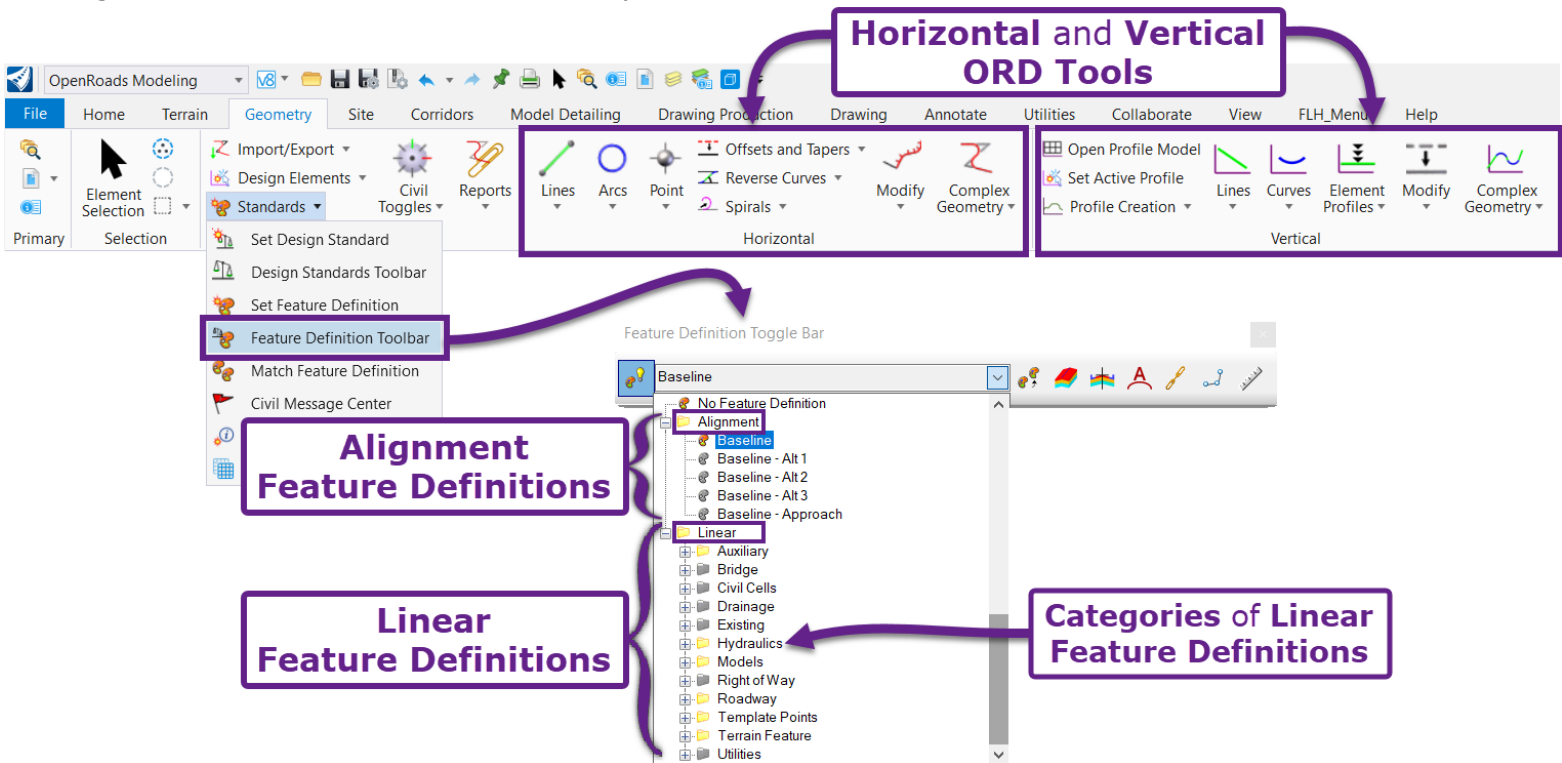All **Alignment** and **Linear** Feature Definitions in the FLH Library are shown in the Feature Definition Tool Bar. The Feature Definition Toolbar is discussed in <mark>7B.3 Feature Definition Toolbar</mark>.

BEST PRACTICE: Explore and become familiar with the categories and organization of the Alignment/Linear Feature Definition library.

Alignment Feature Definitions: These Feature Definitions are specifically used to draw horizontal and vertical geometry for the proposed centerline of road. For example, the mainline centerline of road should be drawn with the "Baseline" Feature Definition. An intersecting approach centerline should be drawn with the "Baseline – Approach" Feature Definition.

The "Baseline – Alt 1,2,3" Feature Definitions are intended for alternate alignments and temporary traffic control detour alignments.
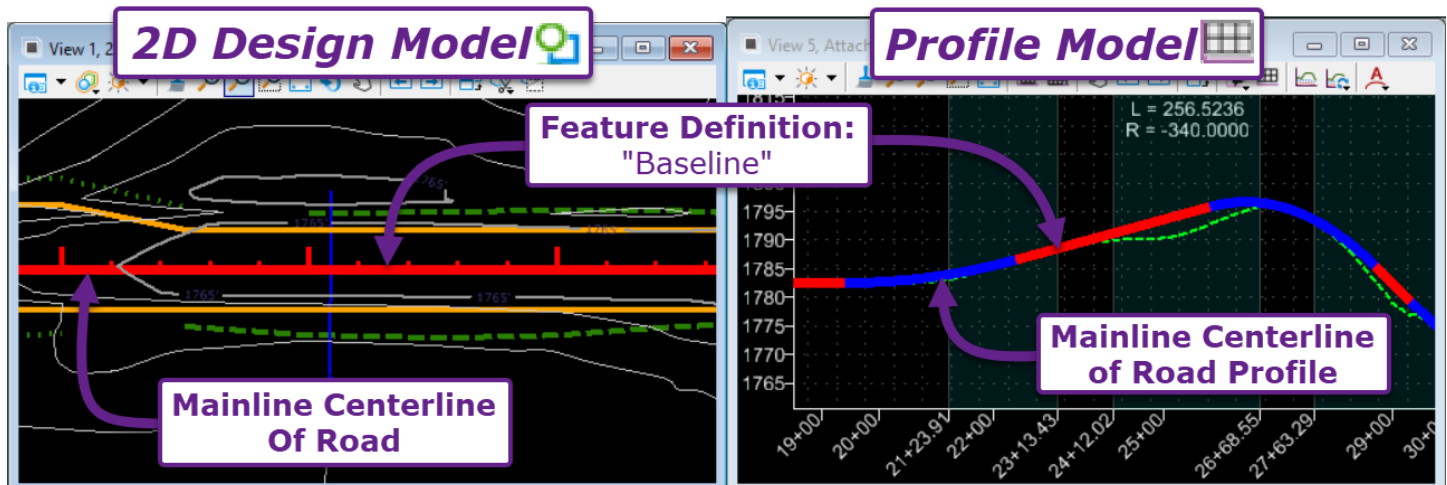
Linear Feature Definitions: These Feature Definitions are used to draw horizontal and geometry. For example, the centerline and profile of a Culvert should be drawn with the "Pipe culvert" Feature Definition.
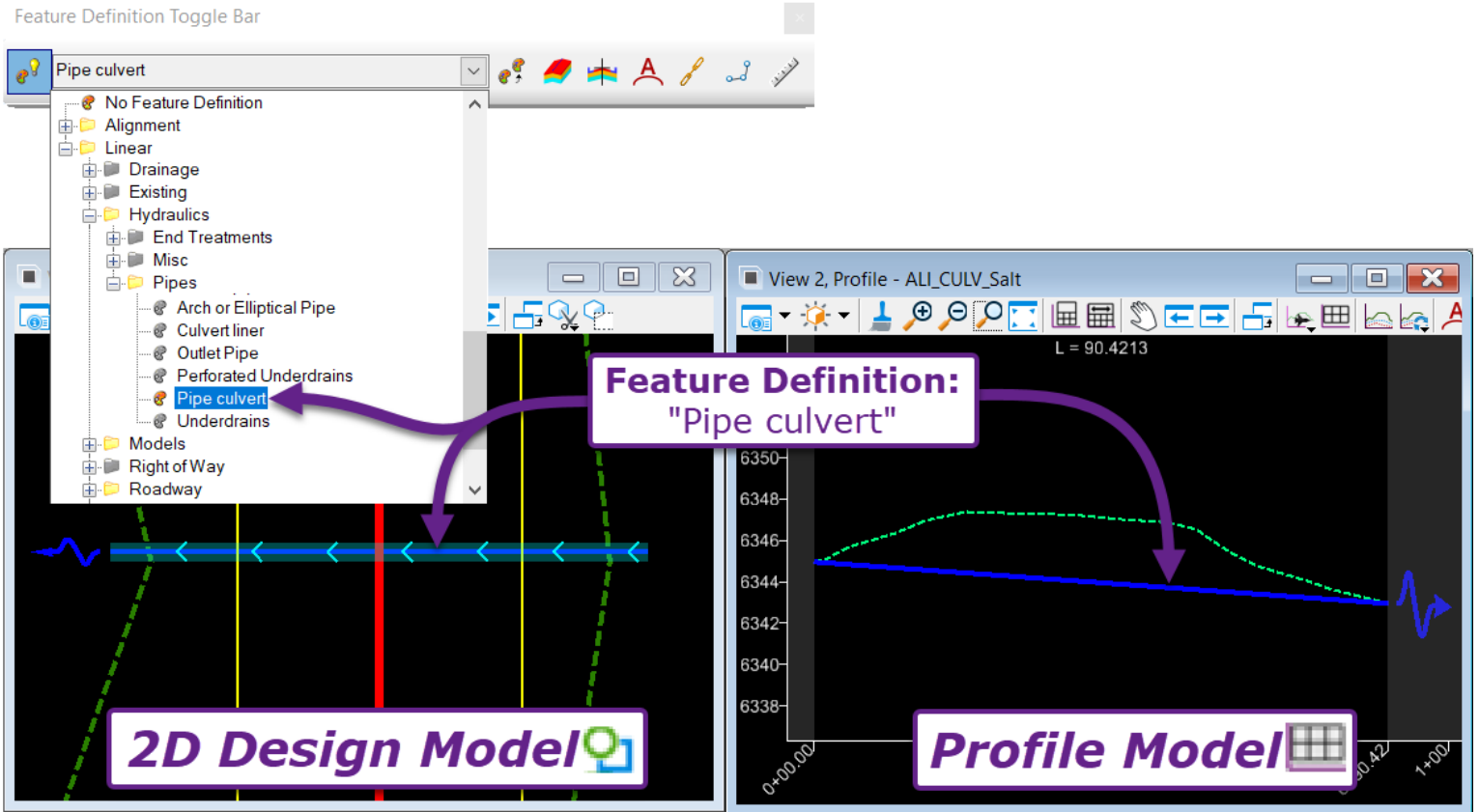
After the Profile element is *activated*, then a 3D Linear Element is created in the *3D Design Model* . The 3D Linear Element is assigned to the same Feature Definition as the horizontal element (in the *2D Design Model*).
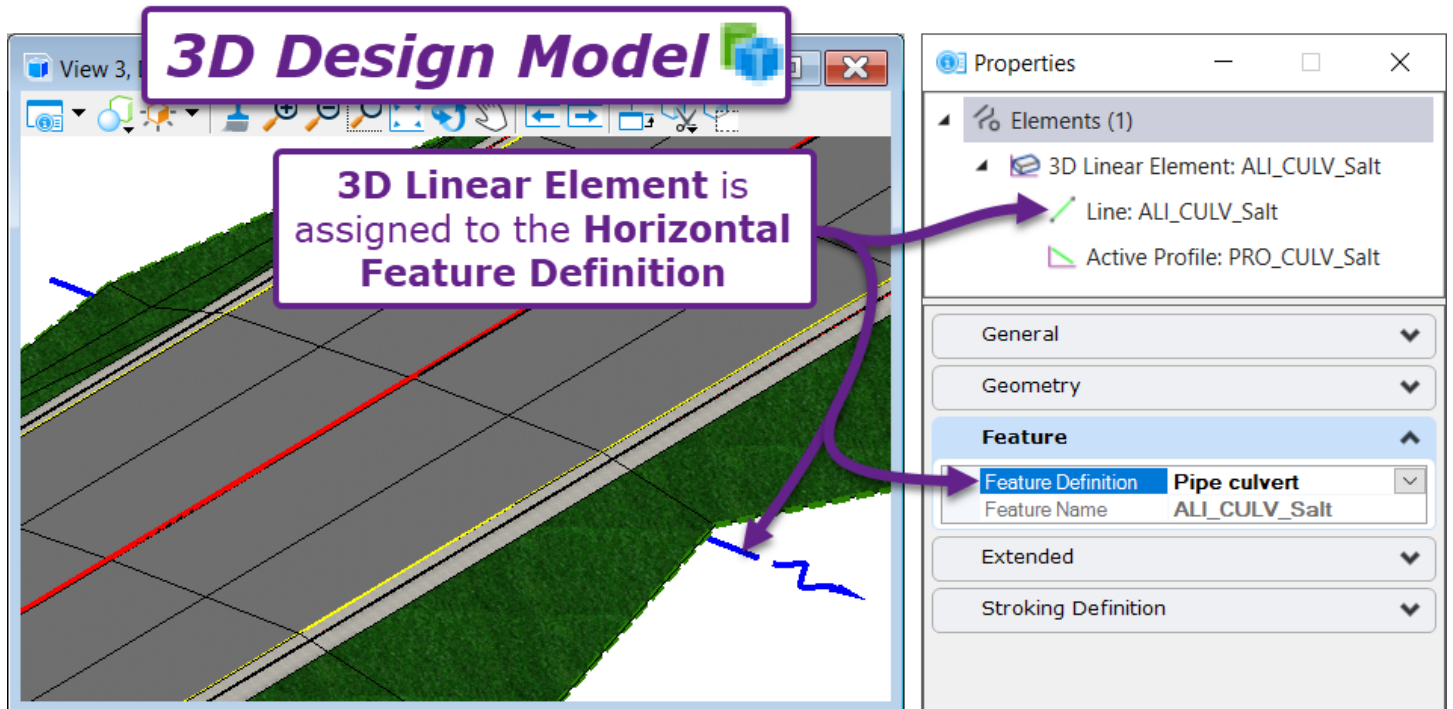
17B.1.a   Linear Feature Definitions in Corridor Modeling

In Corridor modeling, **Template Points** are extruded as 2D and 3D Linear Elements. Feature Definitions for the resulting 2D and 3D Linear Elements are assigned in the Template Point Properties menu. Template Points utilize the Linear Feature Definition library.
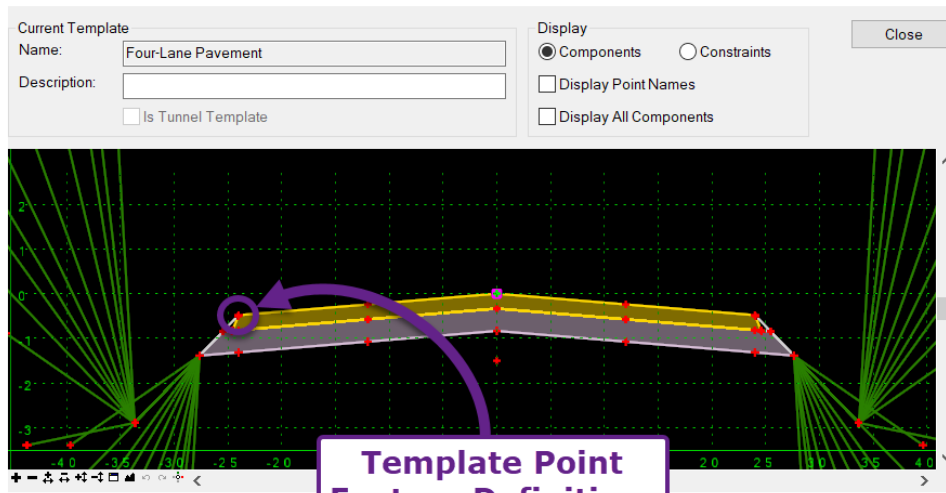
17B.1.b Create Template Geometry Setting for Corridor Modeling

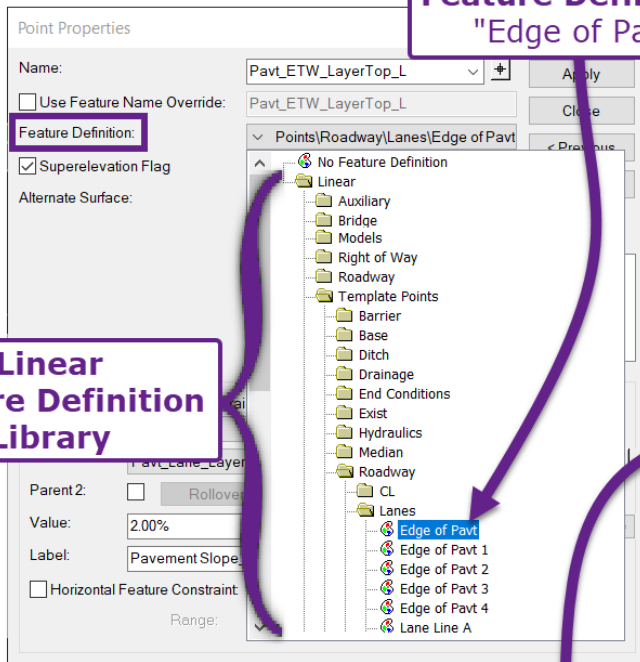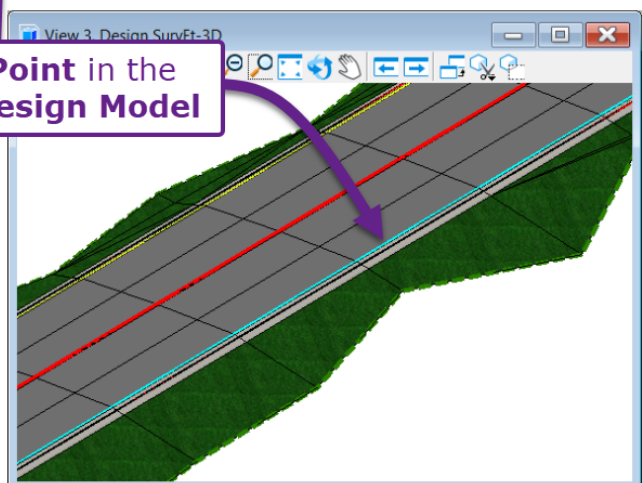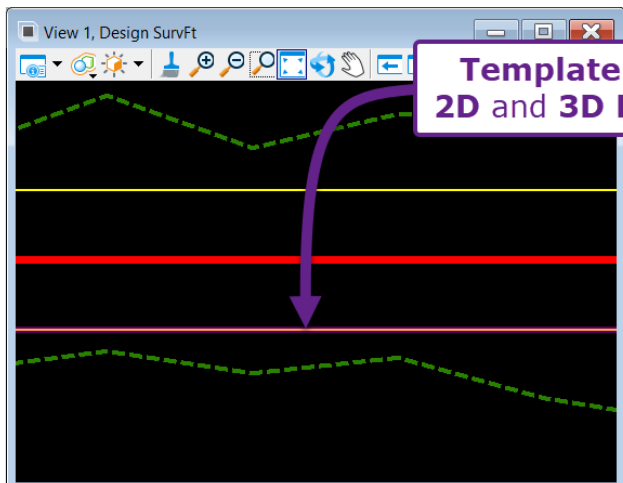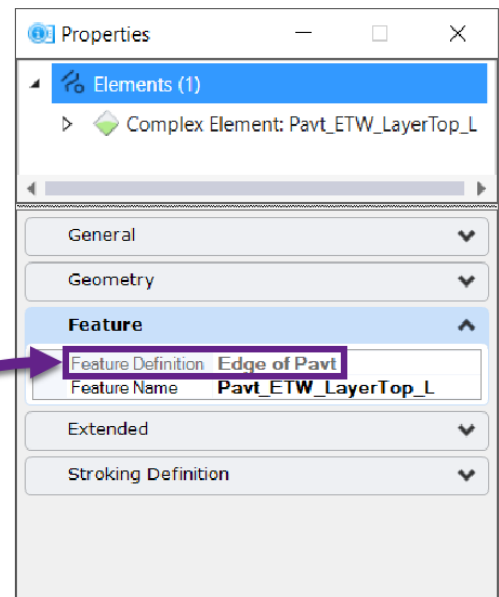By default, a small selection of Template Points is created directly in the *2D Design Model* 🗐 as 2D Linear Elements. The Feature Definition determines if a 2D Linear Element is created from a Template Point.

For example, the "Edge of Pavt" Template Point produces a 2D Linear Element in the *2D Design Model* 🗐. The "Subgrade" Template Point does NOT.

The "Create Template Geometry" Feature Definition setting enables the creation of a 2D Linear Element. For the "Subgrade" Template Point, "Create Template Geometry" is set to False, which means a 2D Linear Element is NOT created.

NOTE: Feature Definition settings are accessed through the OpenRoads Standards drop-down in the Explorer 🔍. Accessing and editing Feature Definition settings is discussed in <mark>*17C – Feature Definition Settings and Editor*</mark>.

17B.2   Mesh Feature Definitions

Mesh Feature Definitions are assigned to **Template Components** in Corridor, Linear Template, and Surface Template modeling.

17B.2.a Mesh Feature Definitions in Quantity Calculations

When quantities are calculated, Template Components of the same Mesh Feature Definition are summed together in the report.

For example, if two disconnected Template Components are assigned the same Feature Definition, then their volumes will be summed together in the quantities report.

Assign the disconnected Template Components different Feature Definitions to separate them in the quantities in the report.

17B.2.b   Volume Option Setting for Earthwork Calculations

Volume Option is a Feature Definition setting that applies to Mesh and Terrain Feature Definitions ONLY. The Volume Option determines how Meshes and Terrains are analyzed in earthwork calculations. Volume Option is discussed in <mark>20G – Advanced Information: Component Feature Definition and Volume Options</mark>.
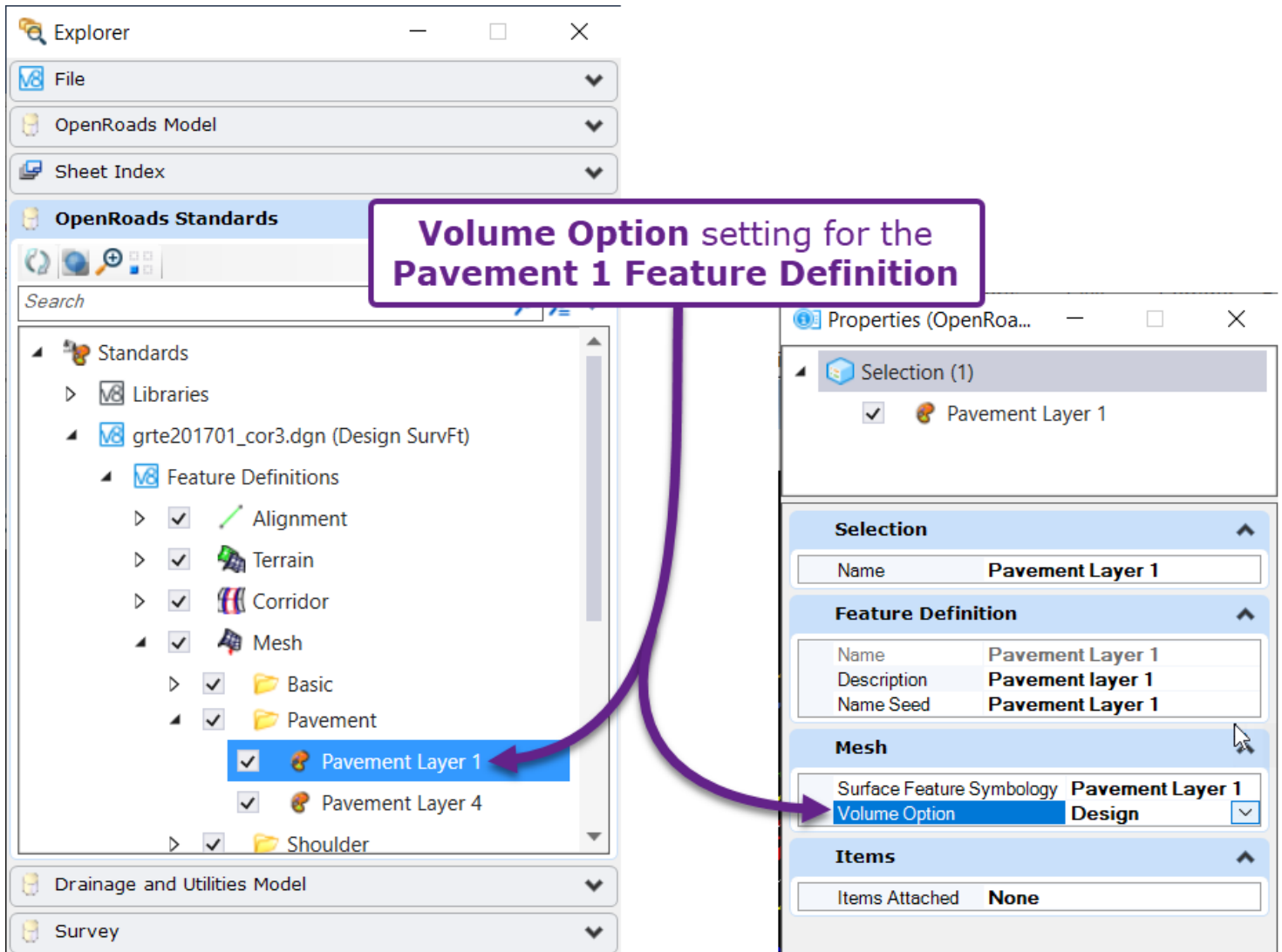
NOTE: In the FLH WorkSpace, the Volume Option for each Mesh and Terrain Feature Definition is pre-configured. In most circumstances, it is unnecessary to alter the Volume Option.

When creating new Mesh Feature Definitions, ensure the Volume Option is set appropriately.

Proposed materials (i.e., asphalt and aggregate) should be set to the "Design" Volume Option for consideration in earthwork calculations. When an element is set to the "Design" Volume Option, then the cut/fill quantities are calculated for placement of the element, with respect to the existing ground elevation.

If a new Mesh Feature Definition should NOT be considered in earthwork calculations, then set the Volume Option to "None".

BACKGROUND INFORMATION: The *Create Cut Fill Volumes* tool creates Cut and Fill Mesh components, which are summed and tallied in quantities reports. To generate Cut and Fill Meshes, the Volume Option for all Template Components and Terrain Models are analyzed.

> **NOTE:** The *Create Cut Fill Volumes* tool is discussed in <mark>20B – Create Cut Fill Volumes tool and Earthwork Calculations</mark>.

In the example shown below, ALL Road Corridor Components are assigned to the "Design" Volume Option. The *Create Cut Fill Volumes* seeks out the bottom of the "Design" Components to create a sub-grade datum.

The Existing Ground Terrain Model is assigned to the "Existing" Volume Option.

Cut and Fill Components are created between the "Existing" Terrain Model and the sub-grade datum of the "Design" Components.
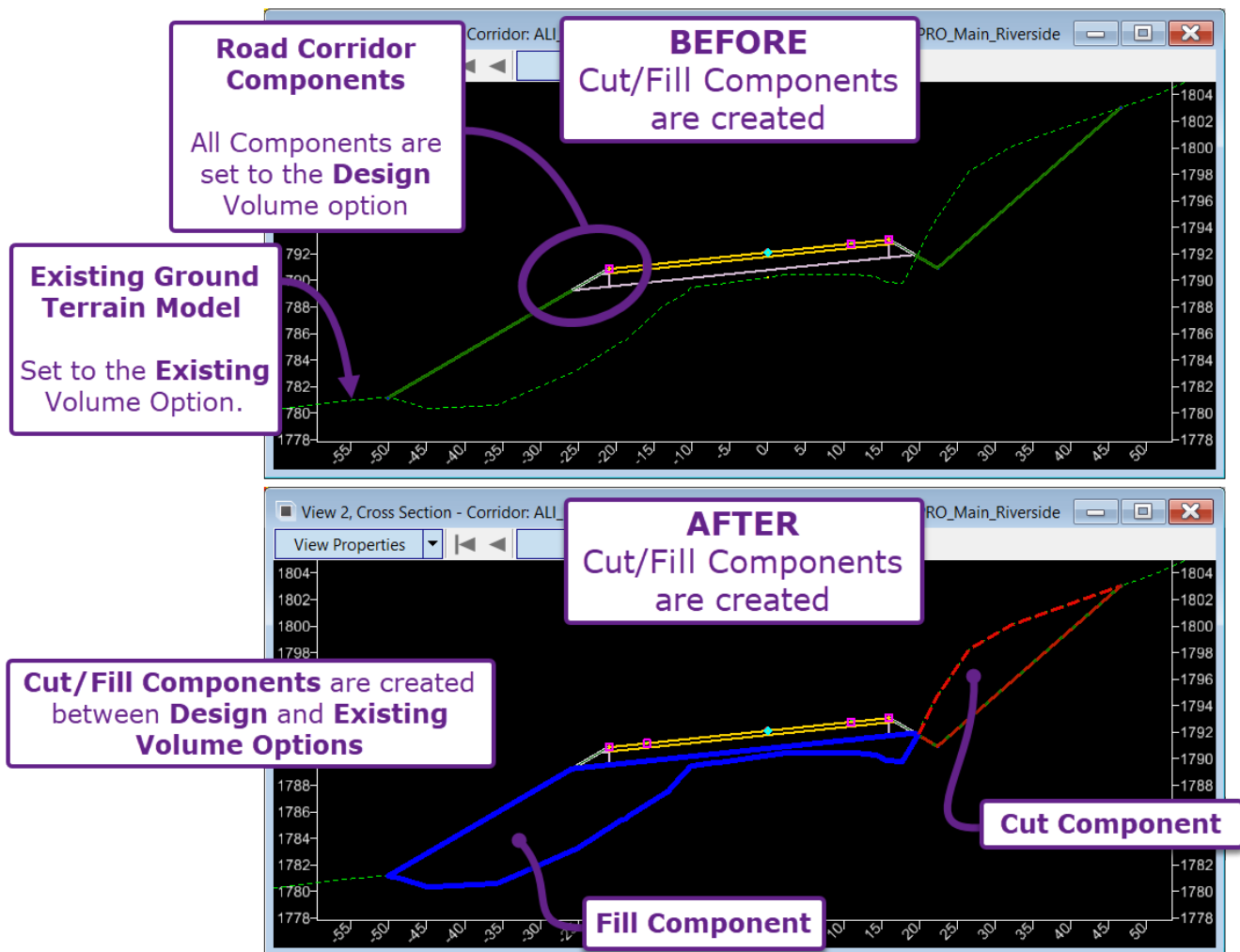
17B.3 Corridor Feature Definitions

The Corridor Feature Definition primarily affects the density of the Corridor. The Corridor Feature Definition Library is found and changed in the Properties ⊞ box when the Corridor Handle is selected. This section provides a high-level overview of the Corridor Feature Definitions. However, for more information, see 9D.2 Corridor Feature Definitions: Design and Final.

Select the **Corridor Handle** to view the **Feature Definition** in the **Properties** ⊞ box.

Corridor Feature Definition Library

TIP: The **Corridor Handle** is **Yellow** when set to **Design**.

It is **Red** when set to a **Final** Feature Definition.
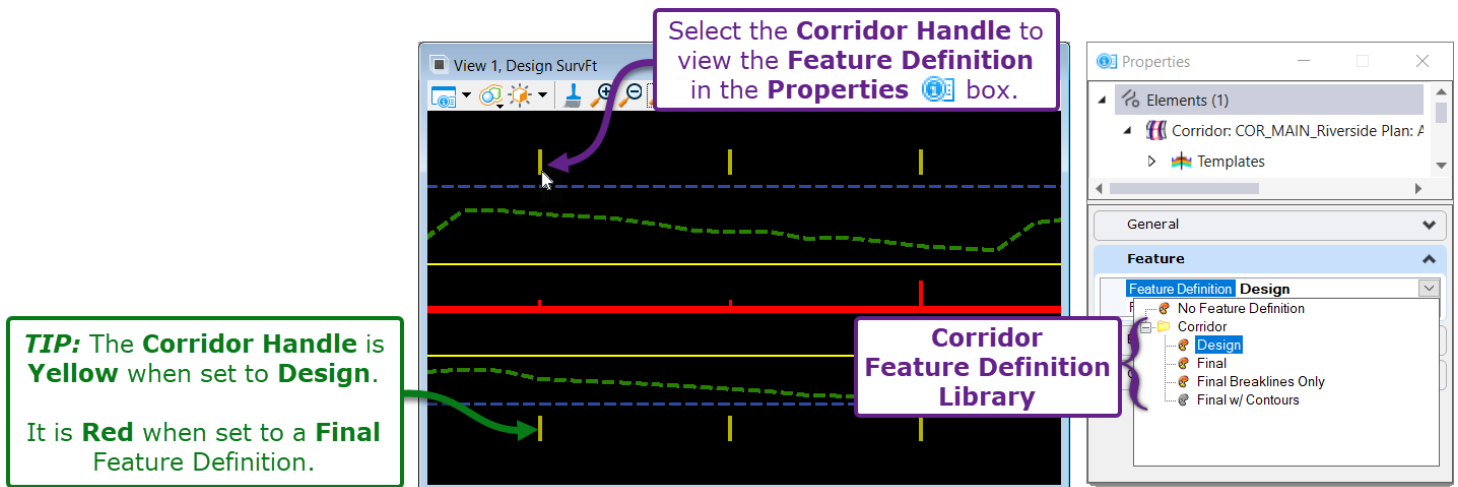
Design: When the Corridor Feature Definition is set to **Design**, the Interval is multiplied by 2. As shown below, the Interval is set to 10 feet in the Template Drop element properties. However, the actual Interval is 20 feet due to the Interval Multiplier imposed by the **Design** Feature Definition.

Final: When set to **Final**, the Template Drop Interval is set to 1. The actual Interval matches the Interval set in the Template Drop element properties.

Design Feature Definition

Template Drop Interval Multiplier = 2

20' Actual Interval

Corridor is **Less Dense**

Final Feature Definition

Template Drop Interval Multiplier = 1

10' Actual Interval

Corridor is **Denser**.

Select the **Template Drop Element** to view the **Interval**.
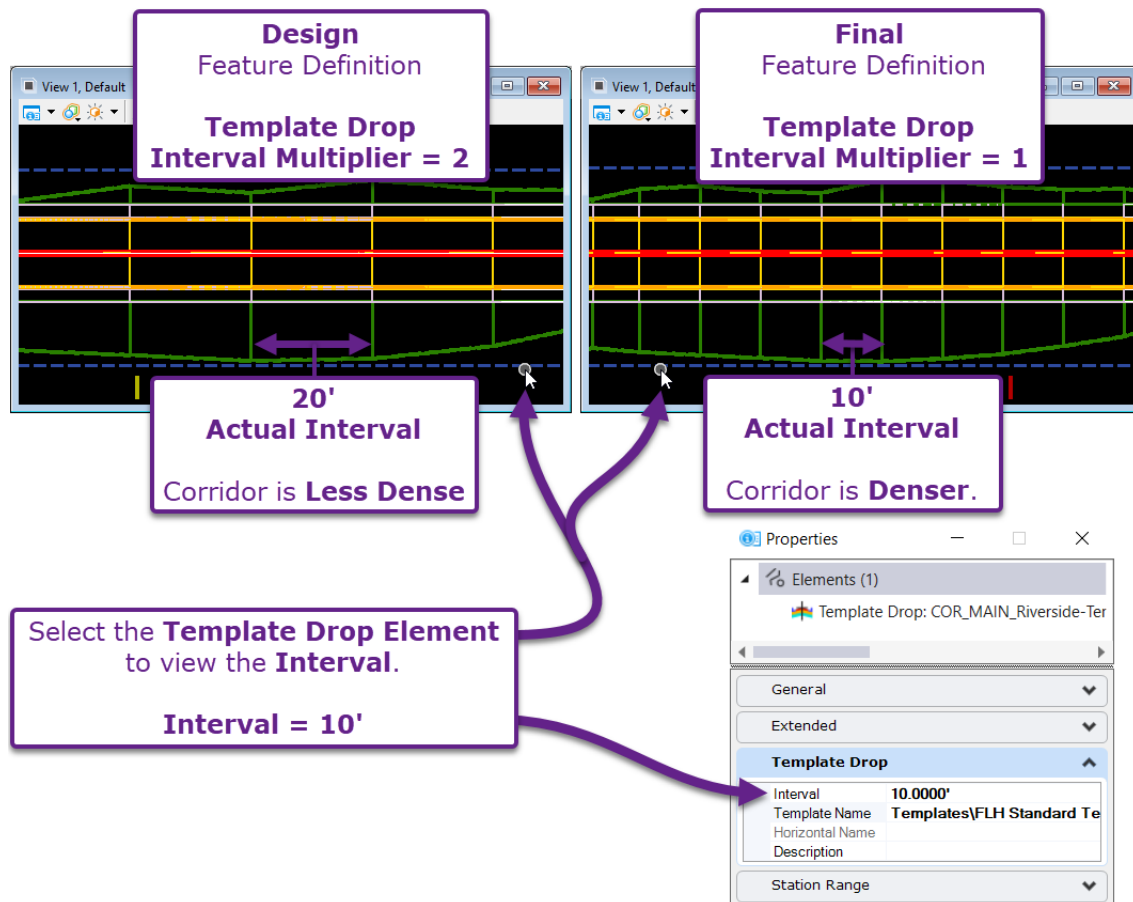
Interval = 10'

BEST PRACTICE: The **Final** Feature Definition is easier to work with because there is no multiplier applied to the Template Drop Interval. However, the **Final** Feature Definition may increase processing times because the Corridor is denser. When set to the **Design** Feature Definition, the Corridor is less dense and will process faster.

It is acceptable to set and leave the Corridor Feature Definition assigned to **Final** if processing times are acceptable. For example, relatively simple Corridors will NOT suffer a significant performance decline when set to the **Final** Feature Definition.

For complex Corridors, it is recommended that the Corridor Feature Definition is set to **Design** when edits are being made to the Corridor, Alignment, Profile, and all elements that interact with the Corridor. Set the Corridor to the **Final** Feature Definition when performing the following tasks:

- **Calculating Quantities:** Quantities will be more accurate if the Corridor is denser.

- **Creating Proposed Terrain Models from the Corridor:** The Proposed Terrain Model will be smoother, and a more accurate surface is produced.

- **Printing Road Plan and Profile Sheets:** When the Corridor is set to **Final**, the Cut/Fill linework will slightly alter because more Template Drop sections are added. It is advised that the Cut/Fill linework aligns with the resulting Proposed Terrain Model and Quantities Calculations.

After performing the tasks listed above, change the Corridor Feature Definition back to **Design**.

Other Final Feature Definitions: There are two other **Final** Feature Definitions that are used for specific tasks.

Final Breaklines Only: This Feature Definition is ONLY utilized when generating the 3D Breaklines DXF File for Physical Data package. See *23H – Proposed 3D Breaklines in DXF File Format*. When switched to this Feature Definition, ONLY 3D breaklines are shown from the Corridor in the *3D Design Model* 📦. All other Corridor elements (i.e., Components and Meshes) are hidden, making it easy to select the 3D Breaklines.

Final w/ Contours: When switched to this Feature Definition, elevation contours are shown around the Corridor Model. ***NOTE:*** The contours are placed in *3D Design Model* 📦. The contours can only be seen in the *2D Design Model* 🔲 if the display for the *3D Design Model* 📦 **reference** is toggled ON.

17B.4   Terrain Feature Definitions

Terrain Feature Definitions are used with Terrain Model elements. The Terrain Feature Definition Library is shown in the Properties ⊙ box when a Terrain Model is selected.
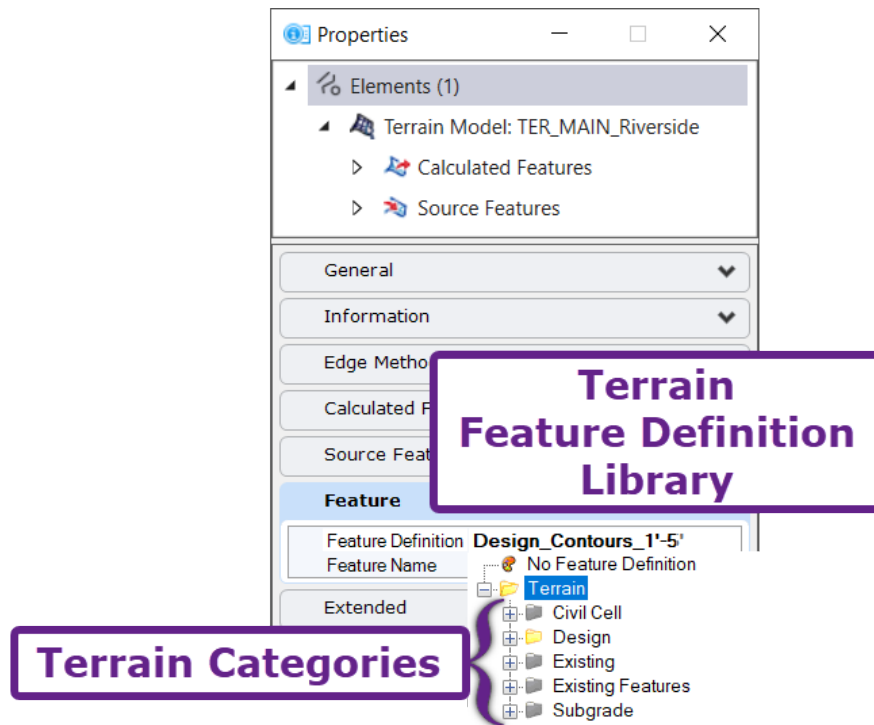
There are 5 categories of Terrain Feature Definitions:

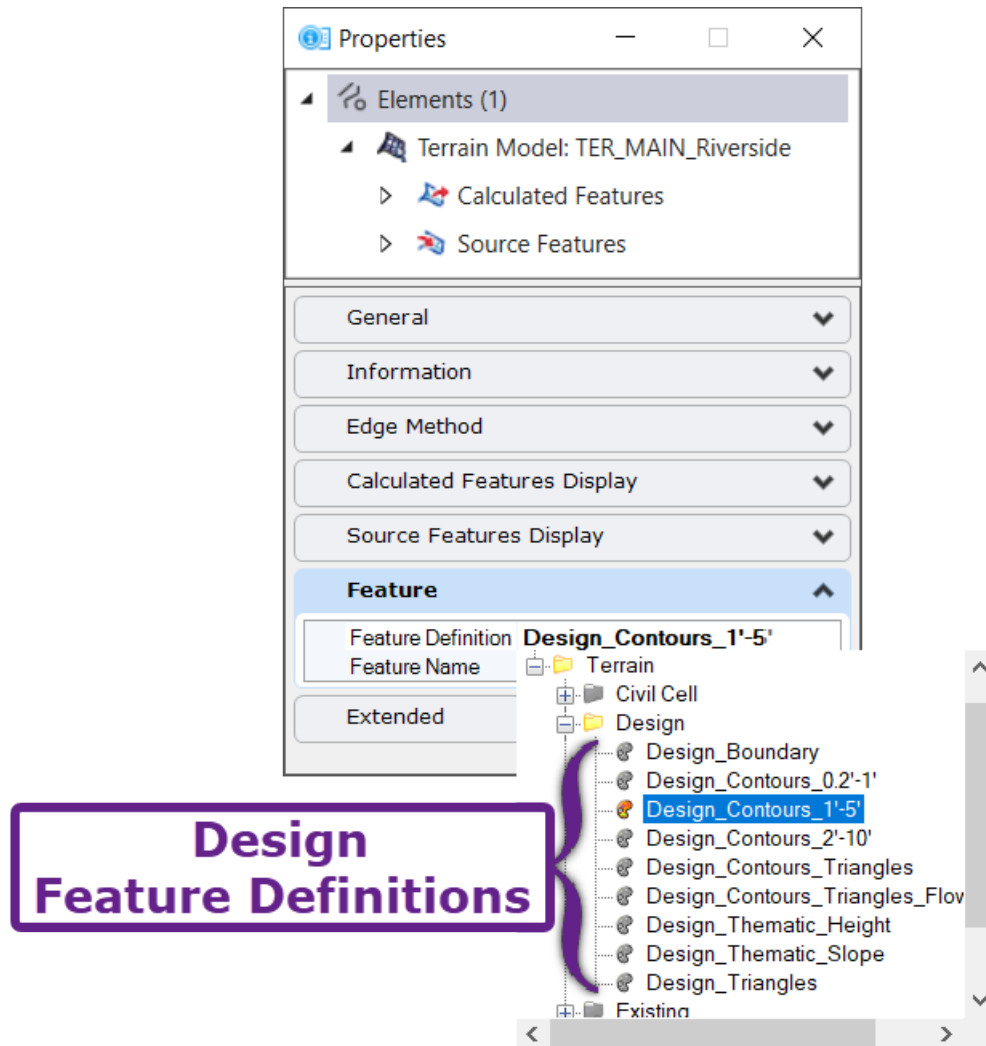| Terrain Model Feature Definition Categories		
Category:	**Description:**	**Volume Option**
Existing	Terrain Models that represent the Existing Ground surface.	Existing
Existing Features	Terrain Models that represent Existing Features, such as existing buildings, existing topsoil, existing gravel, and existing pavement. Existing Feature Terrain Models are primarily used to calculate and account for unsuitable materials in earthwork quantities.	None
Design	Terrain Models that represent the Finished Grade surface of a proposed feature.	Design
Subgrade	Terrain Models that represent the Subgrade surface of a proposed features.	Subgrade
Civil Cell	For use in Terrain Models within Civil Cells.	None

The category has two primary effects on a Terrain Model:

- Printed Appearance: When printed on paper or PDF, the category affects the color and line weights of the contours and contour labels. For example, the **Existing** category produces contours and labels that are light in color and line weight. The **Design** category produces darker and heavier weight contours.

- Quantity Calculations: The **Volume Option** is a Feature Definition setting that determines how the Terrain Model is treated in earthwork quantities calculations. The Volume Option setting also applies to Mesh Feature Definitions and is explained in <mark>17B.2.b Volume Option Setting for Earthwork Calculations</mark>.

When a category drop-down is expanded, a list of Feature Definitions is shown. All Terrain Feature Definition adhere to the same naming convention. The Feature Definition name indicates which Terrain Model components are displayed.

For example, "Design_Boundary" only shows the boundary of the Terrain Model. "Design_Contours_1'-5'" shows the minor and major contours (in 1' and 5' increments respectively) and the boundary of the Terrain Model.
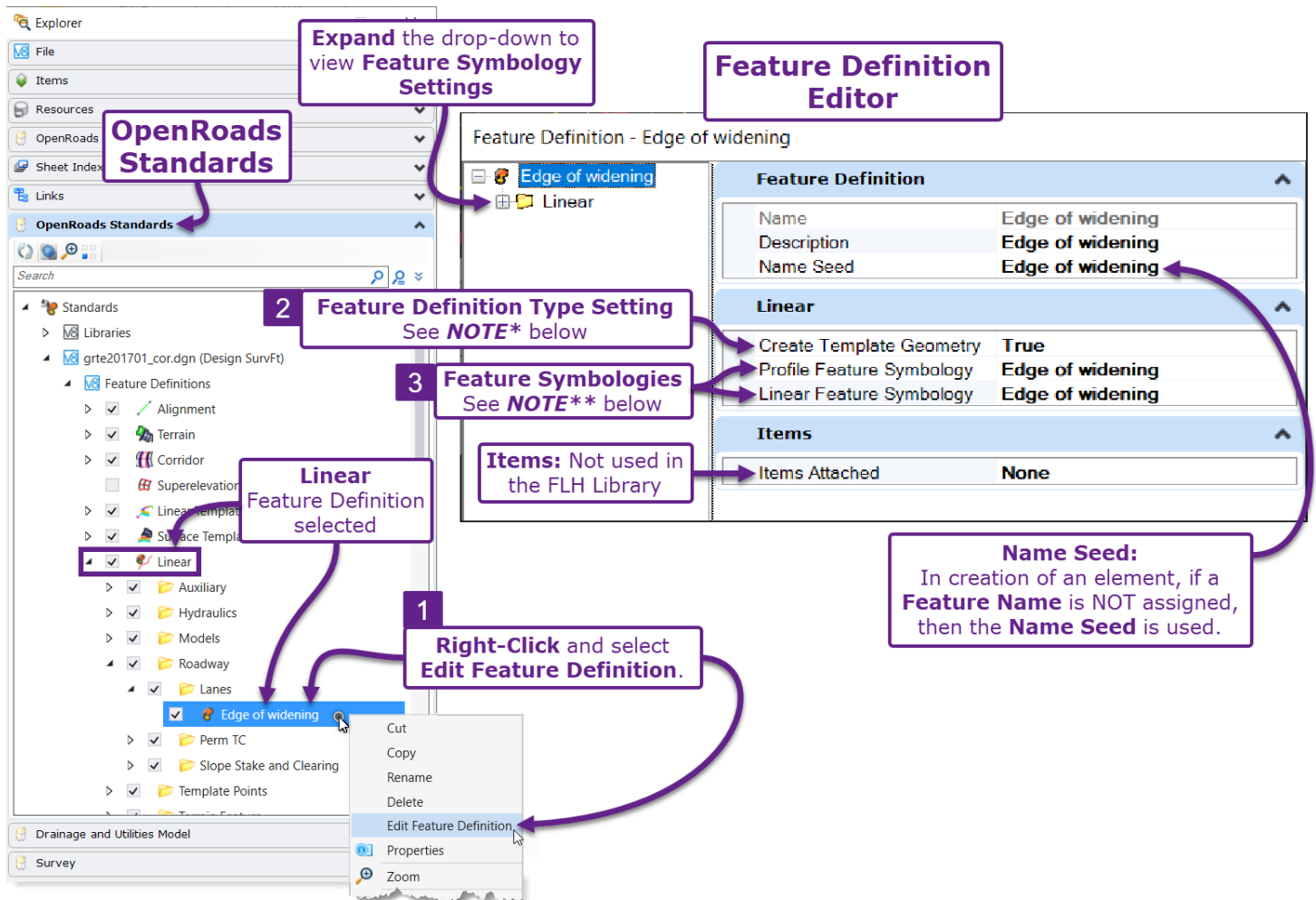

NOTE: Terrain Feature Definitions are graphically demonstrated in <mark>5B.1 Feature Definition Settings for the Existing Ground Terrain Model</mark>.

17C – FEATURE DEFINITION SETTINGS AND EDITOR

Feature Definition settings are shown and edited in the Feature Definition Editor. The Feature Definition Editor is accessed through the **OpenRoads Standards** drop-down in the Explorer 🔍.

1	To open the Feature Definition Editor, right-click on a Feature Definition and select the ***Edit Feature Definition*** tool.

The graphic above shows the general settings for a **Linear** Feature Definition. Feature Definition settings are slightly different, depending on the selected Feature Definition Type.

2	**Feature Definition Type Settings:** These settings are unique to the type of Feature Definition. **NOTE*:** The "Create Template Geometry" setting is shown when a Linear Feature Definition is selected. The "Volume Option" setting is shown when a Mesh or Terrain is selected.
3	**Feature Symbology:** The Feature Symbology setting determines the graphical appearance and annotation capabilities of the Feature Definition. On the left-side of the editor, expand the drop-downs to show Feature Symbology settings. **NOTE**:** Most Feature Definition Types only have a single Symbology setting. However, the **Alignment** and **Linear** types have two Symbologies: **Linear** and **Profile**. The **Linear Feature Symbology** controls the Feature Definition appearance in the *2D Design Model* 🔲 and *3D Design Model* 🔲. The **Profile Feature Symbology** controls the appearance in the *Profile Model* 🔲.

17C.1   Feature Symbologies and Element Templates

Feature Symbologies are a collection of settings that determine how the Feature Definition appears in different Models and Dynamic Views.

Feature Symbologies use **Element Templates** to set the graphical properties and attributes for the Feature Definition in specific Models and Dynamic Views. Typically, the Element Template is simple set of properties consisting of a Level, Color, Line Style, and Weight. However, other settings can be assigned to an Element Template, such as Cells and Materials.

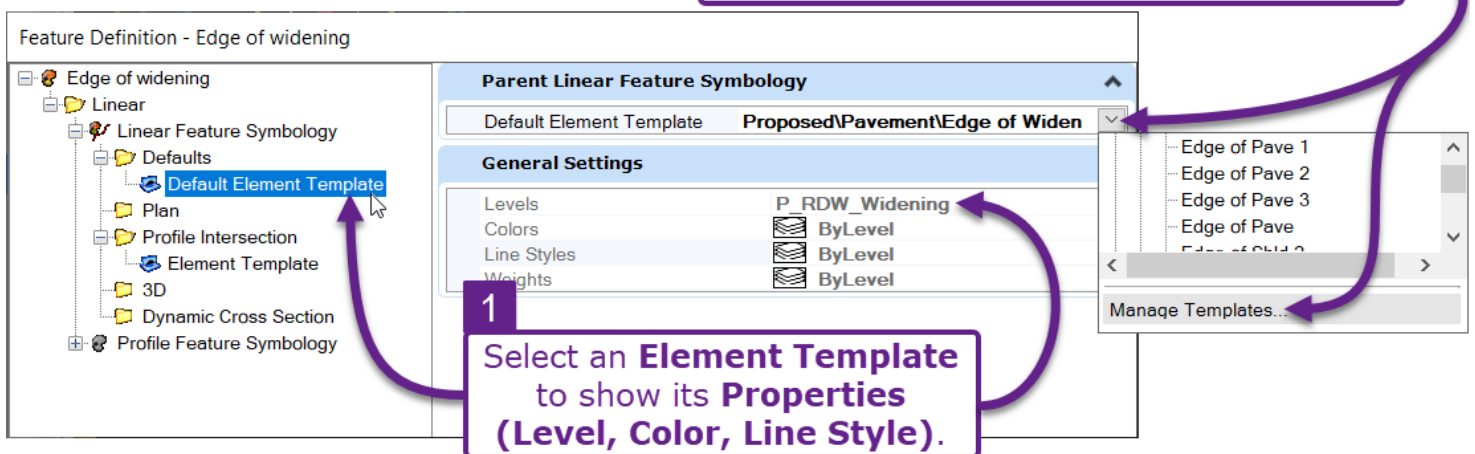

1	**Defaults:** This is the master Element Template. The Default Element Template is used when an Element Template is NOT assigned in a View category (i.e., Plan, Profile Intersection, 3D, Dynamic Cross Sections). For example, in the graphic above, the **3D Element Template** is set to None meaning that the Default Element Template is used when the Feature Definitions is shown in *3D Design Model* 🧊.
2	**Plan:** Determines the Feature Definition properties in the *2D Design Model* 🔷 (plan view). This category is unique because a separate Element Template can be assigned for the **Arc** and **Spiral** portions of the Linear element. **NOTE:** The "Baseline" Feature Definition utilizes these options to show the **Line** portions in Red, **Arcs** in blue, and **Spirals** in white.
3	**Profile Intersection:** This category is relevant when the *Profile Intersection Point* tool is used. **NOTE:** Most Feature Definitions use the "Proposed/Profiles/Intersecting Profile" Element Template to show a pink dot when the *Profile Intersection Point* tool is used.
4	**3D:** Determines the Feature Definition properties in the *3D Design Model* 🧊.
5	**Dynamic Cross Section:** Determines the Feature Definition properties in *Dynamic Cross Section View* 🪁 for a Corridor. **NOTE:** Guardrail Feature Definitions use an Element Template that contains a Cell to show a guardrail graphic in the *Dynamic Cross Section View* 🪁.
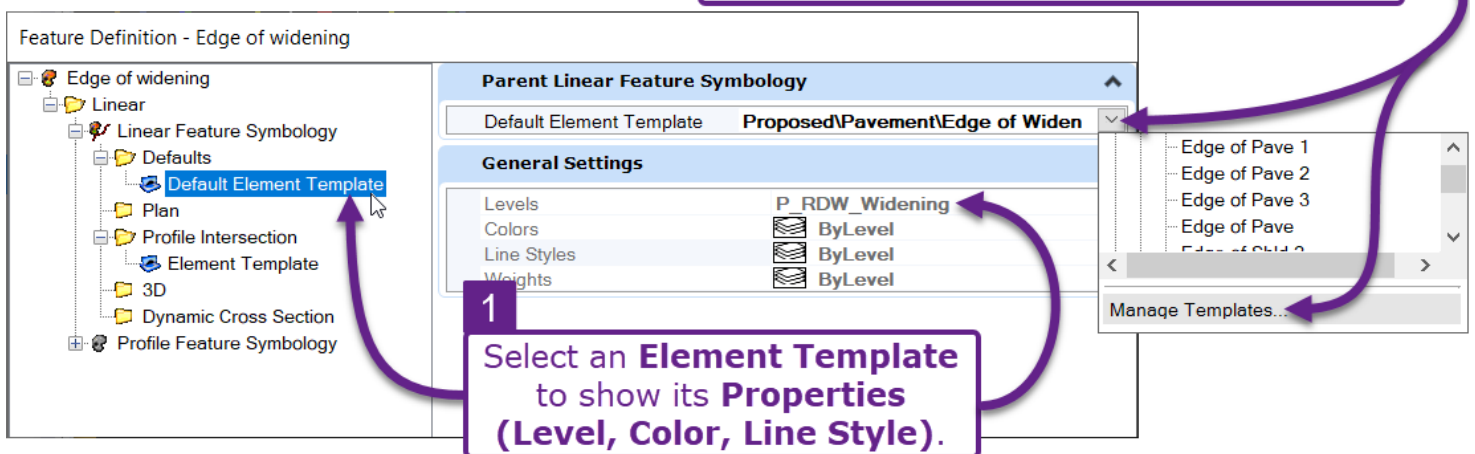
17C.2   Edit an Element Template

Element Templates are edited in the Element Template Manager. Opening the Element Template Manager is shown below:

2 Expand the Element Template drop-down and select **Manage Templates...**

1 Select an **Element Template** to show its **Properties (Level, Color, Line Style)**.

Element Template Manager

4 **Edit** the **Properties**

3 **Locate** and **Select (highlight)** the **Element Template** to edit.

17D – CREATE A NEW FEATURE DEFINITION

In this demonstration, a new Mesh Feature Definition is created for use in a Corridor, Linear Template, or Surface Template. After this workflow, the new Feature Definition is selectable in the Template Editor. However, the new Feature Definition is ONLY available in the ORD File that it was created in.
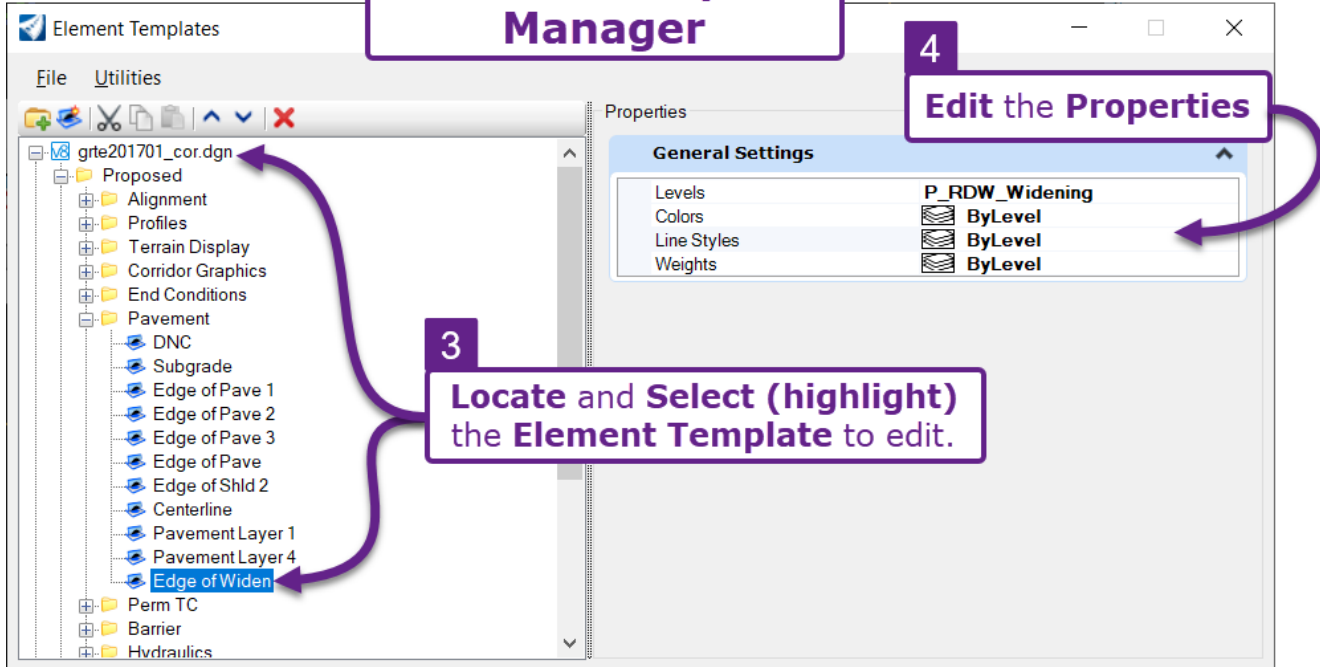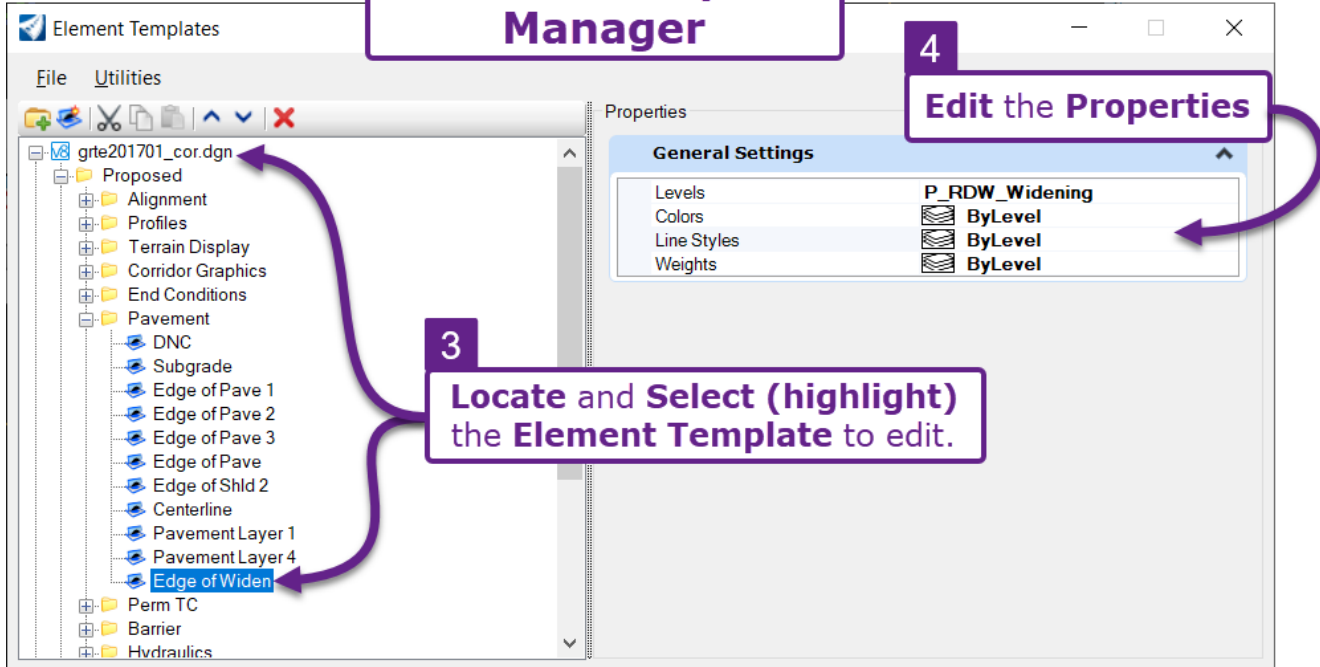
*NOTE:* This workflow is applicable to any Feature Definition Type, including Linear and Alignment Feature Definitions.

BEST PRACTICE: Creating a new Feature Definition from scratch is NOT encouraged. Instead, create a copy of a similar Feature Definition and rename it.

WARNING: Creating a new Feature Definition should ONLY be done if a suitable Feature Definition CANNOT be found in the FLH Feature Definition Library.

In this workflow, a Mesh Feature Definition is needed to represent Brick Pavers.   The FLH Feature Definition Library does not have a Brick Feature Definitions. Instead, the "Sidewalk Layer 1" Feature Definition is copied as the basis for the new Feature Definition.

1	Browse the FLH Feature Definition Library to locate a comparable Feature Definition. *NOTE:* Locate a Feature Definition from the **Libraries** drop-down. The entire FLH Feature Definition Library is shown from this location.
2	Right-Click on a Feature Definition and select **Copy**.
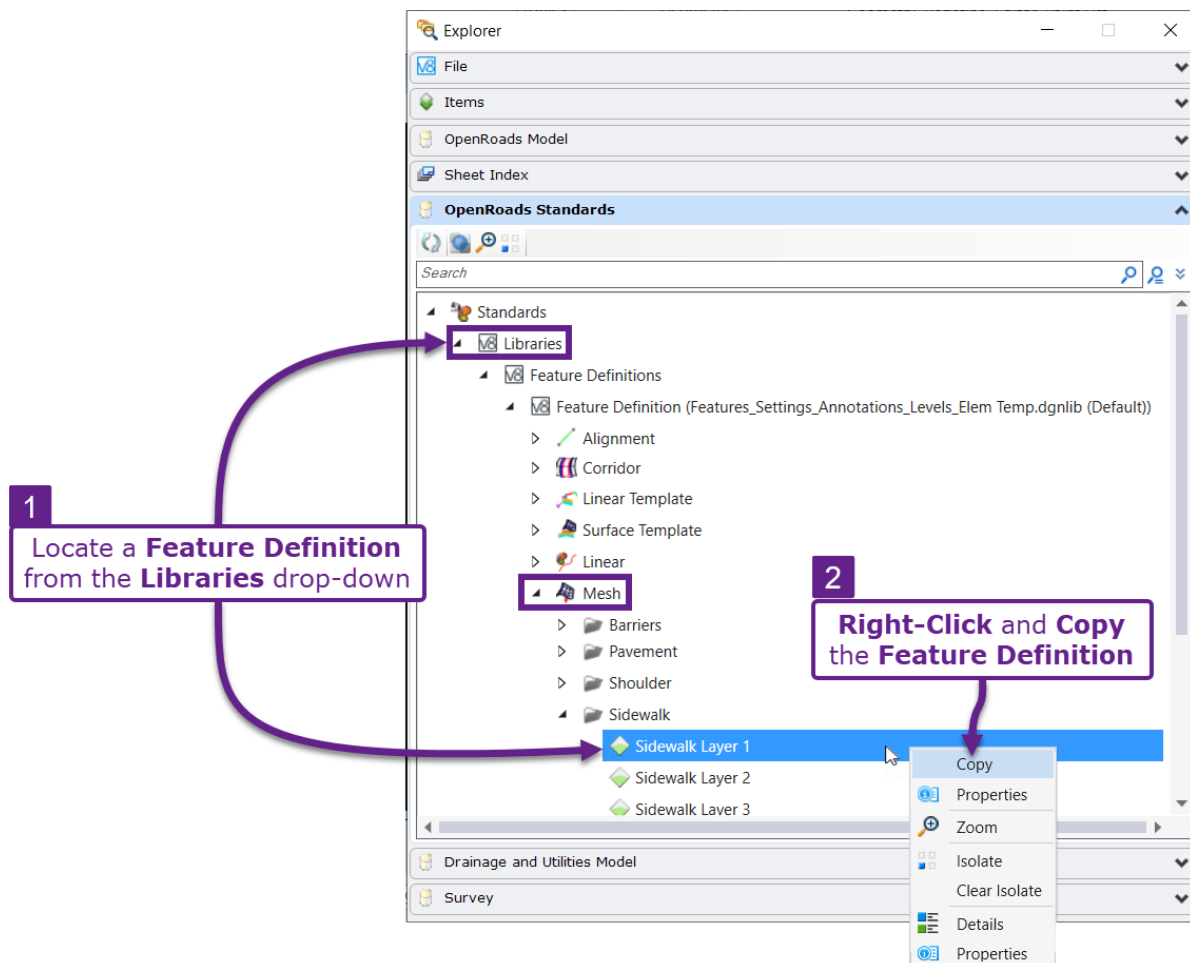
|	
3	Expand the **Current ORD File** drop-down. In this case, the "grte201701_cor.dgn (Design SurvFT)" drop-down.
4	Expand the **Feature Definitions** drop-down.
5	Expand the **Mesh** drop-down.
6	Right-Click on the **Mesh** drop-down and select **Paste**.
7	Assign the new Feature Definition an appropriate **Name**.

3 Expand the **Current ORD File** drop-down

4 Expand the **Feature Definitions** drop-down

5 Expand the **Mesh** drop-down

6 Right-Click on the **Mesh** drop-down and select **Paste**

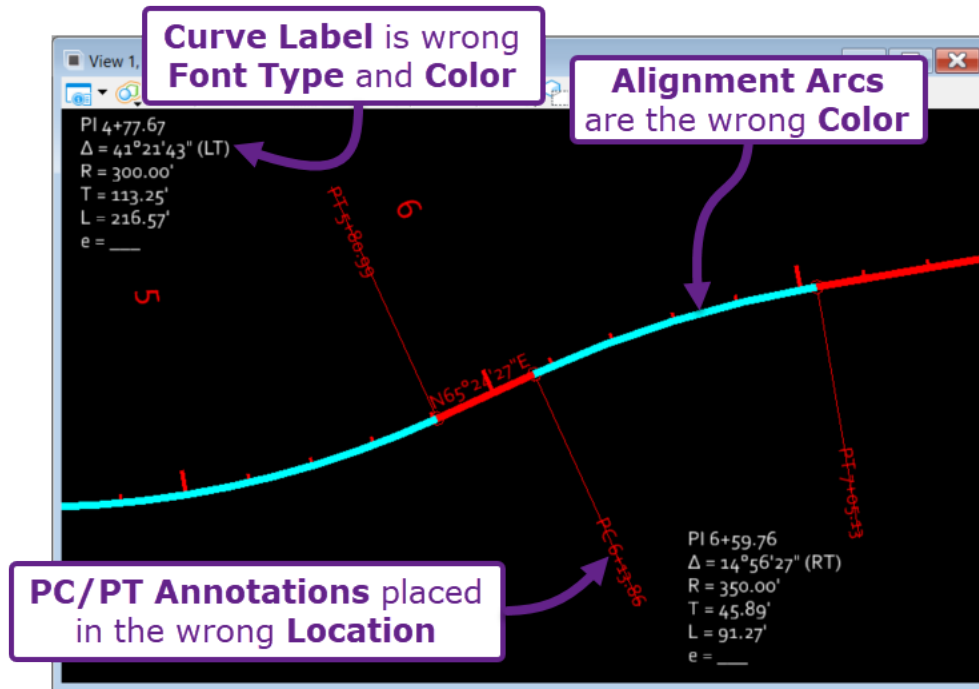**7** Name the **Feature Definition**
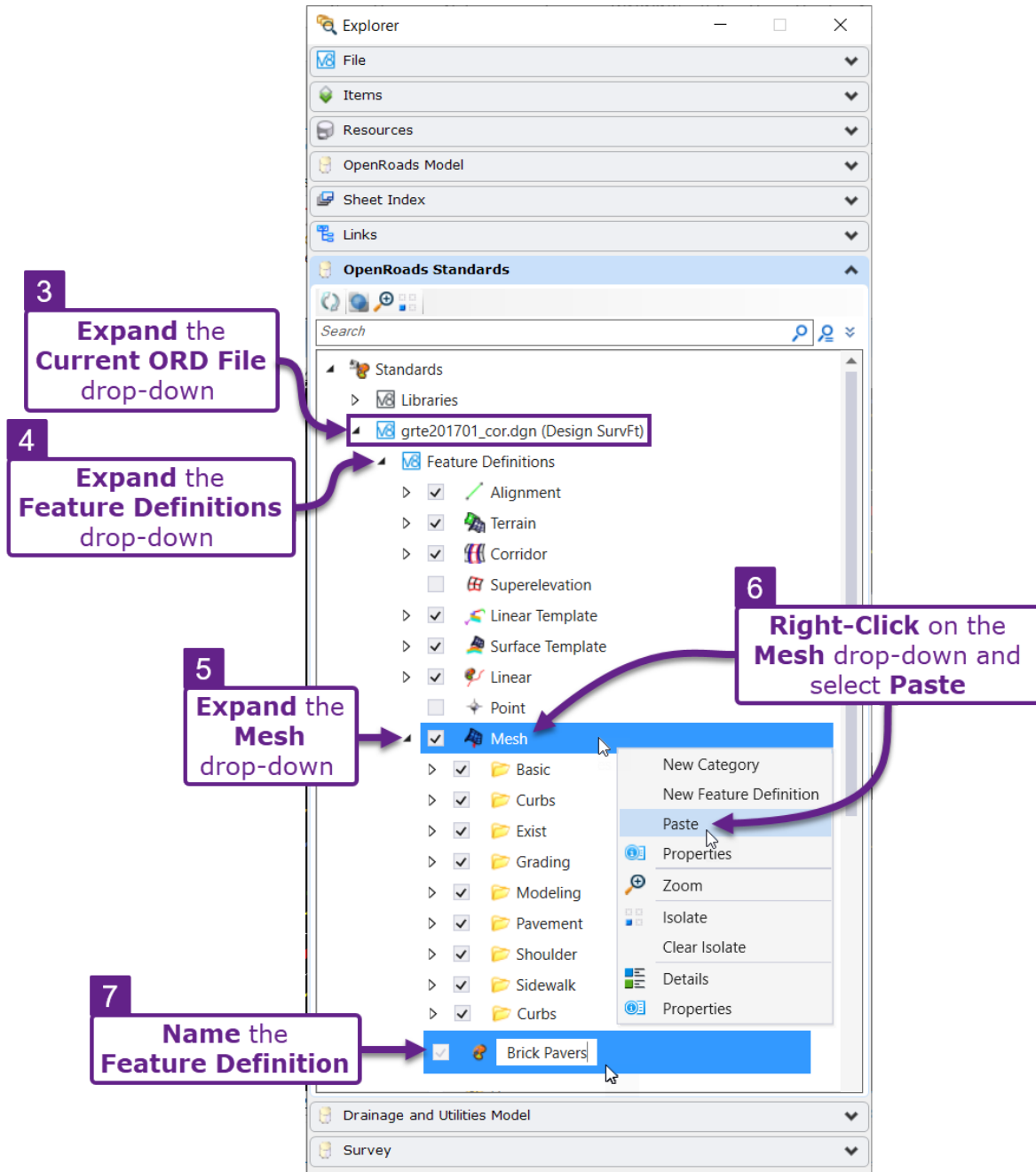
NOTE: The new Feature Definition will have the same Level, attributes, and properties as the copied Feature Definition. To edit the Feature Definition and corresponding Element Templates, see <mark>17C – Feature Definition Settings and Editor</mark>.

After the new Feature Definition is created, it will be shown in the FLH Feature Definition Libraries. As shown below, the new Feature Definition is available in the Template Editor and can be assigned to the desired Component.
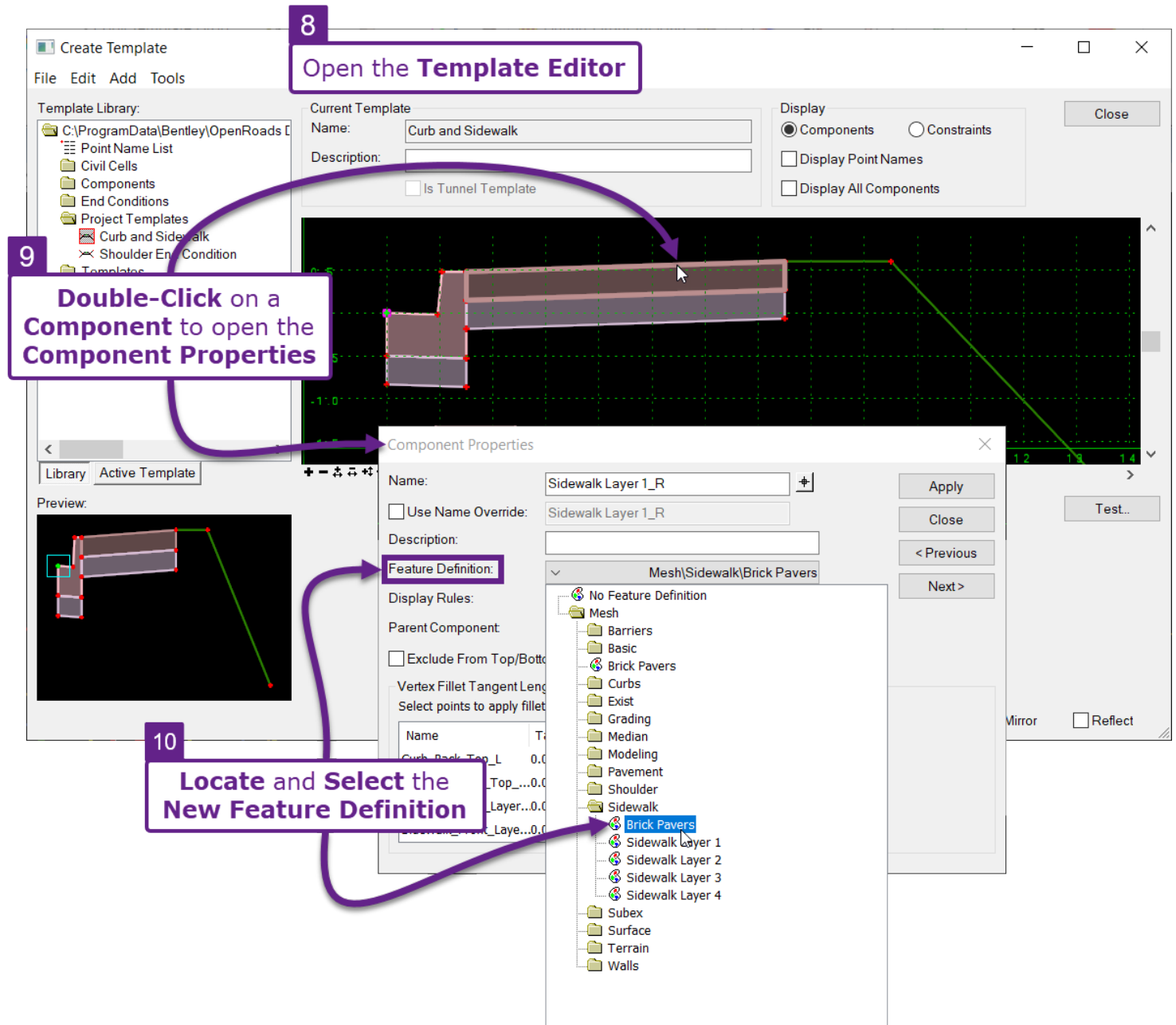
# 17E – FIX UNSYNCHRONIZED FEATURE DEFINITIONS AND ALIGNMENT ANNOTATIONS

Occasionally, elements that contain Feature Definitions and Alignment Annotations become unsynchronized with the default FLH Standards. When this happens, Alignment Annotation text may be placed in the wrong location and contain incorrect text characteristics, such as font, color, and height. Elements with Feature Definitions may be out of sync with the FLH Standards if shown with the incorrect Color, Line Style, or Line Weight.

Updating the Feature Definition and Alignment Annotations to FLH Standards is a two-part process. First, open the **Element Template Manager** and run the **Update Templates from Library** tool.
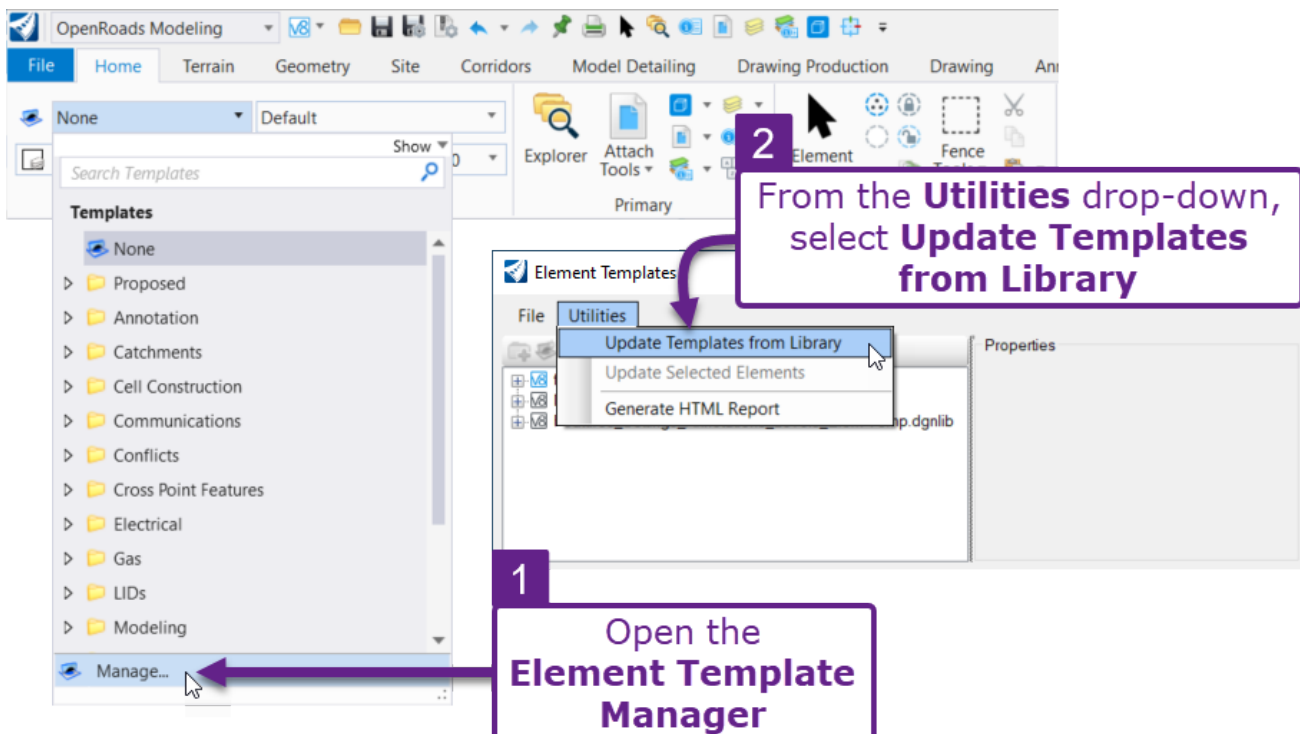
Next, open the **OpenRoads Standards** drop-down in the Explorer 🔍. Right-Click on the Active File Library and select **Update Standards From dgnlib**.
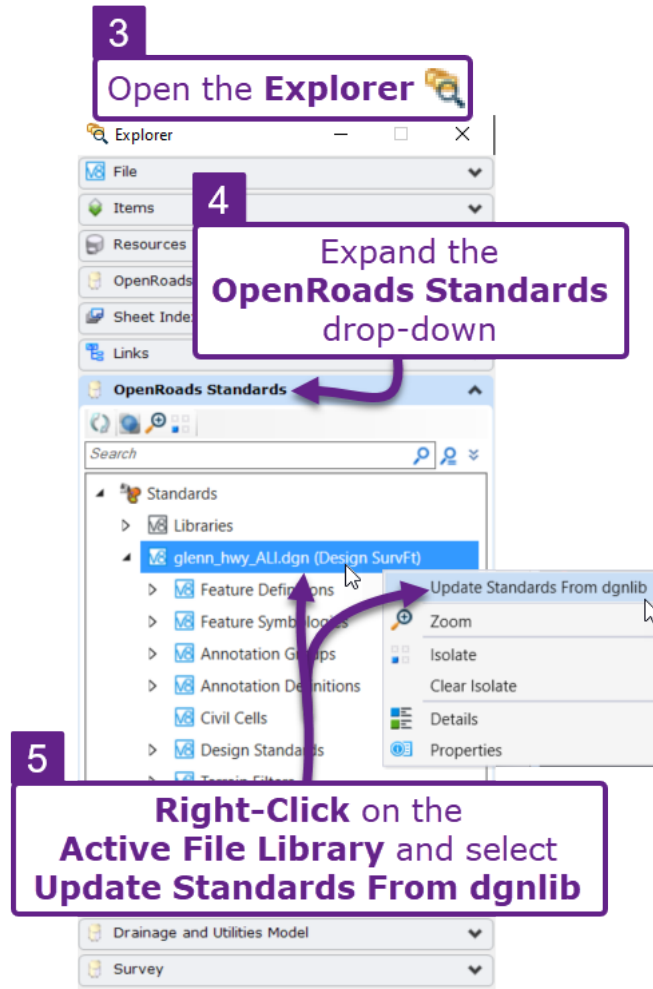
After standards have been updated in both the Element Template Manager and OpenRoads Standards drop-down, Feature Definitions and Alignment Annotations should reflect the default FLH Standards: