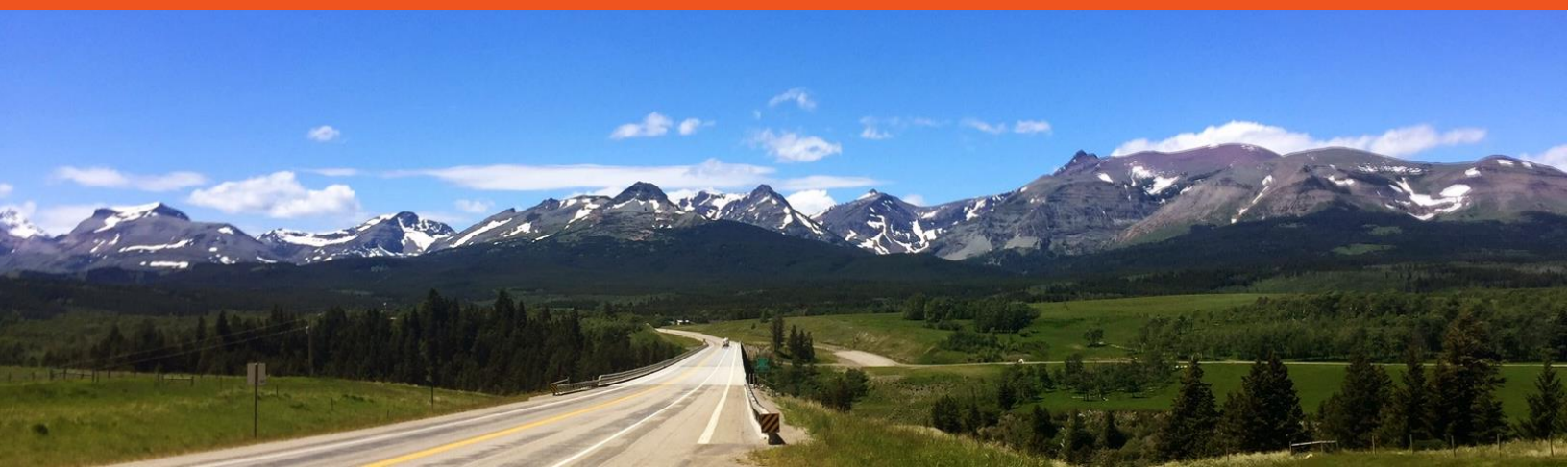

201 – Civil 3D Fundamentals – I

User Guide

Prepared by:

U.S. CAD
ACHIEVE MORE.

Version 1.0
Revision Date: 06/01/2022

DRAFT

Course Description

Course 201 – Civil 3D Fundamentals – I is the first course in the three-part Civil 3D Fundamentals learning path.

Civil 3D Fundamentals courses 201, 202 and 203 have been developed to provide the basic functionality of the software to those who have had limited or no exposure to the Autodesk Civil 3D software. These three (3) courses deliver the building blocks to become more knowledgeable and proficient utilizing Civil 3D.

Course Length

8 hours

User Guide Notification Icons

This User Guide contains icons to help alert and assist the user with specific tasks and content. Each icon is identified and described in the table below.

ICON	DESCRIPTION
	The **EXERCISE** icon identifies tasks where users are guided through a hands-on review of the instructional topic using the software.
	The **TIP** icon identifies software best practices and useful tips.
	The **NOTE** icon is used for identifying general information such as: • To provide additional information that is not considered to be a warning or critical. • To provide additional/alternative steps to workflow. • To provide reminders of important information previously covered that may affect specific tasks throughout the workflow process.
	The **CAUTION** icon is used to help identify and warn users of information and or workflow steps that should be followed or executed correctly.

Course Objectives

- How to navigate and access projects using Civil 3D and BIM 360
- Overview of MDT State Kit contents
- Properly manage a Civil 3D project using Data Shortcuts and External References
- Learn how to create and label Civil 3D Alignments
- Ability to create surface profiles
- Discover the Profile design tools and labeling

Topics Covered

- Navigating Civil 3D and the User Interface
    - Accessing a BIM 360 Project
    - Navigating Toolspace
    - Contextual Ribbons
- MDT State Kit Overview
    - State Kit Documentation
    - Layers, Styles, Settings, and Fonts
    - Blocks and Libraries
    - Reference Templates
    - Assemblies
- Project Management
    - Data Shortcuts & (Data References (DREF)
    - External References (XREF)
- Alignments
    - Alignment Creation tools
    - Offset Alignments
    - Widening
    - Labeling
    - Super Elevations
- Profiles
    - Generating Surface Profiles
    - Profile Creation tools
    - Profile Views
    - Labeling

Pre-requisites

- A basic understanding of design/drafting procedures and terminology
- A working knowledge of your operating system
- 101 – AutoCAD Fundamentals for Bentley Users

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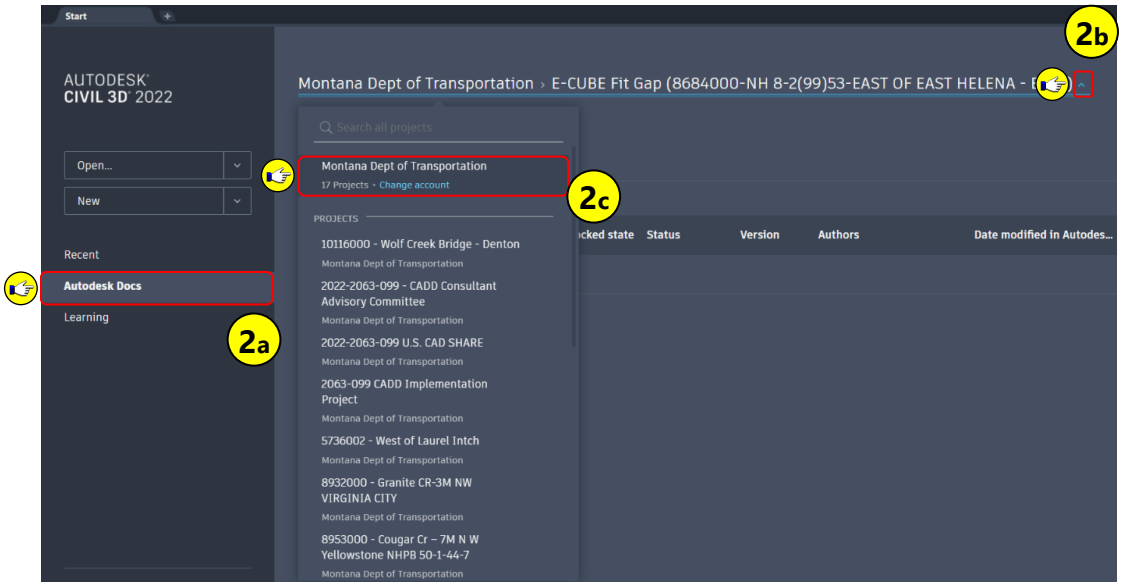
Navigating Civil 3D and the User Interface (UI)

Montana Department of Transportation (MDT) has elected to use Civil 3D in conjunction with BIM 360. BIM 360 is a cloud-based collaboration software that allows project data to be organized, shared and accessed via the cloud. Accessing BIM 360 from the Civil 3D environment is relatively simple through the user interface. Each user will need to have a free Autodesk account created, username and password, to gain access to Autodesk Docs.

Accessing a BIM 360 Project

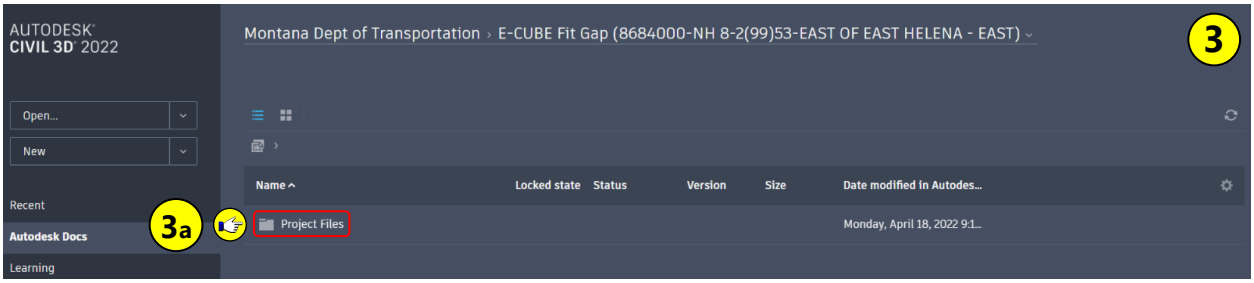
Step 1: Open Civil 3D 2022 by double clicking the desktop icon.

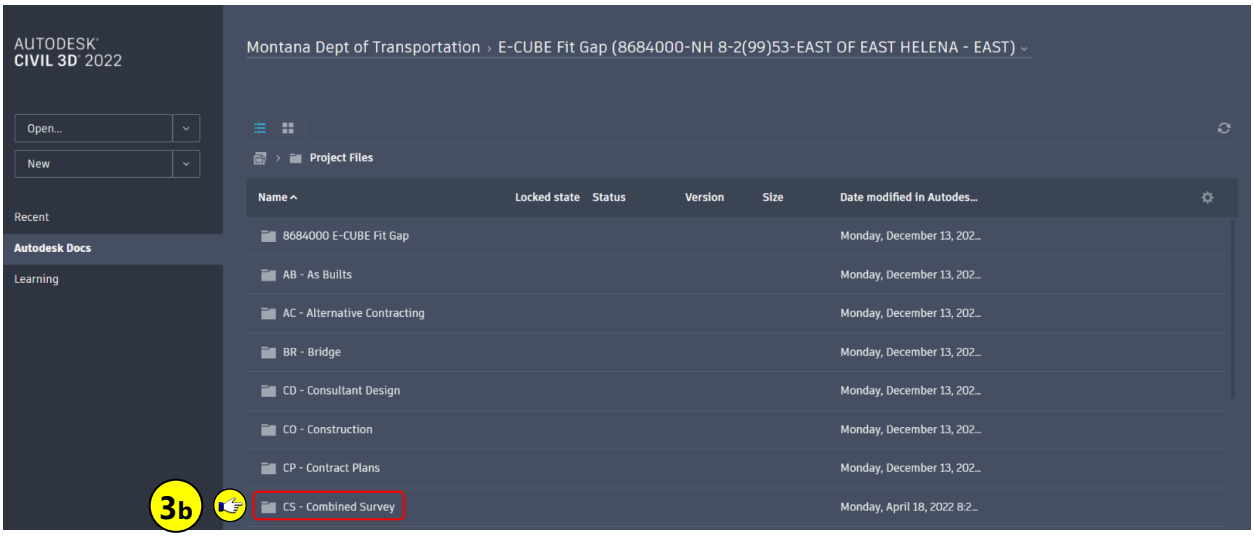
Step 2: On the Start tab, select Autodesk Docs, select the account list drop down to see the Montana Dept of Transportation account and the project list.

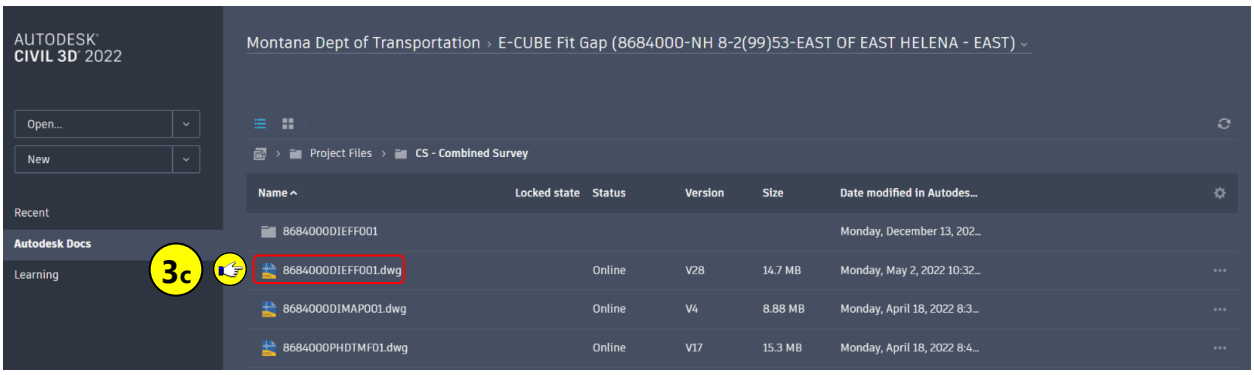


	When a BIM 360 project is assigned to an individual by the administrator, an email will be sent notifying the individual they have access to the BIM 360 project. The project will then be listed in the Montana Dept of Transportation account and the individual will be able to select and browse to the Project Files > Individual functional design folder.

Step 3: Select Project Files, select functional design folder, select drawing to open.







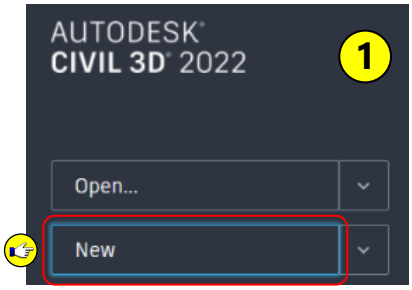
	The MDT folder structure in Autodesk Docs was created to replicate the previous internal server structure. User rights are assigned to each function design group, allowing read and write access to users within the functional design groups folder, but read-only access to other folders.

Civil 3D Toolspace

The Civil 3D Toolspace comprises of four (4) tabs, Prospector, Settings, Survey, and Toolbox. The prospector tab organizes the drawings, Civil 3D objects, and Data Shortcuts. The Settings tab contains the MDT Styles, Feature settings, Command settings and Drawing settings. The Survey tab allows survey data to be created through the Survey Database and the Toolbox tab is a collection of tools and reports. The Toolspace can be turned off and on, as well as the tabs. The Toolspace has an Autohide function allowing it to be minimized and expanded when needed.

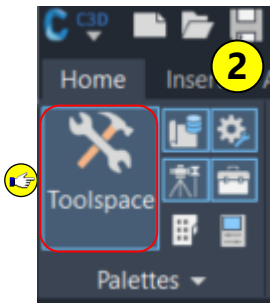
Navigating Toolspace

Toolspace display options



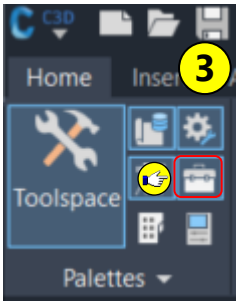
Step 1: From the Start tab, **select** **New** to create a new drawing.

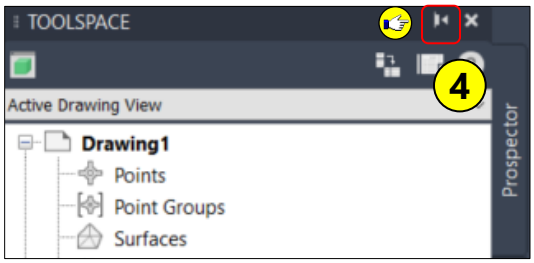
Step 2: **Navigate** to the **Palettes** panel, **select** the **Toolspace** button to turn on and off the Toolspace.



Step 3: With the Toolspace turned on, **navigate** to the **Palettes** panel, **select** the **Toolbox** button, and turn it off and on.

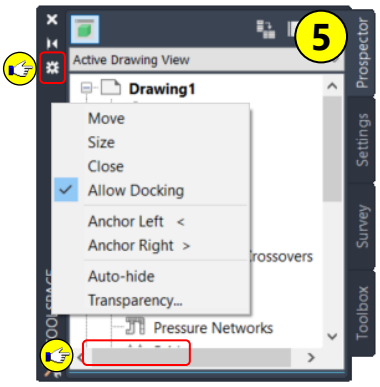
Step 4: **Navigate** to the **Toolspace** palette, **select** the **Auto-hide** symbol.





Step 5: **Navigate** to the **Toolspace** palette, **select** the **Properties** symbol, **select** **Anchor Left <**.

Step 6: **Navigate** to the **Toolspace** palette, **select** and hold down the **Ctrl key** on the keyboard, **left-click** on the **mouse**, **drag** the **Toolspace** back into the drawing workspace.



Toolspace – Prospector Tab

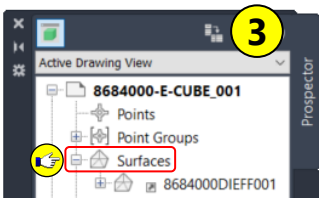
Prospector tab review.

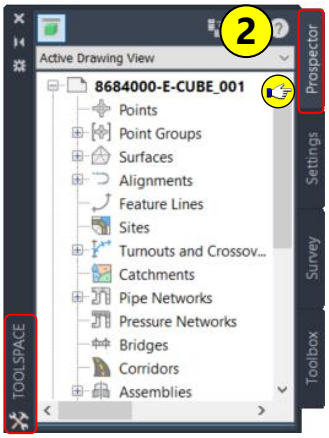
Step 1: **Open**: **8684000-E-CUBE_001.dwg**

- C:\mdtapps\Autodesk_Training\201-C3D Fundamentals I\Working\

Step 2: **Navigate** to TOOLSPACE > **Prospector tab**.

Step 3: **Select** the **+** symbol next to Surfaces to expand Surfaces.



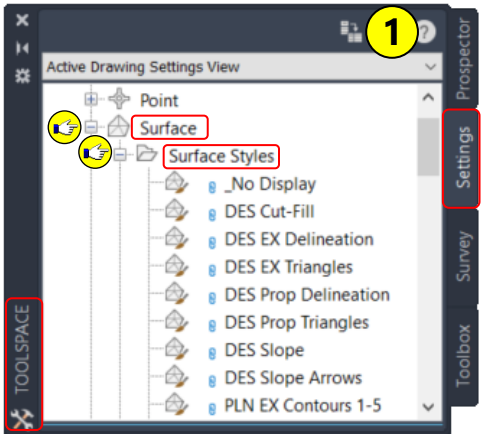


Notice the icon next to the surface name. This icon is used to identify a Civil 3D Data Shortcut object.

Toolspace – Settings Tab

A look at the settings tab.

Step 1: Navigate to TOOLSPACE > **Settings tab**, **select** the **+** symbol next to **Surface**, **select** the **+** symbol next to **Surface Styles**.

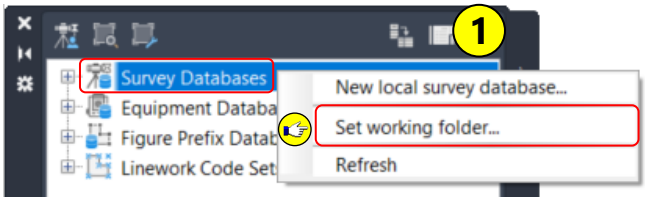


> Notice the blue paperclip icon next to the Surface Styles. This icon is used to identify a reference template style. Reference Templates will be discussed later in the training guide.

Toolspace – Survey Tab

Survey tab overview.

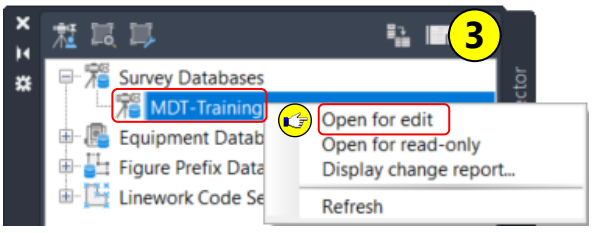
Step 1: Navigate to TOOLSPACE > **Survey** tab, **right-click** on **Survey Databases**, **select Set working folder**.

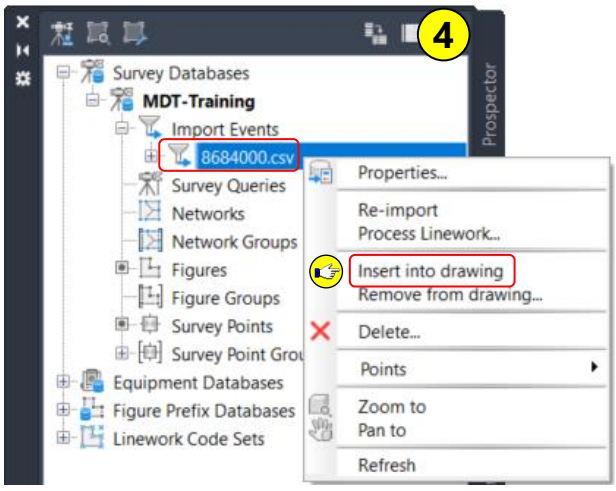


Step 2: Navigate to C:\mdtapps\Autodesk_Training\201-C3D Fundamentals I**Survey**, **select** "**Select Folder**".

Step 3: Right-click on MDT-Training database, select Open for edit.

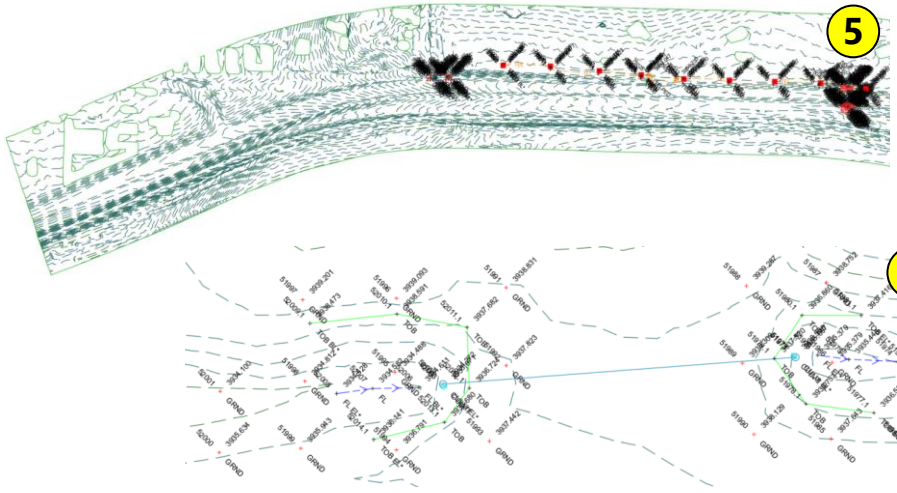
Step 4: Expand Import Events, right-click on 8684000.csv, select Insert into drawing.



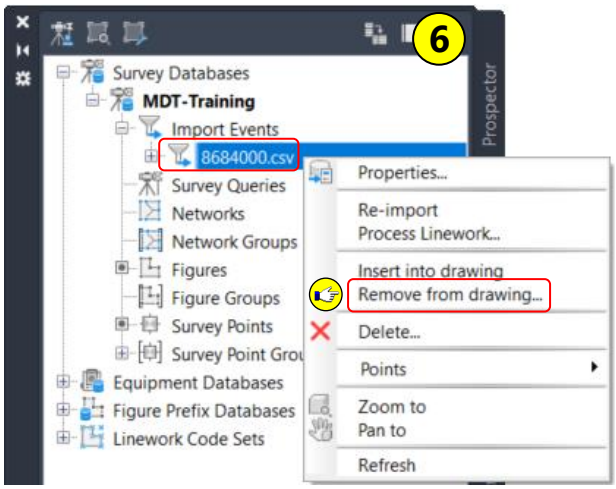


	Since the points and survey figures are brought in through the Survey Database, the points are read-only and cannot be edited or moved. The Survey Figures can be edited and moved, so use caution. If the Survey Figures are mistakenly edited or moved, they can be removed and reimported.

Step 5: **Zoom** into the **Northwest** end of the project, **change** the annotation scale to **1" = 10'** to make the points easier to see, **zoom** into an area containing **points**.



Step 6: **Right-Click** on **8684000.csv** Import Event, **select Remove from drawing**, **select Yes** when prompted "Are you sure you want to remove these objects from the drawing?".

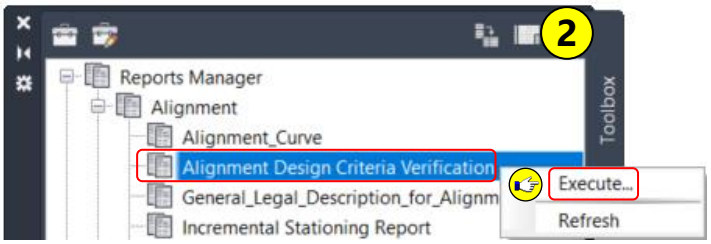


Toolspace – Toolbox Tab

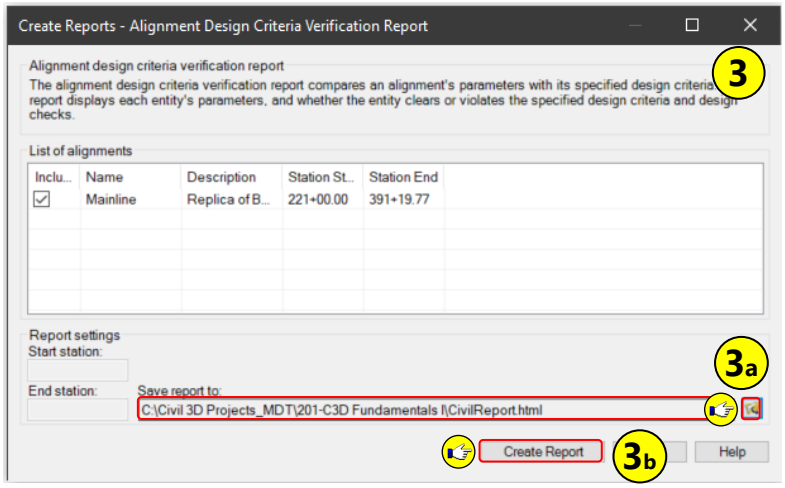
Generate an Alignment report.

Step 1: **Navigate to** TOOLSPACE > **Toolbox** tab, **expand** **Reports Manager**, **expand** **Alignment**.

Step 2: **Right-click** on **Alignment Design Criteria Verification** report, **select** **Execute**.



Step 3: In the Create Reports dialog box, **select** the **browse button**, **navigate** to C:\mdtapps\Autodesk_Training**201-C3D Fundamentals I**, **select** **Save**, **select** **Create Report**.



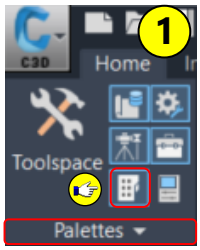
	In the Save As dialog for the report the file can be renamed, and the file type can be changed to HTML, DOC, XLS, TXT or PDF formatted report.

MDT State Kit Overview

The State of Montana Department of Transportation (MDT) uses an MDT State Kit for their Civil 3D environment. The MDT State Kit will provide consistency internally as well as externally with consultants. The MDT State Kit contains Civil 3D Styles, templates, fonts, line types, assemblies, subassemblies, resources and documentation to create uniformity of Civil 3D projects.

State Kit Documentation

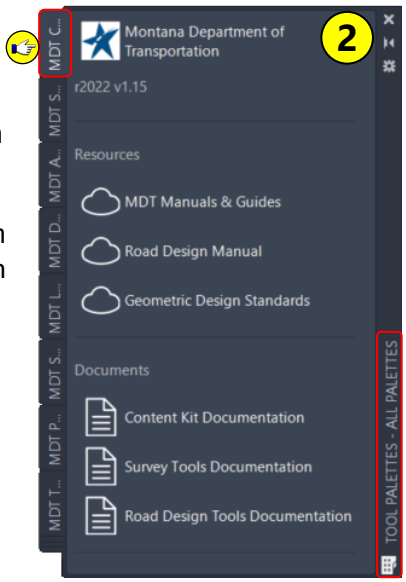
Step 1: **Navigate** to Home > **Palettes panel**, **select** the **Tool Palettes** button.



	Alternatively, you can open and close the Tool Palette by selecting Ctrl+3 on the keyboard.

Step 2: **Navigate** to TOOL PALETTES > **MDT Content Kit** tab.

- Resources - MDT Manuals & Guides, Road Design Manuals and Geometric Design Standards are links to information on the MDT website.
- Documents - Content Kit, Survey Tools and Road Design Tools Documentation are links to PDF's contained locally on your computer.



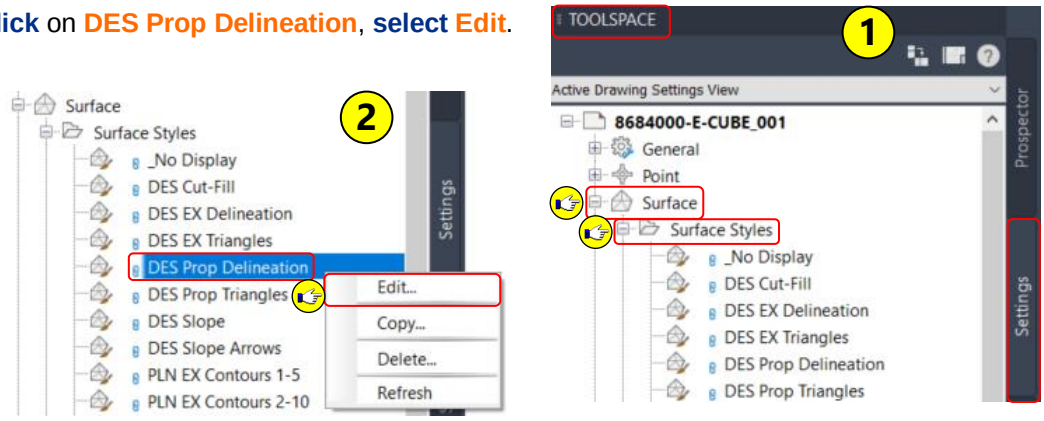
Styles

The MDT State Kt includes template files that contain styles suited for MDT workflows. Civil 3D styles manage the appearance of Civil 3D objects, their labels, and tables. Styles control Civil 3D objects colors, line types and visibility in various views. Some of the common views are plan, model, and section. Styles facility uniformity throughout MDT's design functional areas as well as externally with consultants.

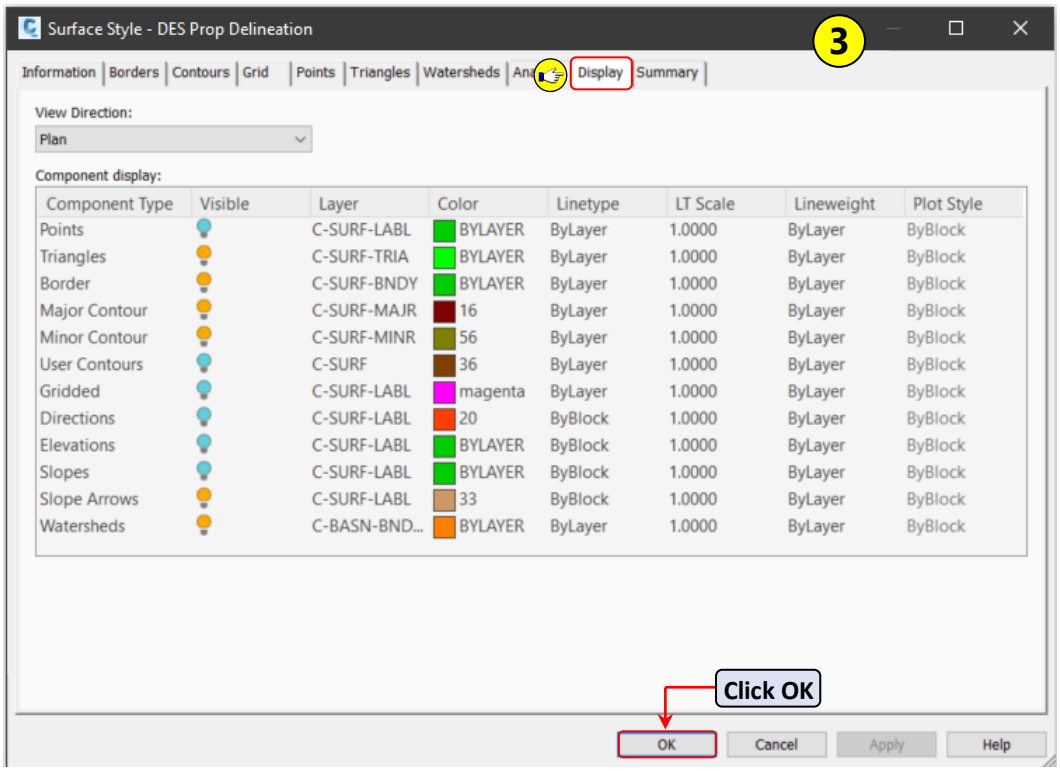
Viewing a style

Step 1: Navigate to TOOLSPACE > **Settings** tab, **expand Surface**, **expand Surface Styles**.

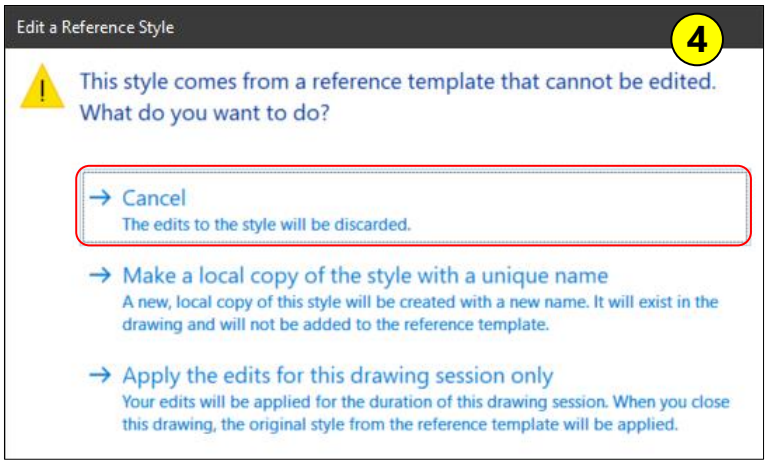
Step 2: Right-click on **DES Prop Delineation**, **select Edit**.



Step 3: Select the **Display** tab, **review** the styles components, visibility, layers and colors, **click OK**.



Step 4: **Select** **Cancel** from the Edit a Reference Style dialog box.



	MDT leverages Reference Templates to organize and control Civil 3D styles. The styles are being referenced and cannot be edited or changed unless a copy is created, or the edit is temporary for the drawing session. If the edits are applied for the drawing session, the style will reset at the close of the drawing.

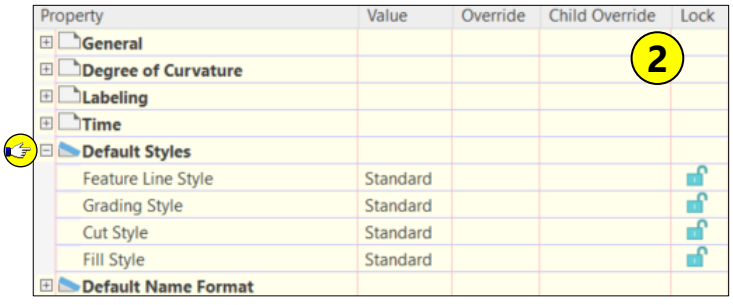
Settings

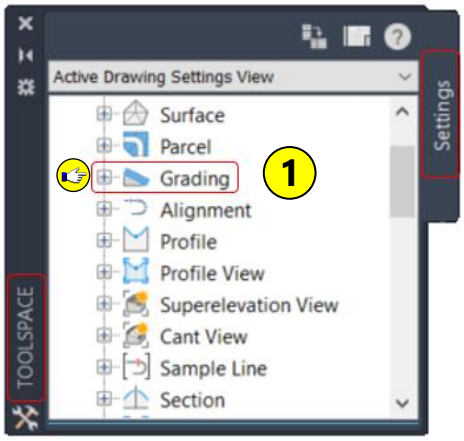
Civil 3D contains a hierarchy of settings. The drawing settings, the feature settings, and the command settings. A command setting can override a drawing setting or feature setting which is referred to as a child override. The Edit Feature Settings for Grading is used to view and change grading related default settings. It allows for styles, name format, unit, precision and rounding values to be assigned as defaults. There is the ability to lock the settings as well, giving no option to change the values during the Civil 3D object creation process. The settings defined in this dialog box override any ambient settings that have been established for the drawing.

Exploring the Feature settings

Step 1: **Navigate** to the TOOLSPACE > **Settings** tab > **Right Click** on **Grading** > **Select** **Edit Feature Settings…**

Step 2: **Expand** the **Default Styles** by **selecting** the **+** symbol.



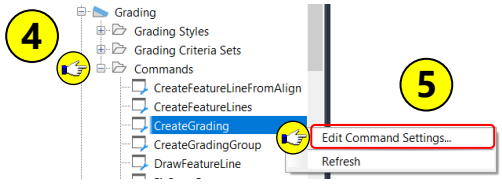


Notice the icons next to the Property categories in the Edit Feature Settings - Grading dialog box. The Drawing-level ambient settings are identified by the drawing icon and the grading feature settings are identified by the grading icon.

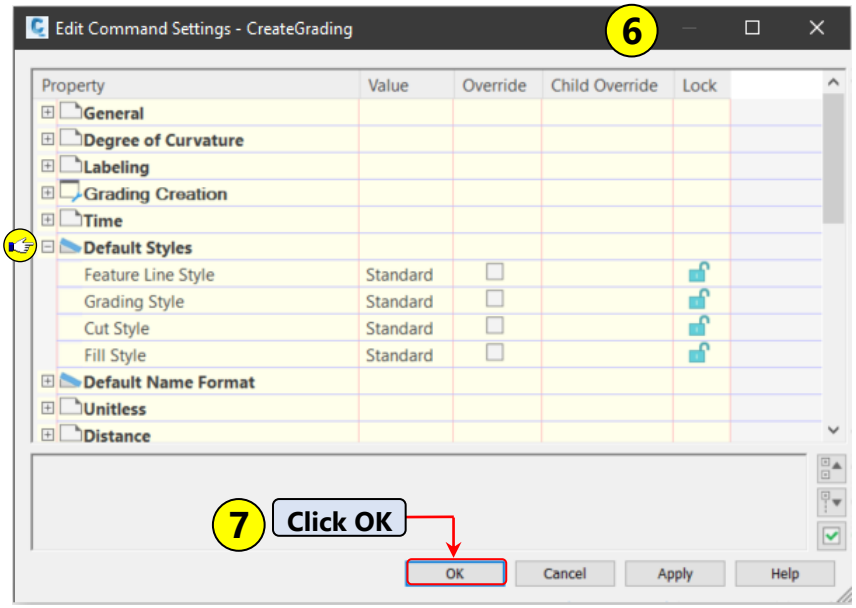
Step 3: **Select** **OK** to close the dialog box.

Step 4: **Expand** the Grading **Commands** by **Selecting** the **+** symbol.

Step 5: **Right Click** on **CreateGrading** and **Select** **Edit Command Settings**. The Edit Command Settings – CreateGrading dialog box will be displayed.



Step 6: **Expand** the **Default Styles** by **Selecting** the **+** symbol.



Step 7: **Select** **OK** to close the dialog box.

Text Styles and Fonts

MDT has implemented Arial as the font to be used for annotation within Civil 3D. This elevates the need to support custom fonts and maintain uniformity throughout MDT and consultants.

MDT - TITLE "Arial/Bold Italic TH = 0.24"

MDT - TITLE SUB "Arial/Bold Italic TH = 0.20"

MDT - HEADING "Arial/Bold Italic TH = 0.12"

MDT - HEADING SUB - Arial/Bold Italic TH = 0.10"

MDT - REGULAR "Arial/Italic TH = 0.06"

MDT - REGULAR SUB "Arial/Italic TH = 0.05"

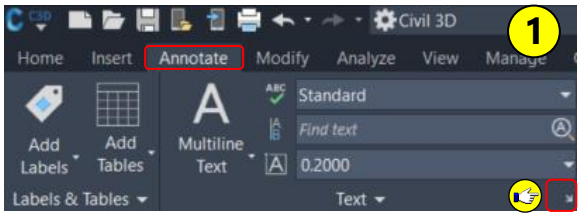
Standard "Arial/Italic TH = 0.06"

MDT LINETYPE "Arial/ItalicTH = 0.06"

MDT BLOCKTEXT "Arial/ItalicTH = 0.06"

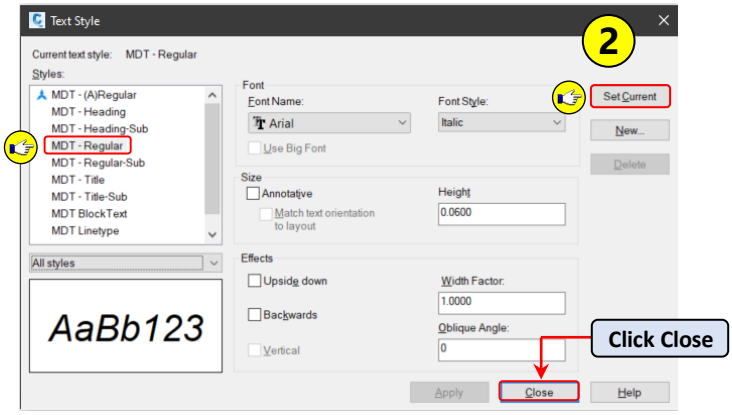
Access text styles and fonts

Step 1: **Navigate** to Annotate tab > **Text** panel, **select** the **arrow symbol** in the bottom right corner.



	Alternatively typing Style at the command line will open the Text Style dialog box.

Step 2: **Select** **MDT – Regular**, **select** **Set Current**, **click** **Close**.



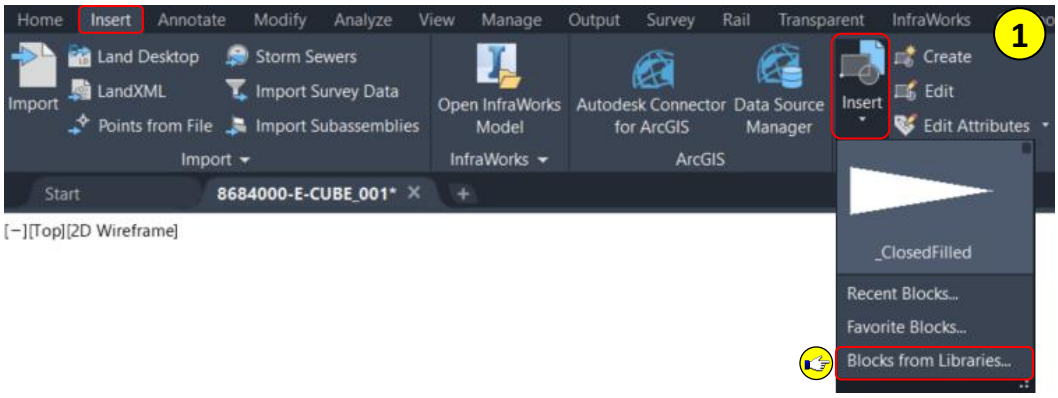
	By setting the text style current, all Single Line and Multiline text commands will use the MDT – Regular text style as default.

Blocks and Libraries

Blocks are named groups of objects that act as a single 2D or 3D object. Blocks can be used for repetitive content, such as title blocks, standard details, and drawing symbols. Civil 3D can leverage blocks within object styles as well. Blocks can be essential in the design and production environment. MDT has created an extensive block library that can be access within Civil 3D.

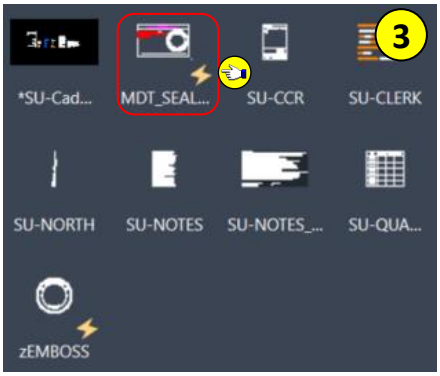
Navigating block libraries

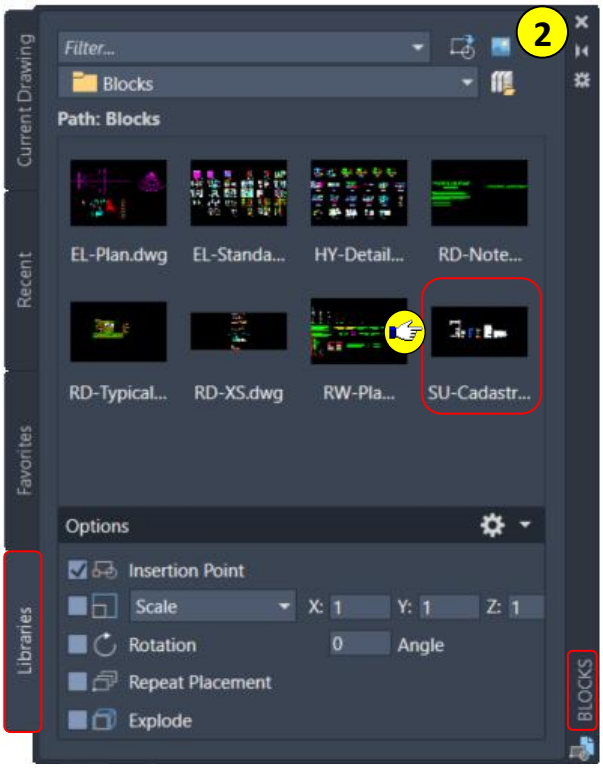
Step 1: **Navigate** to Insert tab > **Blocks** panel, **select Insert**, **select Blocks from Libraries**.



Step 2: **Double-click** on the **SU-Cadastral Notes.dwg** image in the BLOCKS Tool Palette.

Step 3: **Select** the **MDT_SEAL_BLOCK**, **left-click** in **model space** to place the block, **select OK** in the Edit Attributes dialog**.**





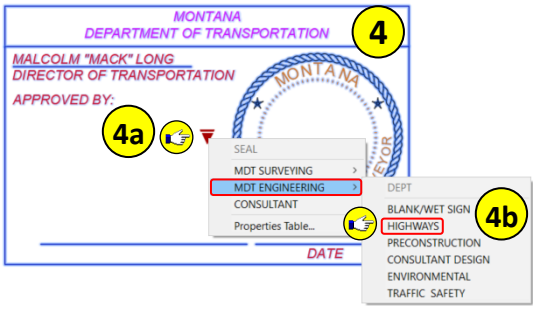
Notice the symbol next to the MDT_SEAL_BLOCK. This symbol represents a dynamic block. Dynamic blocks have additional parameters added to them.

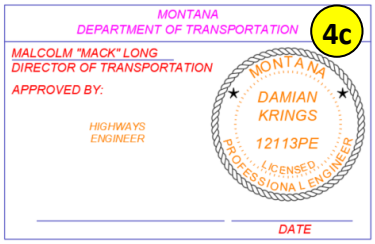
Step 4: Select the **block** to highlight it parameters.

a. Select the **down arrow.**

b. Select MDT ENGINEERING, **select HIGHWAYS**.

c. Highways Engineer information is now displayed.





MDT Styles Templates

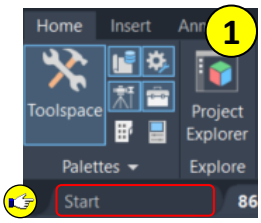
The MDT State Kit contains several styles templates to start a new drawing from. Currently there are three (3) templates to choose from when creating a new drawing. Each template includes styles and settings specific to the functional design groups needs.

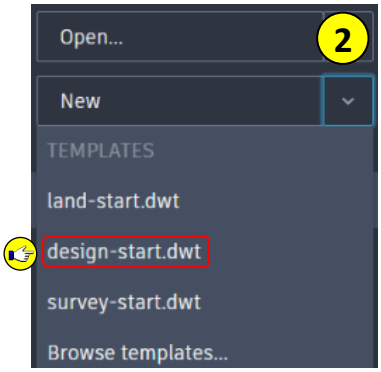
- **design-start.dwt** – Used for creating a non-Cadastral or Survey drawing.
- **land-start.dwt** – Used for creating a Cadastral survey drawing.
- **survey-start.dwt** – Used for creating a Survey drawing.

Creating a new drawing

Step 1: Select the **Start** tab.

Step 2: Select the **arrow** next to New, **select design-start.dwt**.





	Alternatively, the “Browse templates...” can be selected and will display the templates and as well.

Step 3: **Save** and **Name** the drawing: **8684000RDMAP001.dwg**

- C:\mdtapps\Autodesk_Training\201-C3D Fundamentals I\Working

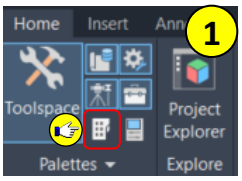
Assemblies

Assemblies are comprised of subassemblies that represent the design section of a corridor model. Assemblies contain a baseline that follows an alignment horizontally and a profile vertically. An Assembly is created by attaching subassemblies to its baseline. The assembly is then applied to a corridor to create a 3D model. The MDT State Kit contains Assemblies and subassemblies specifically created for roadway design.

Where to find the MDT assemblies and subassemblies

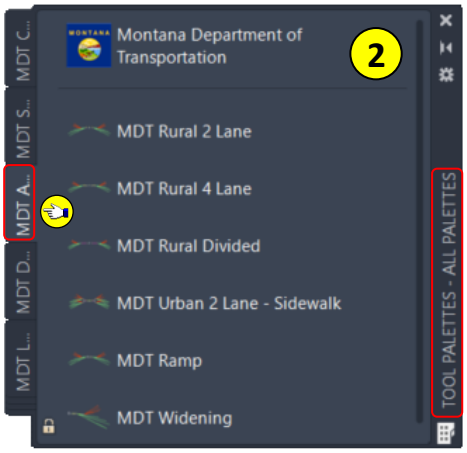
Step 1: Navigate to Home tab > **Palettes** panel, **select Tool Palettes**.

	Selecting Ctrl+3 on the keyboard will open and close Civil 3D Tool Palettes.



Step 2: Select MDT Assemblies tab on the Tool Palettes.

Step 3: Select MDT Subassemblies tab on the Tool Palettes.



Project Management

The primary tools within Civil 3D used for managing, sharing, and accessing a projects data are Data Shortcuts, Data References (DREF) and External References (XREF). The main benefits of using DREF's and XREF's for projects are collaboration and reduced file size.

Data Shortcuts and Data References (DREF)

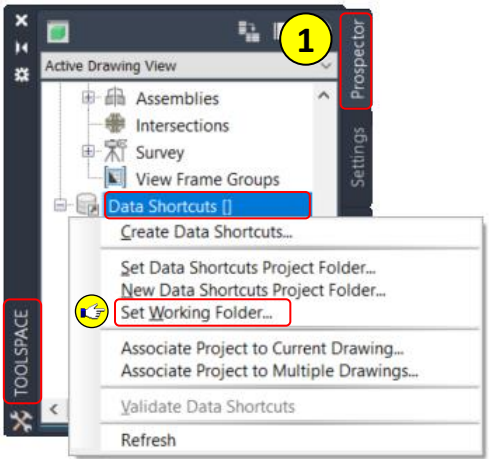
The relationship between data shortcuts and DREF's are data shortcuts provide a direct path to the location of a shareable source object. In a single operation, data shortcuts can be created for multiple objects in a source drawing. The data shortcut is used only for the creation of DREF's.

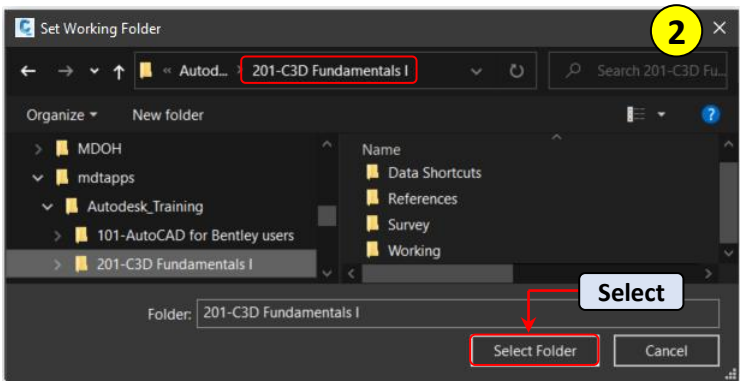
DREF's are a read-only copy of a source object, inserted into a consumer drawing. From the Prospector tab, you can select a shortcut for an object and create a DREF to that object in the active drawing. The DREF maintains an active link to the source object in the source drawing, without relying on the data shortcut.

Working with Data Shortcuts and DREF's

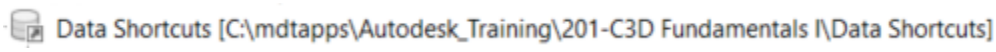
Step 1: **Navigate** to TOOLSPACE > Prospector tab > **Data Shortcuts**, **right click** on **Data Shortcuts**, **select Set Working Folder**.

Step 2: **Browse** to **C:\mdtapps\Autodesk_Training\201-C3D Fundamentals I**, **select Select Folder**.

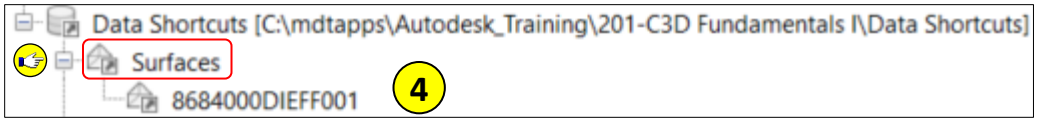




Step 3: **Verify** the Data Shortcuts **path** has been set.

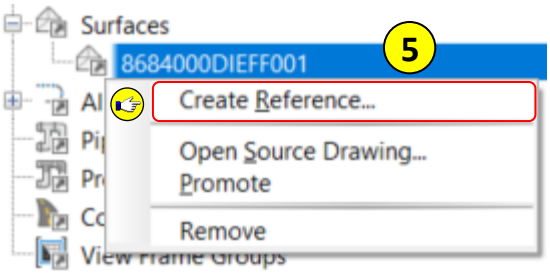


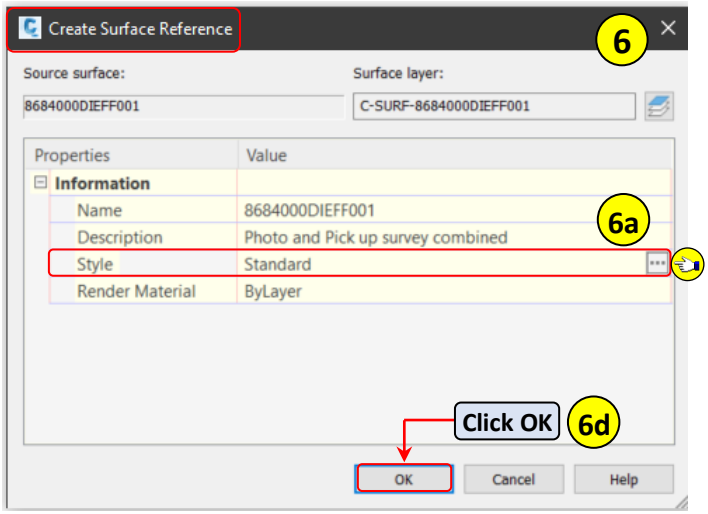
Step 4: **Navigate** to Data Shortcuts > **Surfaces**, **expanded Surfaces**.

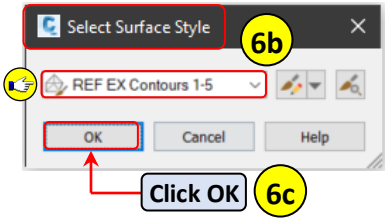


Step 5: **Right click** on **8684000DIEFF001**, **select** **Create Reference**.

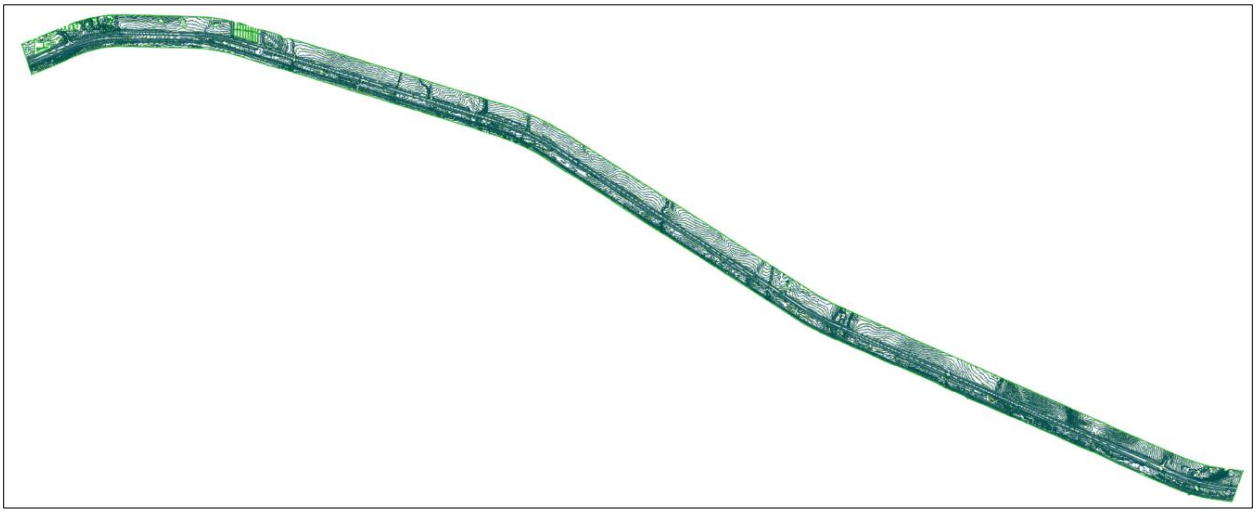
Step 6: In the Create Surface Reference dialog box, **change** the Style to **REF Ex Contours 1-5**, **select** **OK** in the Select Surface Style dialog box, **select** **OK** in the Create Surface Reference dialog box.



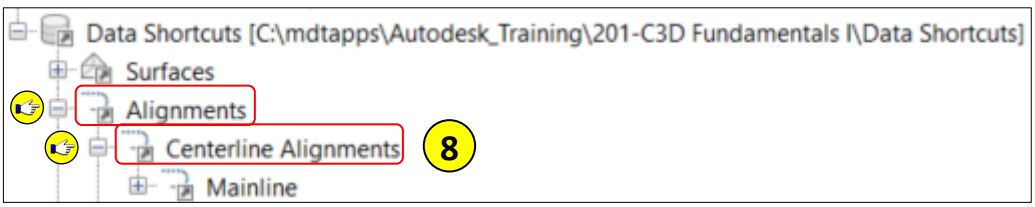




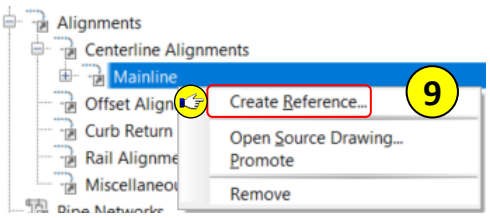
Step 7: **Type** **ZE**, **select** **Enter** on the keyboard to Zoom Extents.



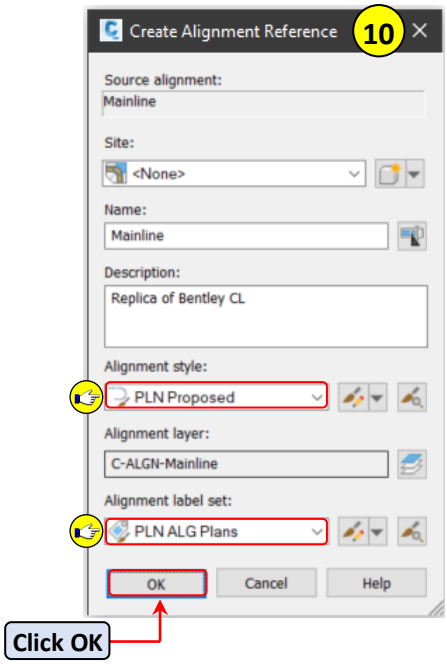
Step 8: **Navigate** to Data Shortcuts > **Alignments**, **expanded** **Centerline Alignments**

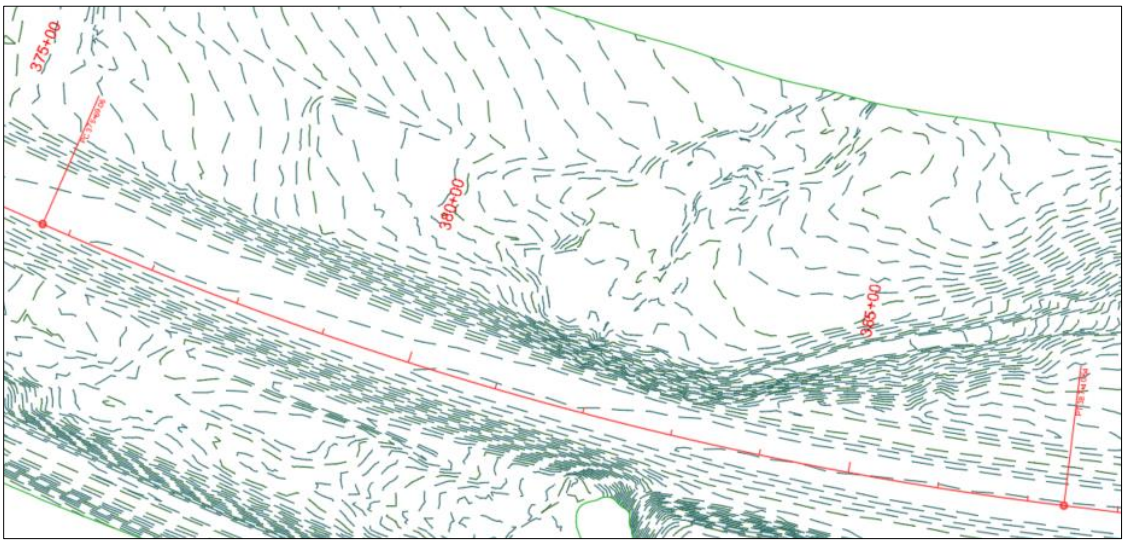


Step 9: **Right click** on **Mainline**, **select Create Reference**.



Step 10: In the Create Alignment Reference dialog box, **change** the Style to **PLN Proposed**, change the label set to PLN ALG Plans, **select OK**.

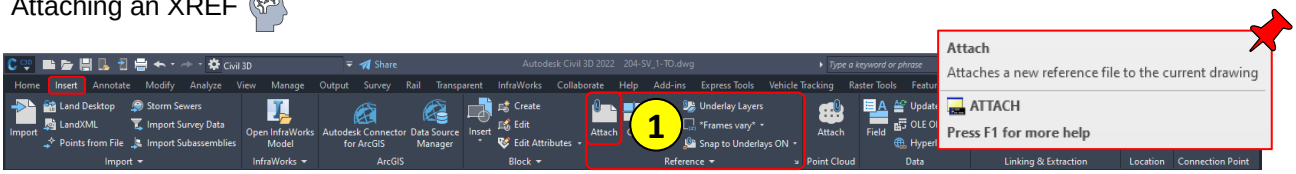




External References (XREF)

External References (XREF) are links to the model space of a specified drawing file. Changes made to the referenced drawing are automatically reflected in the current drawing when it's opened or if the XREF is reloaded. XREF's are a 2D view of the external file to be used as a visual aid or background. There are other objects beside drawing files (DWG) that can be referenced which include Image files, DWF, DGN, PDF, Point Cloud, and Coordination models (NWC & NWD).

Attaching an XREF

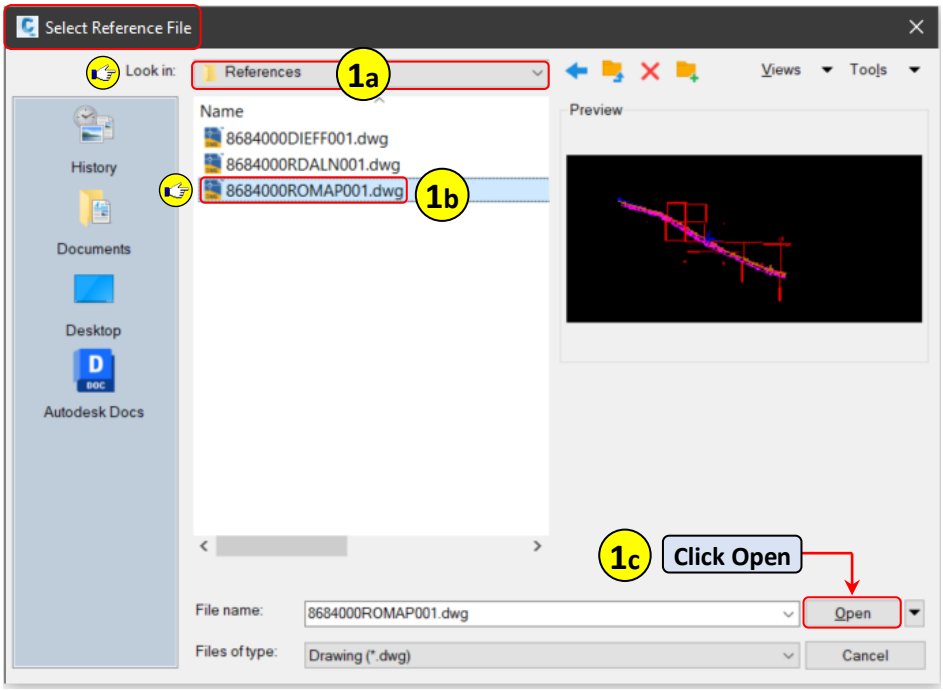


Step 1: **Navigate** to the **Insert** tab > Reference panel > **Select Attach**.

a. **Navigate** to C:\mdtapps\Autodesk_Training\201-C3D Fundamentals I**References**

b. **Select 8684000ROMAP001.dwg**

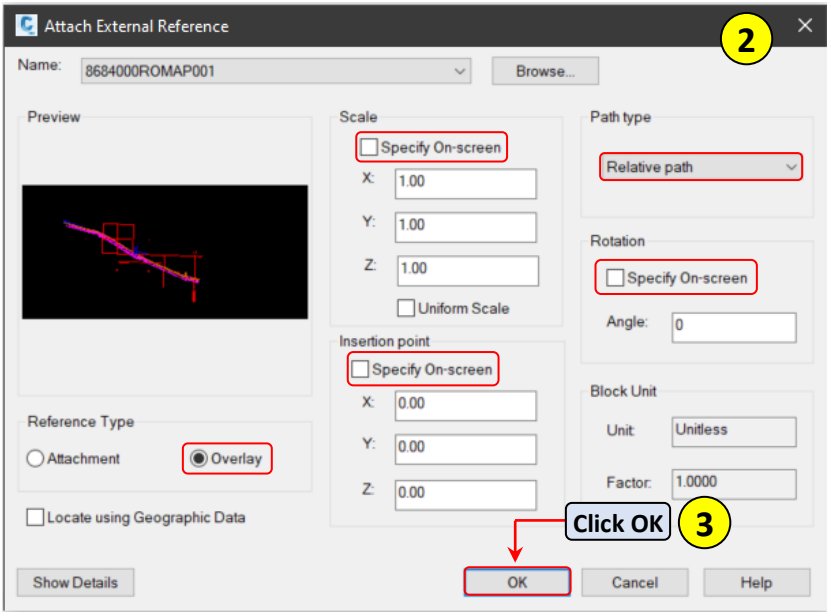
c. **Click Open**.

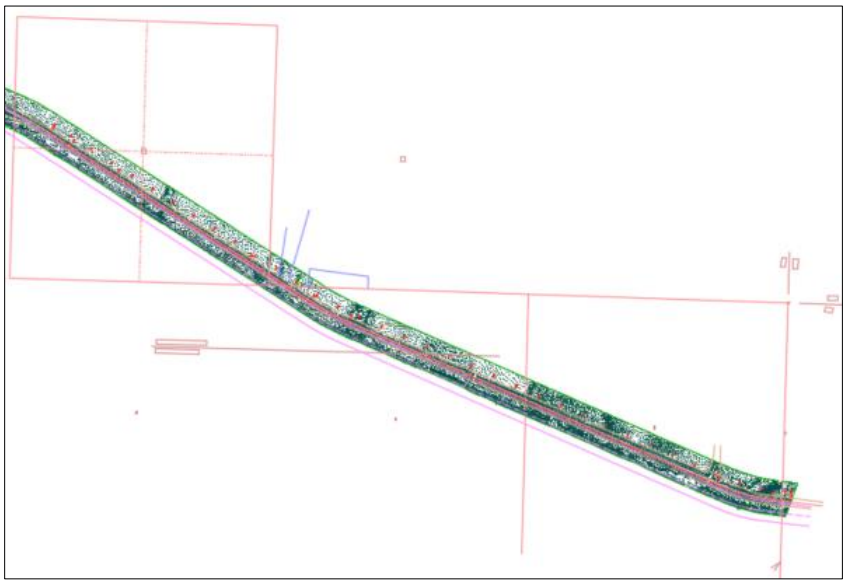


Step 2: From the **Attach External Reference** dialog box, **verify** the following **parameters**:

- **Reference Type** = Overlay
- **Scale** = Specify On-screen is unchecked
- **Insertion point** = Specify On-screen is unchecked
- **Path type** = Relative path
- **Rotation** = Specify On-screen is unchecked

Step 3: **Click OK**.





Alignments

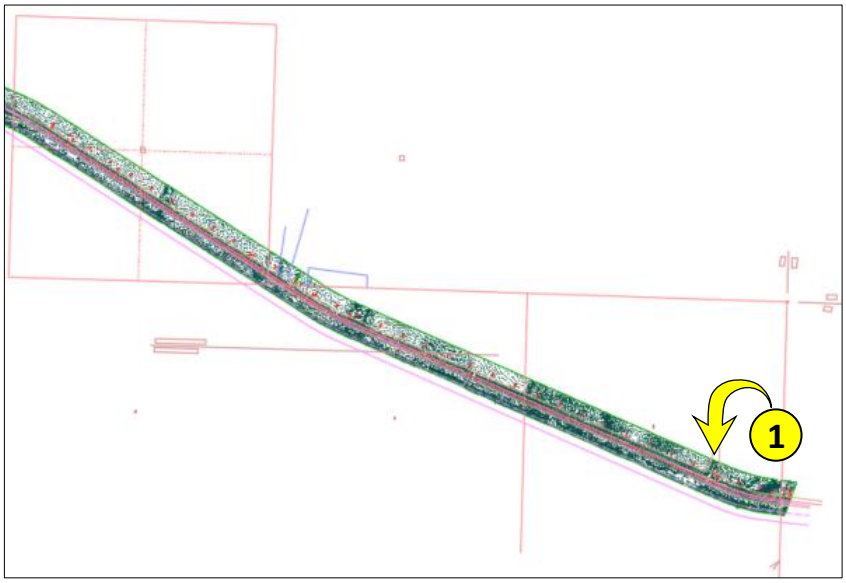
Civil 3D Alignments are typically used for horizontal baselines for Corridors, Profiles or Pipe Networks. They can comprise of lines, arcs, or spirals. Alignments can be created in various ways, the most common methods are utilizing the Alignment Creation Tools or from objects like polylines, arcs, spirals, network parts, pressure networks, corridors or an existing alignment. When creating an alignment from an existing object polylines, arcs and lines can be used from External References (XREF) as well.

Create Alignment from Objects

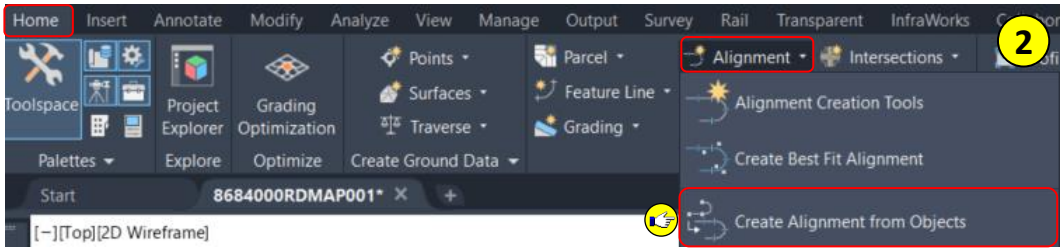
One of the quickest methods to create an alignment is from previously created objects. If the objects are lines, arcs and spirals created in the drawing, Civil 3D will combine these objects into an alignment and provide an option to delete the existing objects. This is not an option when created from XREF objects.

Getting Started

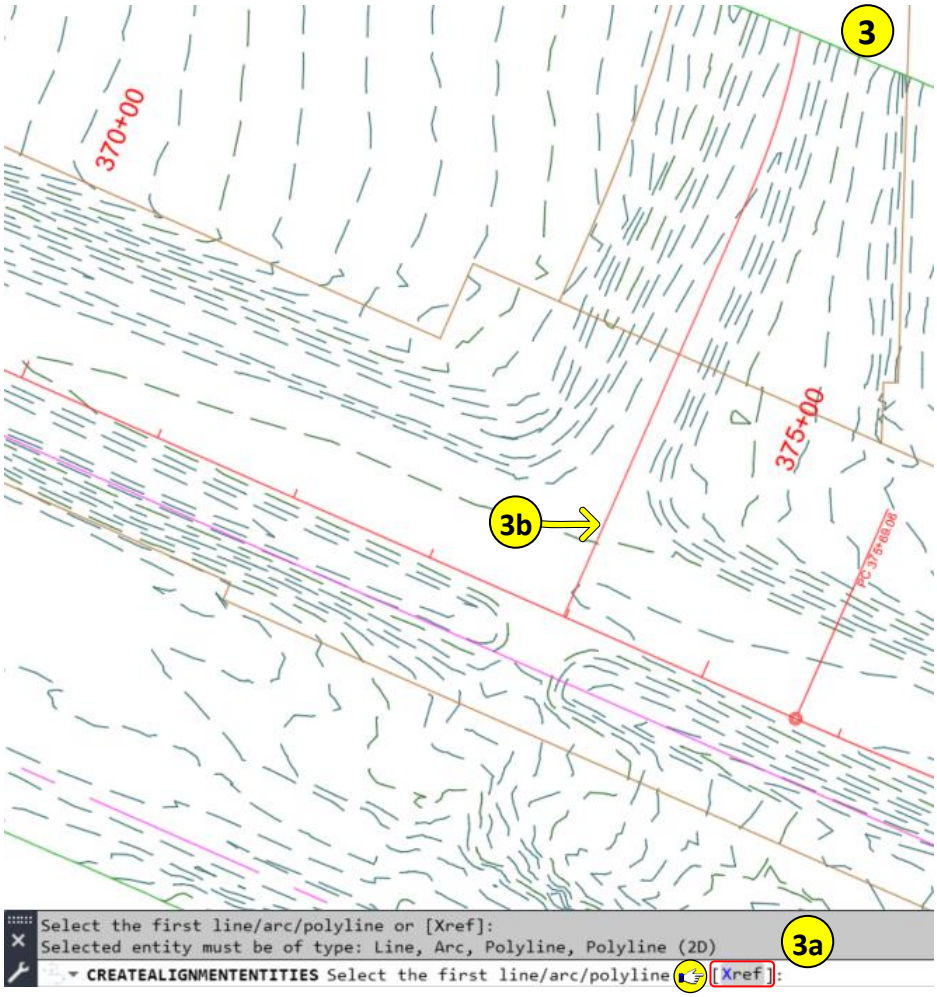
Step 1: **Zoom** to station **375+00** of the Mainline Alignment.



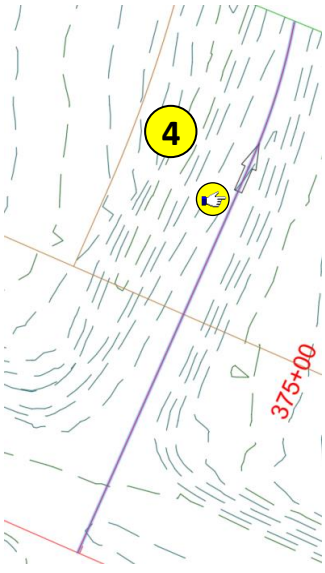
Step 2: **Navigate** to Home tab > Create Design panel > **Alignment**, **select** **Create Alignment from Objects**.



Step 3: **Select** **Xref** from the command line, **select** the **red line** representing the centerline of the access road, **press** **Enter** on the keyboard.



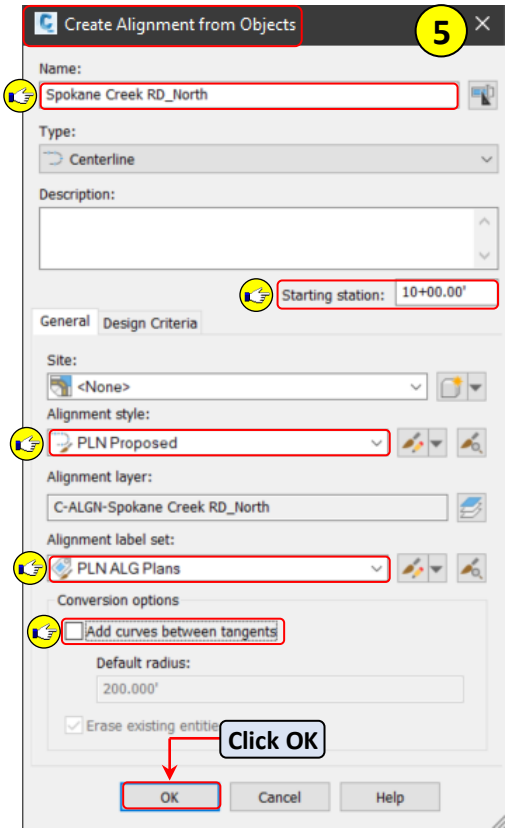
Step 4: **Select** **Enter** on the keyboard to accept the alignment direction. This will start the alignment stationing beginning at the Mainline alignment.

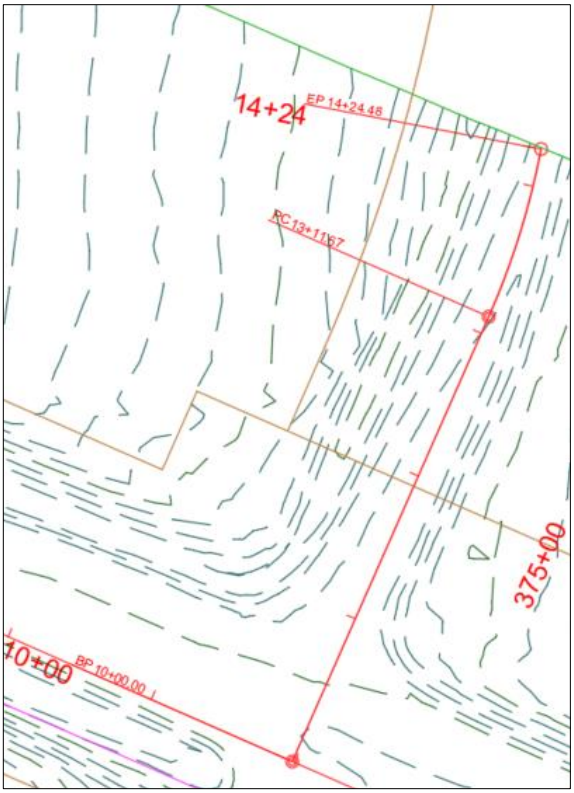


	If the Alignment direction is incorrect, select Reverse from the command line. After the alignment is created the alignment direction can be reversed in the alignment properties as well.

Step 5: From the Create Alignment from Object dialog box, **change** the following **parameters**, **click OK**.

- **Name:** Spokane Creek Rd_North
- **Starting Station:** 10+00
- **Alignment Style:** PLN Proposed
- **Alignment label set:** PLN ALG Plans
- **Conversion options:** Uncheck Add curves between tangents.

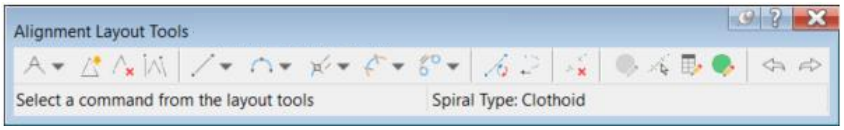




Alignment Creation Tools

The Alignment Creation Tools is a toolbar comprised of alignment creation and editing commands. Once an alignment has been named, assigned a style and label set, the toolbar is visible on the workspace. The Alignment Creation Tools can be invoked to edit or add to an alignment by selecting the alignment and choosing the Geometry Editor from the contextual ribbon. A few of the tools for creating an alignment include Tangent-Tangent (no Curves), Tangent-Tangent (With Curves), line, curve, and spiral. The editing tools include inserting a PI, deleting a PI, convert AutoCAD line and arc, reverse sub-entity direction, delete sub-entity, and alignment grid view. Undo and Redo are also options available.

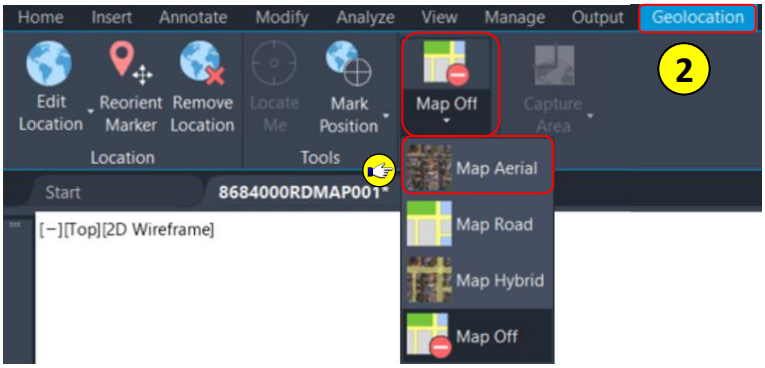
When using the line, arc or spiral tools there are options to create the entities as a fixed, floating or free entity. Fixed entities not dependent on any other entity to define its geometry or to maintain tangency, but its length can be affected by another entity that is attached to it. Floating entities are always tangent to the entity it is attached to. A floating entity cannot be attached to a free entity, but a free entity can be attached to a floating entity. Free entities are defined by specified parameters and are always tangent to an entity before and an entity after. Free entities are dependent on two other entities to define its geometry.

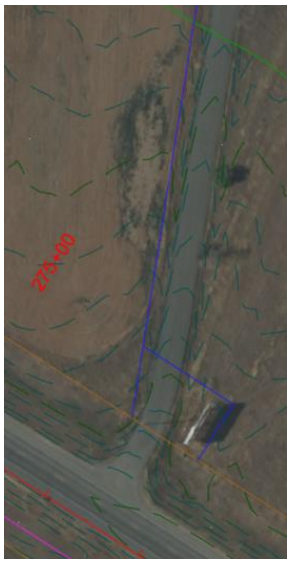


Create an alignment with Layout Tools.

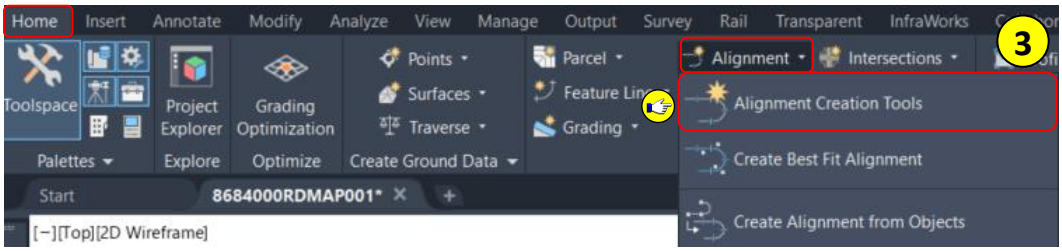
Step 1: **Zoom** to station **275+00** of the Mainline Alignment.

Step 2: Navigate to Geolocation tab > **Online Map** panel, **select Map Aerial**.



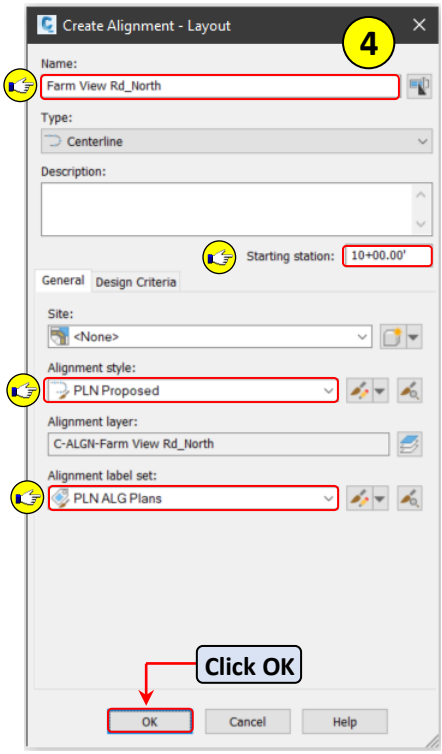


Step 3: Navigate to Home tab > Create Design panel > **Alignment**, **select Alignment Creation Tools**.

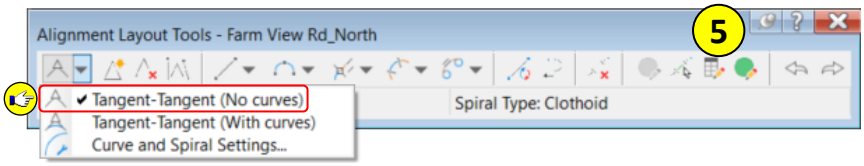


Step 4: From the Create Alignment from Object dialog box, **change** the following **parameters**, **click OK**.

- **Name:** Farm View Rd_North
- **Starting Station:** 10+00
- **Alignment Style:** PLN Proposed
- **Alignment label set:** PLN ALG Plans



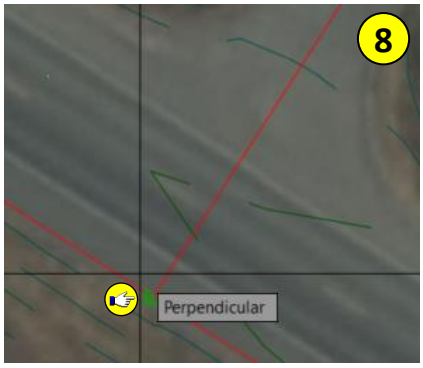
Step 5: Select Tangent-Tangent (No Curves) from the Alignment Layout Tools toolbar.

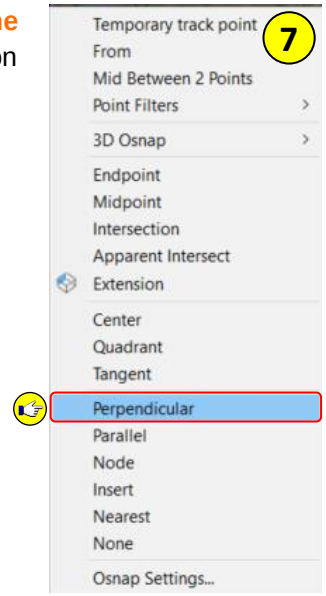


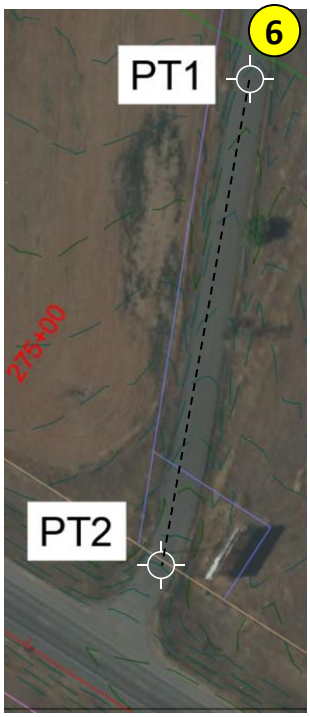
Step 6: When prompted to Specify start point, **select PT1**, when prompted to Specify next point, **select PT2**.

Step 7: When prompted to Specify next point, **hold Shift** down on the keyboard and **Right click** on the mouse, **select Perpendicular**.

Step 8: **Move** the mouse towards the **Mainline** alignment until the Perpendicular icon appears, **left click** on the **mouse**.

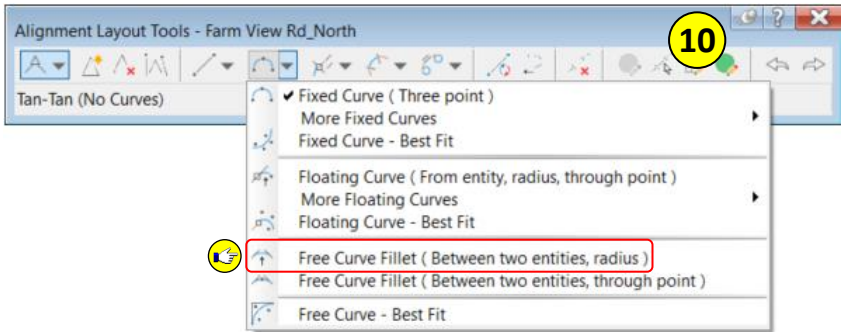




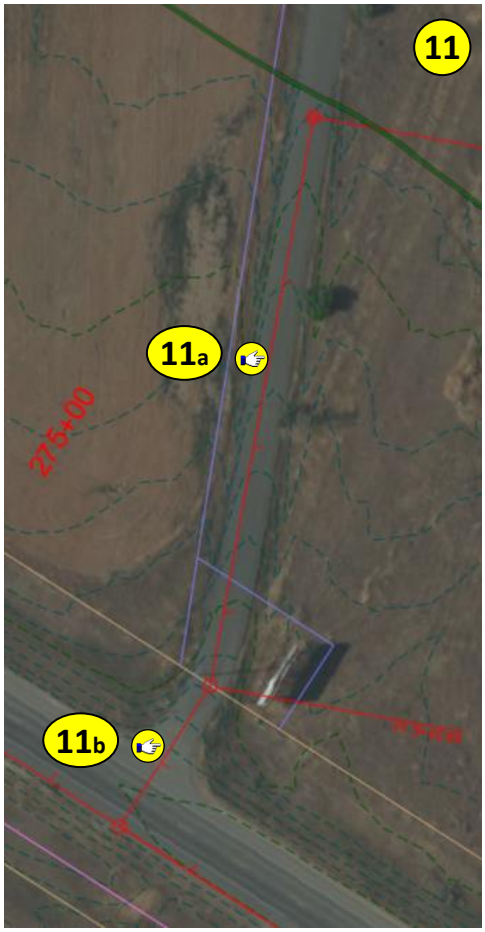


Step 9: **Select Enter** on the keyboard to end the command.

Step 10: **Select Free Curve Fillet (Between two entities, radius)** from the Alignment Layout Tools tool bar.

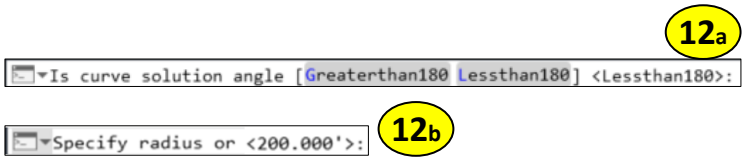


Step 11: **Select** the **northerly alignment tangent**, when prompted to Select first entity, **select** the **southerly alignment tangent**, when prompted to Select next entity.



	The selection order of the alignments entities needs to follow the stationing.

Step 12: **Press** **Enter** on the keyboard to accept the default Lessthan180, **press** **Enter** to accept the default radius of 200.00'.



Step 13: **Press** **Esc** on the keyboard to end the command.

Reverse Alignment Direction

In some cases, it may be necessary to reverse the direction of an alignment. Civil 3D has a Reverse Direction tool for alignments. Once the tool is used the alignment, alignment stationing, and any dependent objects, like profiles and corridors, will reverse as well.

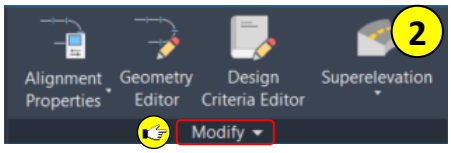
Reversing an alignments direction

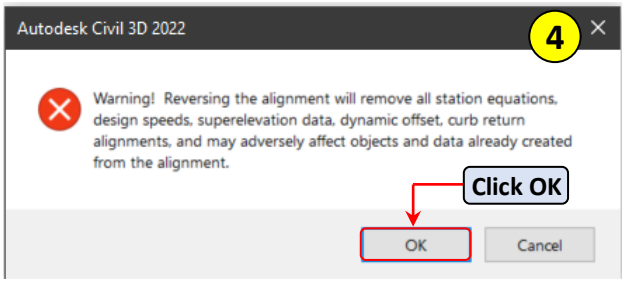
Step 1: **Select the** **Alignment** Farm View Rd_North.

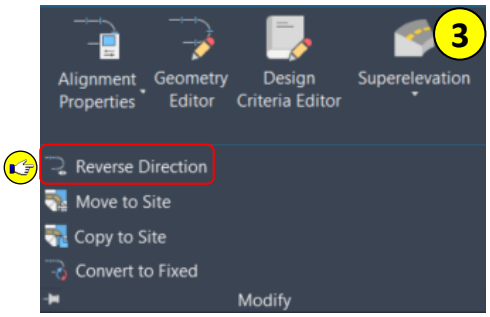
Step 2: **Navigate** to **Modify** on the contextual ribbon, **select** the **arrow** next to Modify.

Step 3: **Select** **Reverse Direction**.

Step 4: **Click** **OK** from the warning box.

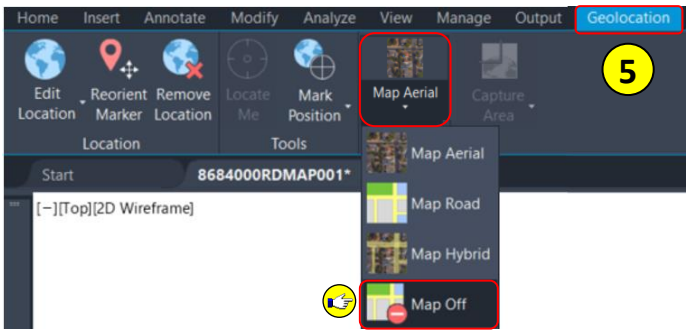


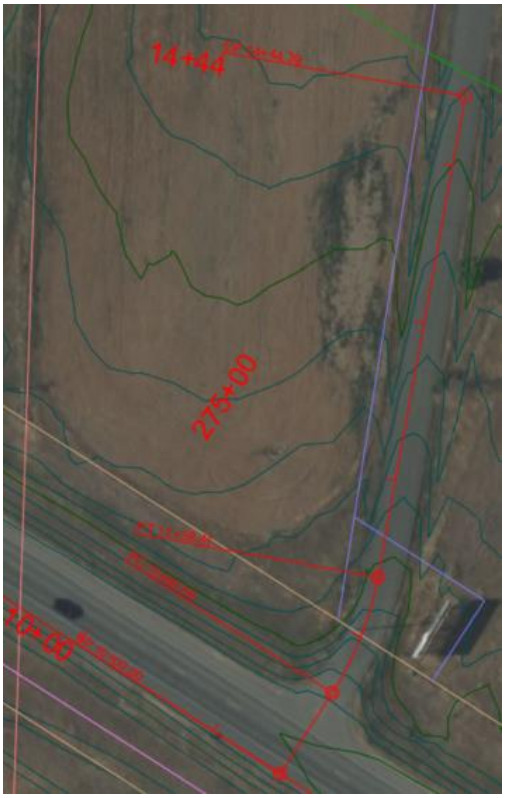




	Notice the Alignment has been reversed and the stationing starts at the intersection of the Mainline Alignment.

Step 5: **Navigate** to Geolocation tab > **Online Map** panel, **select** **Map Off**.



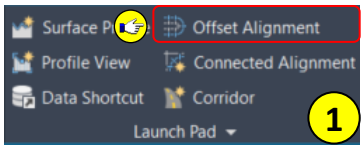


Offset Alignments

Civil 3D has the ability to create an offset Alignment from a previously created alignment. Multiple offset alignments can be created in a single operation. An offset profile for each offset alignment can also be created at the same time.

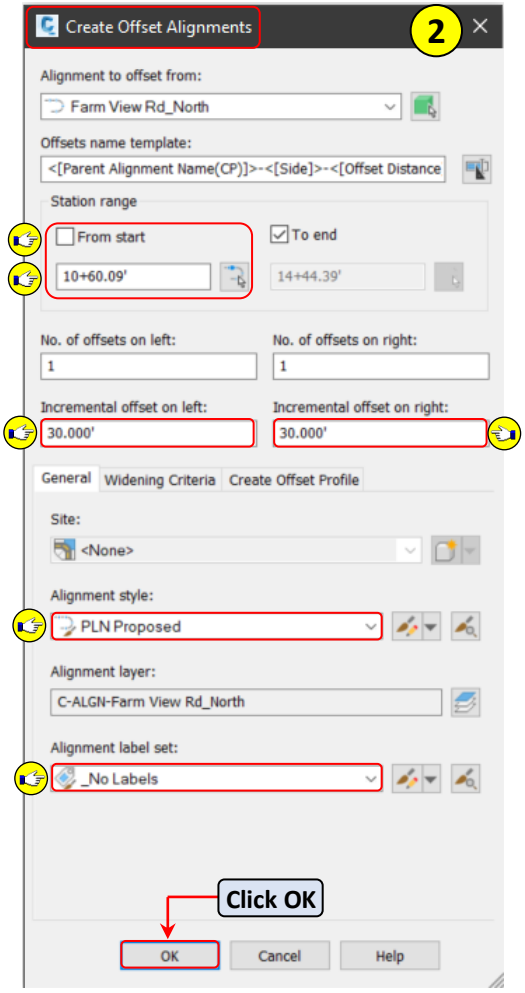
Creating an Offset Alignment.

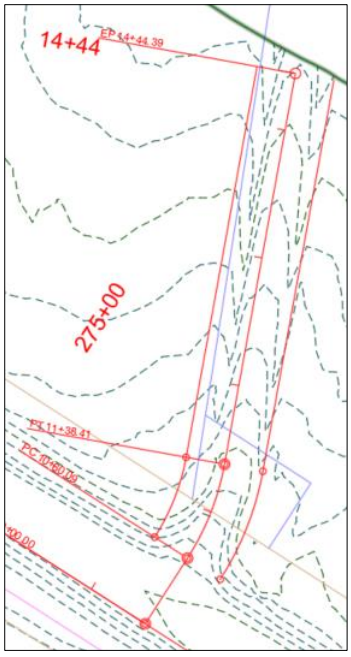
Step 1: **Select** the **Farm View Rd. alignment**, **navigate** to the **Launch Pad** panel on the contextual ribbon, **select Offset Alignment**.



Step 2: From the Create Offset Alignments dialog box, **change** the following **parameters**, **click OK**.

- **From Start** - 10+60.09
- **Incremental offsets on left** - 30
- **Incremental offsets on right -** 30
- **Alignment style -** PLN Proposed
- **Alignment label set** - _No Labels





The offset alignments are dynamically attached to the parent alignment (Farm View Rd.). If the parent alignments horizontal position changes, the offset alignments will change as well.

Add Widening

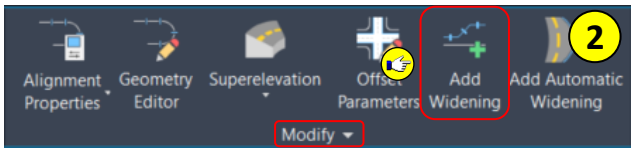
There are times when adding widening to an offset alignment are needed. Approaches, maintenance turn outs, lane tapers and lane additions are a few examples. Civil 3D's Add Widening tool is used for these scenarios. There is a choice to create a new alignment for the widening as well.

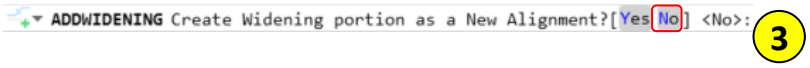
Adding widening to an offset alignment.

Step 1: **Select** the **right offset alignment** for Farm View Rd. alignment.

Step 2: **Navigate** to the **Modify** panel on the contextual ribbon, **select** **Add Widening**.

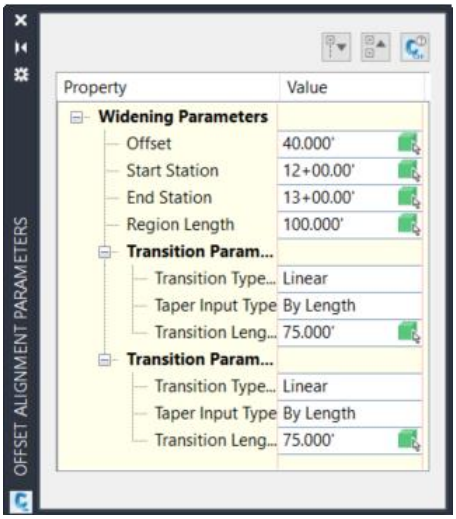
Step 3: **Select** **No** from the command line when prompted to Create Widening portion as a New Alignment?.

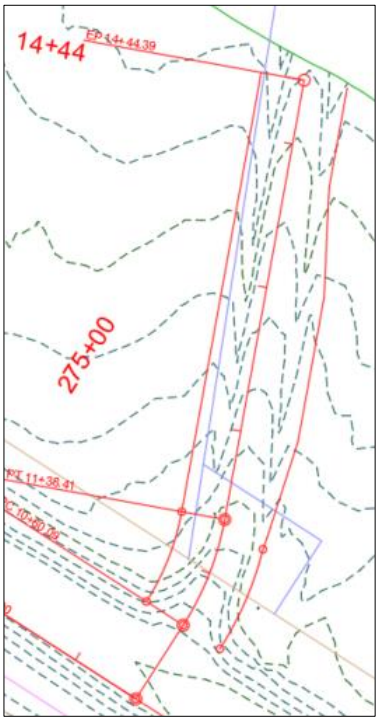




Step 4: **Type** **1200**, when prompted for the start station, **type** **1300** when prompted for the end station.

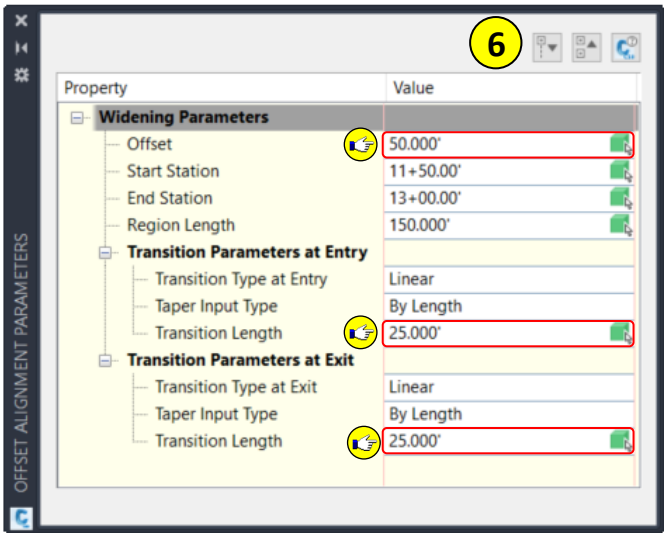
Step 5: **Type** **40** when prompted for the widening offset.

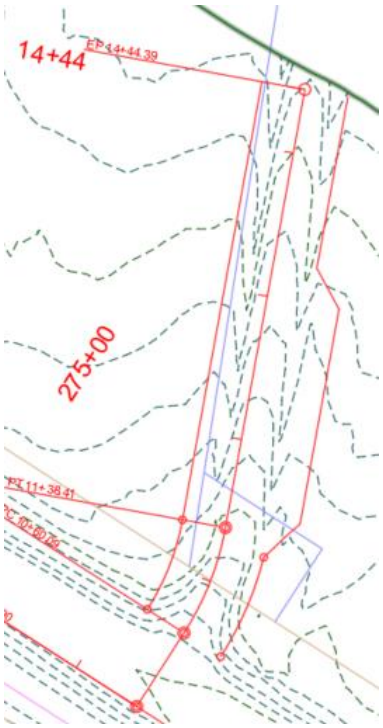




Step 6: **:** From the Offset Alignment Parameters tool palette, **change** the following **parameters**, **select Esc**.

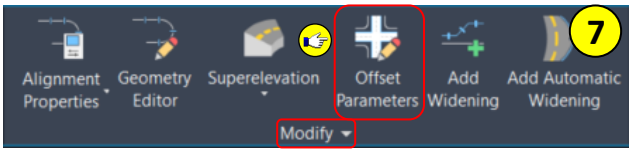
- **Offset** – 50
- **Entry Transition Length** – 25
- **Exit Transition Length** - 25



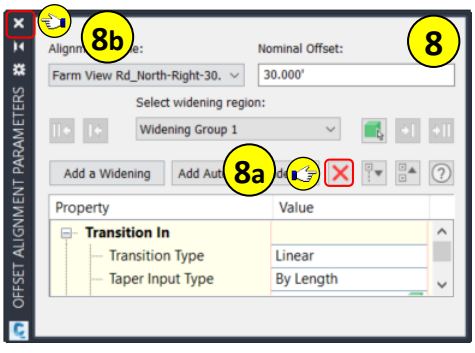


To open the Offset Alignment Parameters tool palette for additional edits, select the offset alignment, select Offset Parameters from the contextual ribbon.

Step 7: Select the **offset alignment** with widening applied, **navigate** to the **Modify** panel on the contextual ribbon, **select Offset Parameters**.



Step 8: Select the red **X** to delete the widening, **close** the **Offset Alignment Parameters** tool palette.



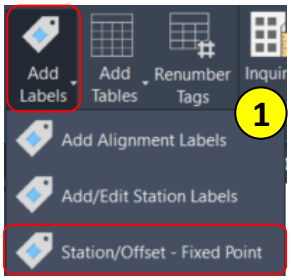
Labels

Alignments can be labeled with a label set during the creation of the alignment or after it has been created. Label sets can display the major and minor stationing along the alignment, geometry points, station equations, design speeds, profile critical points, and superelevation critical points. Alignment labels are dynamic and update when the alignments geometry changes. There are additional labeling commands for alignments as well.

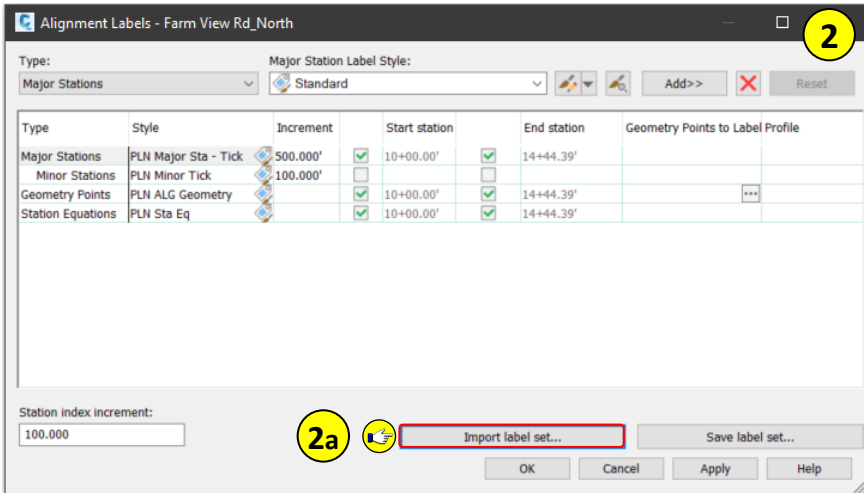
- **Station/Offset – Fixed Point** – Labels a station and offset of a user specified point either on or adjacent to an alignment.
- **Station/offset** – Labels a station and offset of a user specified station and offset.
- **Single Segment** – Labels an individual user selected line, curve or spiral.
- **Multiple Segment** – Labels all lines, curves, and spirals of an alignment.
- **Point of Intersection** – Labels an individual user selected Point of Intersection (PI).
- **Multiple Point of Intersection** – Labels all Point of Intersections (PI) of an alignment.

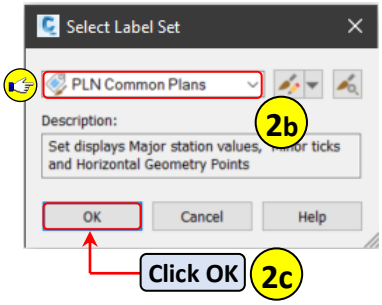
Labeling an Alignment

Step 1: **Select** the **Farm View Rd** alignment, **navigate** to Labels & Tables panel > **Add labels**, **select** **Add/Edit Station Labels**.

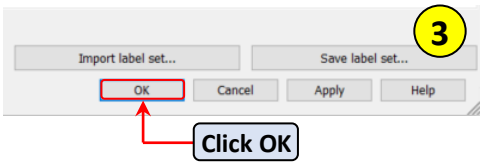


Step 2: **Select** **Import label Set**, **select** **PLN Common Plans**, **Click** **OK**.





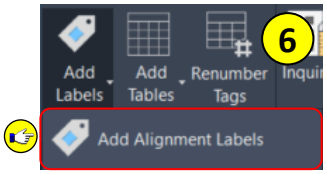
Step 3: **Click** **OK** in the Alignment labels dialog box.

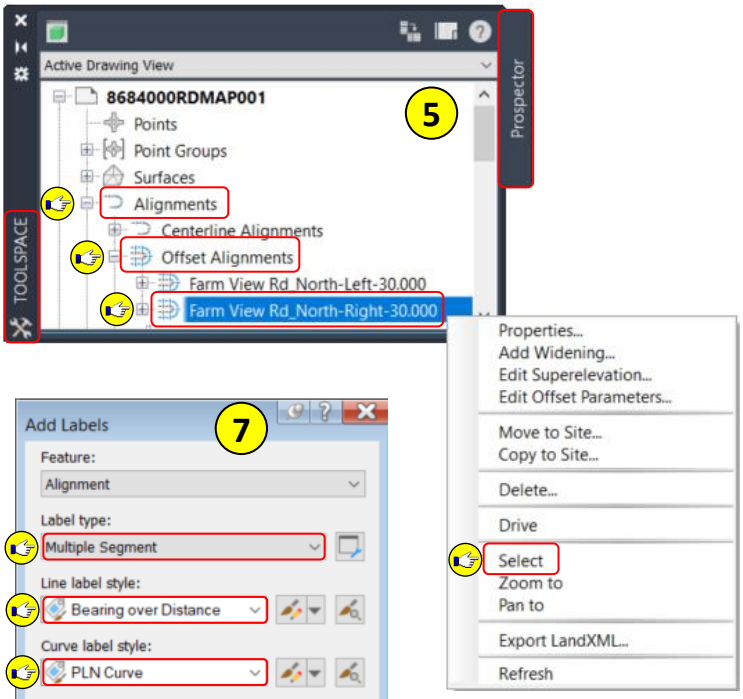


Step 4: **Select** **Esc** to unselect the Farm View Rd. Alignment.

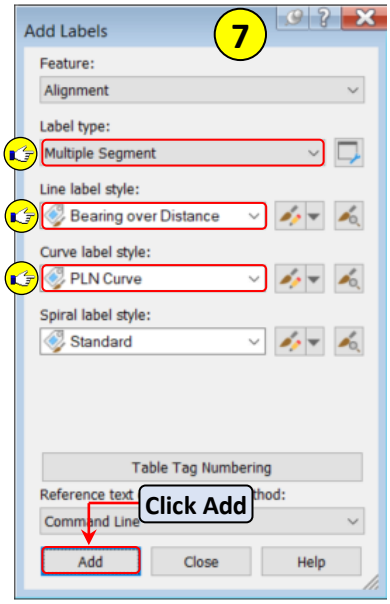
Step 5: **Navigate** to TOOLSPACE > Prospector, **expand** **Alignments**, **expand** **Offset Alignments**, **right click** on **Farm View RD_North-Right-30.000**, **select** **Select**.

Step 6: **Navigate** to Labels & Tables panel > **Add labels**, **select** **Add Alignment Labels**.



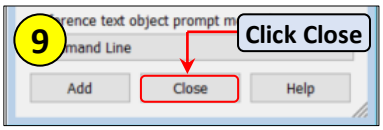


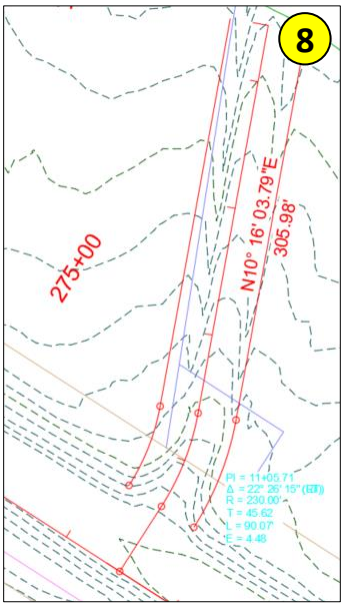
Step 7: From the Add Labels dialog Box, **change** the following **parameters, click** **Add**.



Step 8: **Select** **Farm View RD_North-Right-30.000** Alignment.

Step 9: **Click** **Close** on the Add labels dialog box.



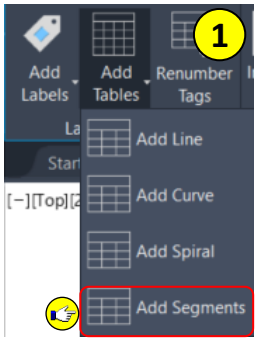


Tables

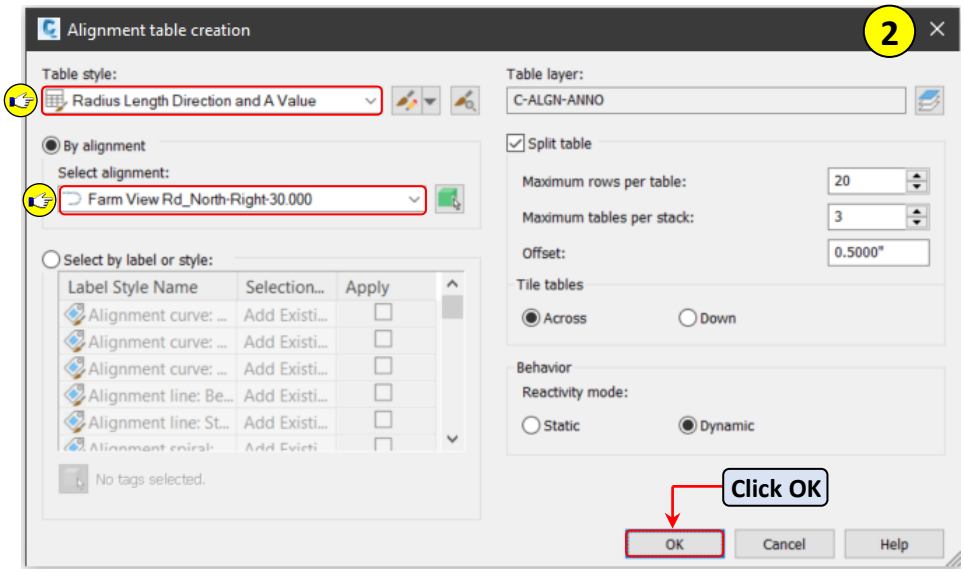
Tables can be created to present Alignment data in an organized format of rows and columns. Once an Alignment is labeled, tables and tag labels can be generated to reduce clutter and increase readability. Tables can be set to be Static or Dynamic to the Alignment.

Create an Alignment Table

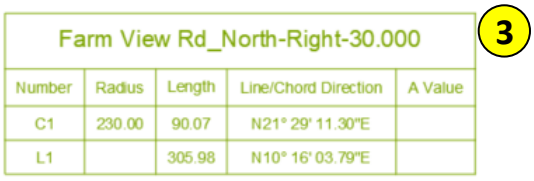
Step 1: Select Farm View RD_North-Right-30.000 Alignment, **navigate** to Labels & Tables panel > **Add tables**, **select Add Segments**.

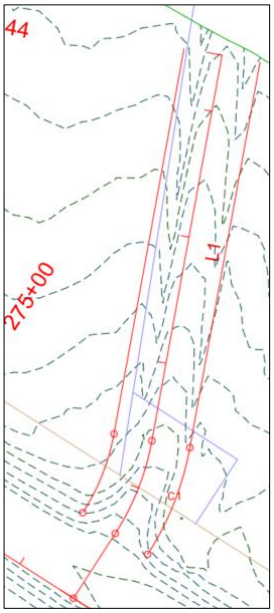


Step 2: From the Alignment table creation dialog Box, **change** the following **parameters, click OK**.



Step 3: Select a **point** within the drawing workspace to place the table.





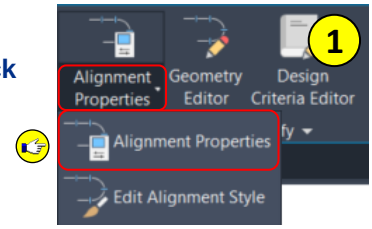
Superelevation

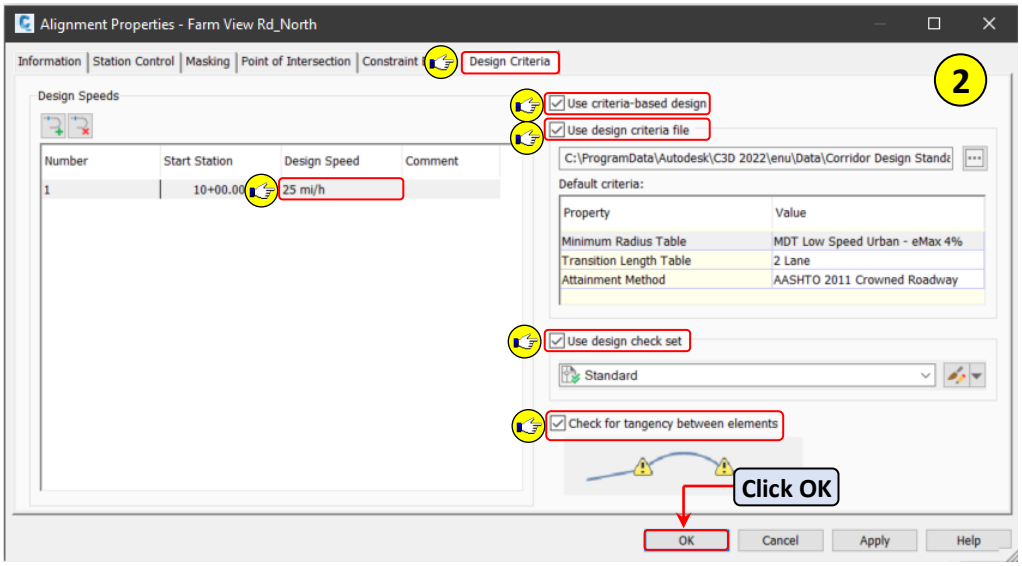
Calculating superelevation within Civil 3D is a fairly simple process. Once the Alignment is created that contains a curve segment, superelevation can be applied to it. The superelevation parameters should be calculated prior to building a corridor. Superelevation can be calculated for divided or undivided roadways, and both symmetric and non-symmetric roadways within the superelevation wizard. After the superelevation is calculated, the parameters can be viewed and edited within the tabular view and a superelevation view can be created as well.

Calculating Superelevation

Step 1: **Select** **Farm View Rd.** Alignment, **navigate** to Modify panel > **Alignment Properties**, **select** **Alignment Properties**.

Step 2: Select Design Criteria tab, **change** the following **parameters, click** **OK**.

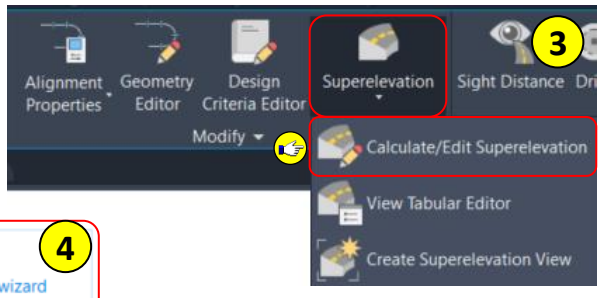


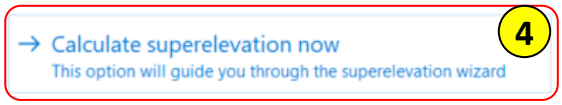


	Multiple design speeds can be added to an alignment by selecting the add button and changing the start station. Design speeds can be deleted by selecting the delete button .

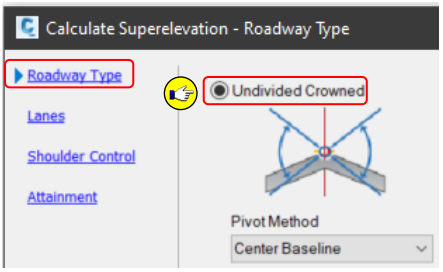
Step 3: **Navigate** to Modify panel > **Superelevation**, **select** **Calculate/Edit Superelevation**.

Step 4: **Select** **Calculate superelevation now** in the Edit Superelevation – No Data Exists dialog box.

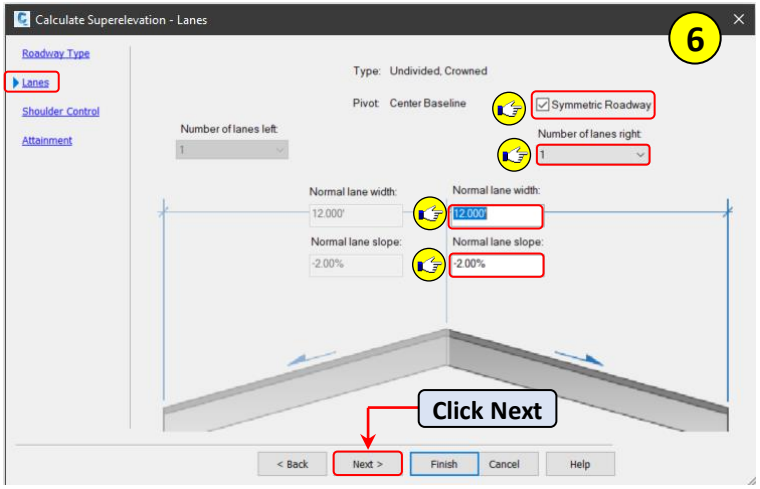




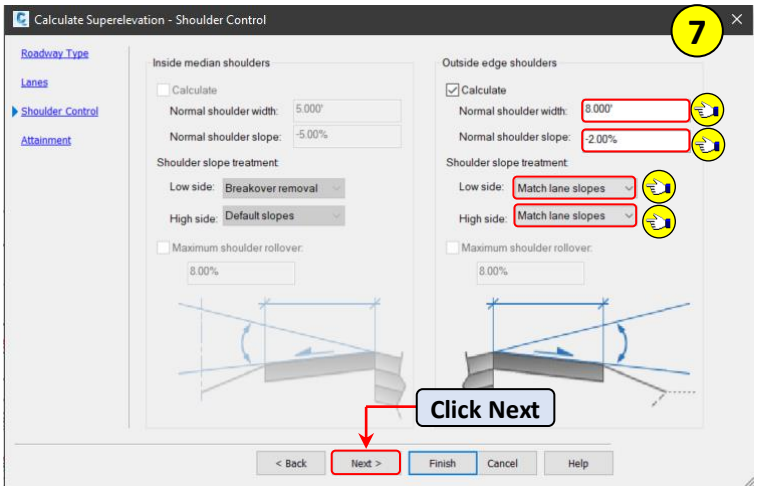
Step 5: Select Undivided Crowned for the Roadway Type, **select Next**.



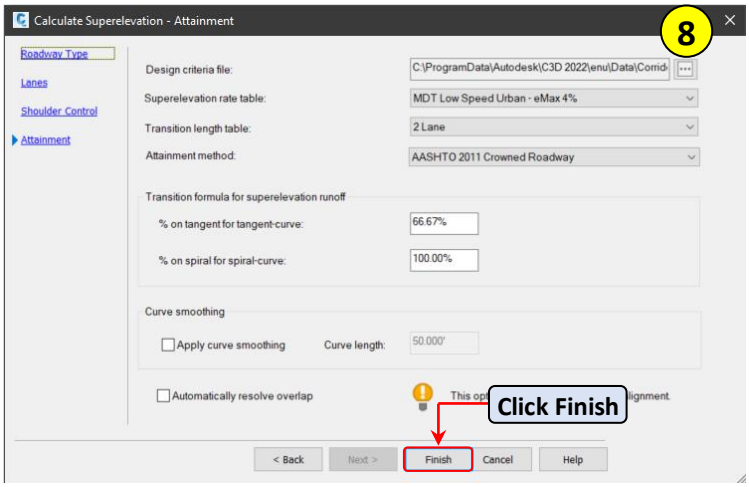
Step 6: Verify the following Lanes **parameters**, **select Next**.



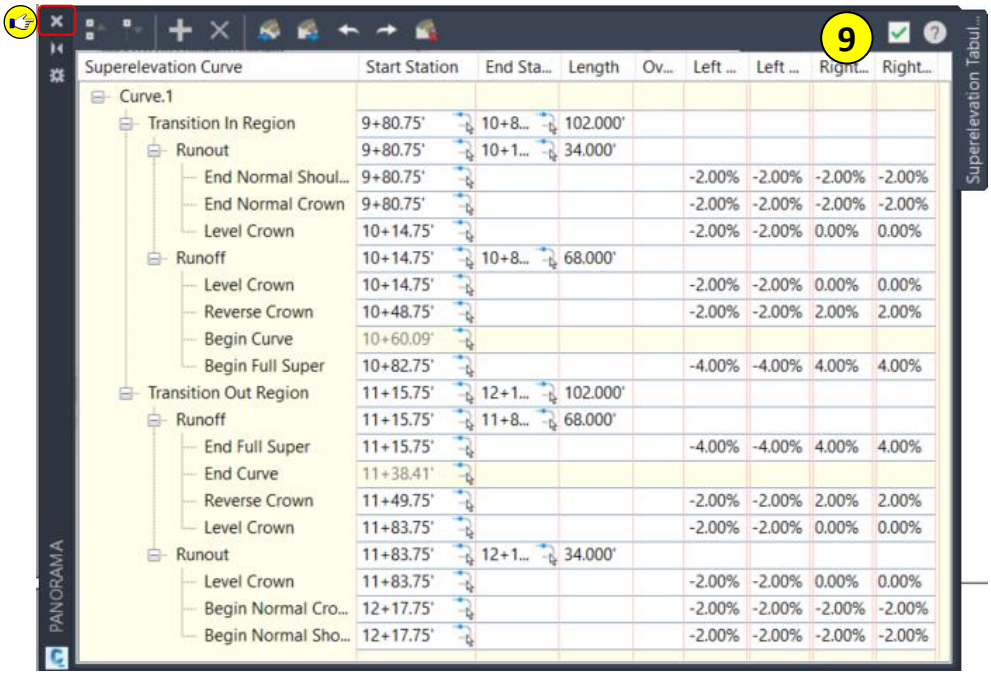
Step 7: Edit the following Shoulder Control **parameters**, **select Next**.



Step 8: Select Finish.



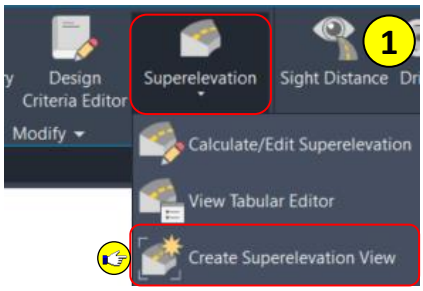
Step 9: **Review** and **close** the **Superelevation Tabular Editor**.



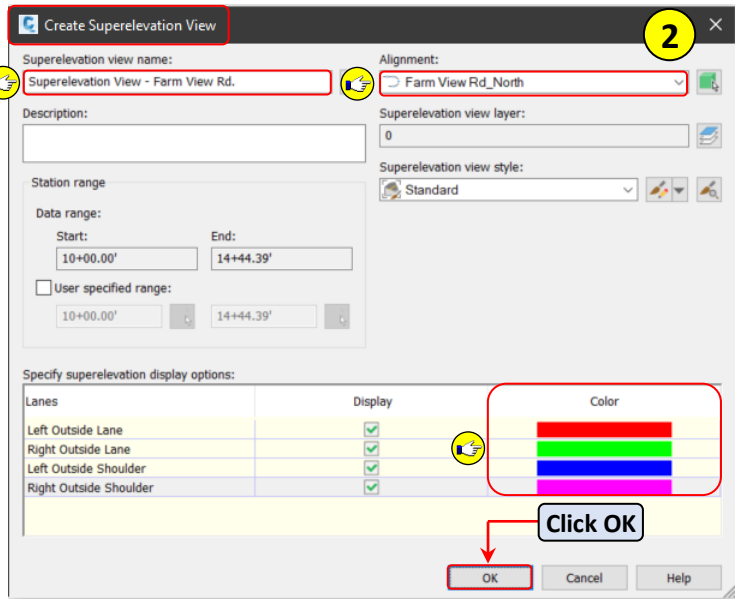
Superelevation View

Creating a Superelevation view

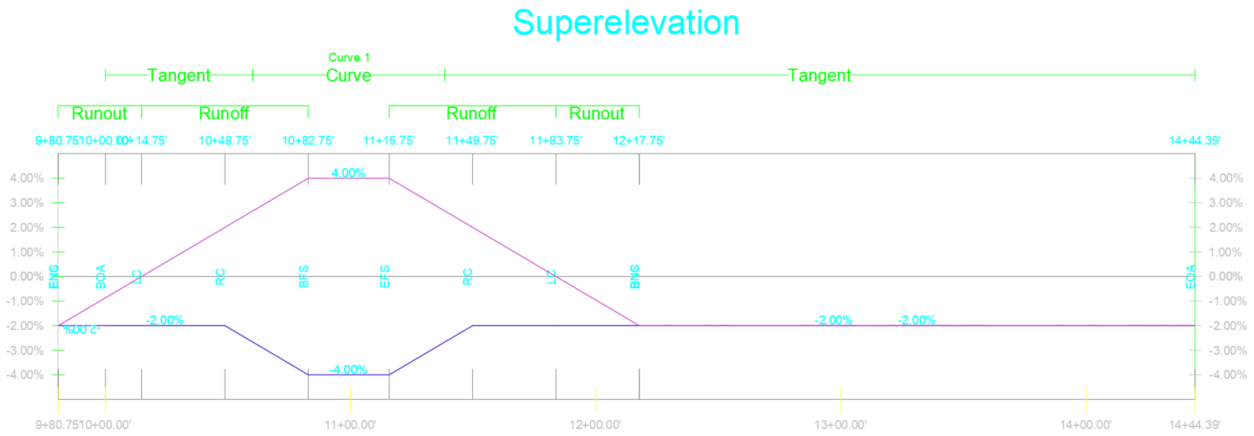
Step 1: **Select** the **Farm View Rd. Alignment**, **navigate** to Modify > **Superelevation**, **select** **Create Superelevation View**.



Step 2: **Edit** the following **parameters** in the Create Superelevation View dialog box, **click** **OK**.



Step 3: Select a **point** within the drawing workspace to place the Superelevation View.



	The Superelevation View can be used to edit the parameters as well as the Tabular Editor. When editing the Superelevation View, having Dynamic Input turn ON allows for user input at the cross hairs. Hovering over the Superelevation View grips gives access to additional parameter changes.

Profiles

A profile is a visual representation of existing or proposed surfaces. They are created to display a vertical surface along an alignment's horizontal location. A profile object is dependent of a horizontal alignment. The horizontal alignment must exist to define the route of a profile across the terrain. If you edit a horizontal alignment after creating dynamic surface profiles along its length, the profiles automatically change.

A profile view object is also dependent on a horizontal alignment. The length of the alignment controls the horizontal extents of the profile view grid, and the alignment stationing controls the annotation of horizontal axes. The vertical extents of the profile view have an optional relationship with one of the profiles in the profile view. You can set the vertical extents to a fixed value, but normally they are dynamically linked to one of the profiles. The dynamic link ensures that the profile view always has several grid lines above and below the profiles.

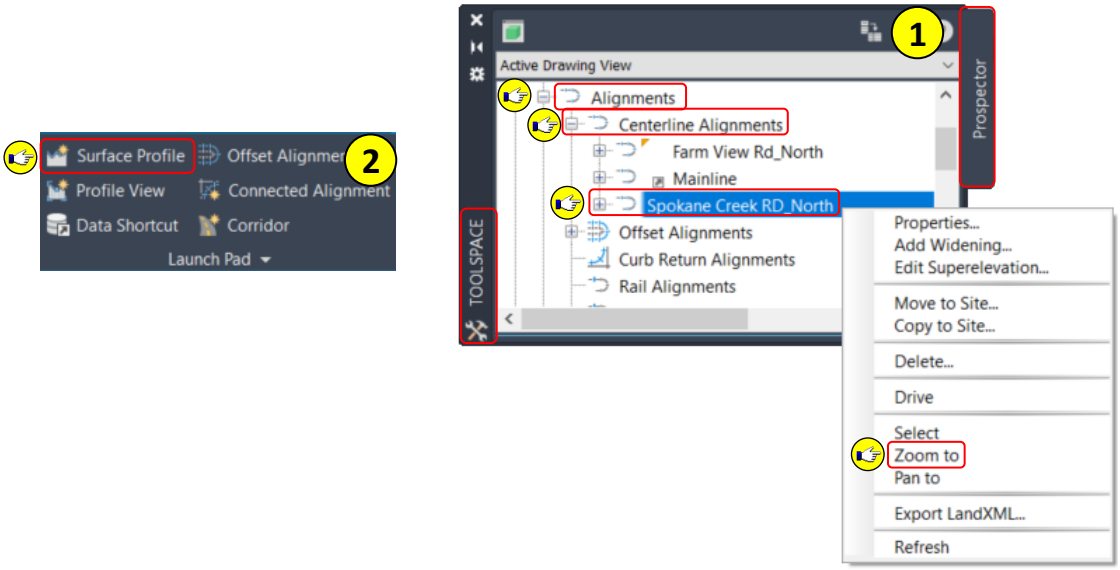
A profile view can contain projected objects such as points, feature lines, or AutoCAD blocks. These objects exist in plan view and are projected into a profile view. Pipe Network pipes and structures can also be shown in a profile view.

Surface Profiles

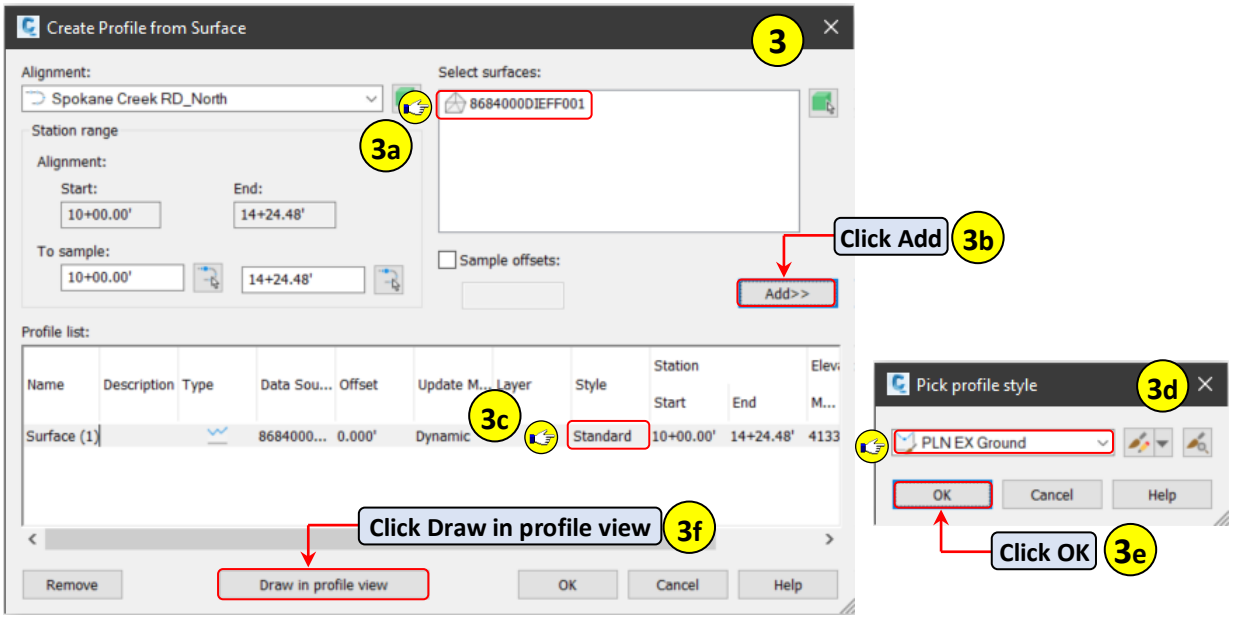
Creating an existing ground profile.

Step 1: **Navigate** to TOOLSPACE > Prospector, **expand** **Alignments**, **expand** **Centerline Alignments**, **right click** on **Spokane Creek RD_North**, **select** **Select**.

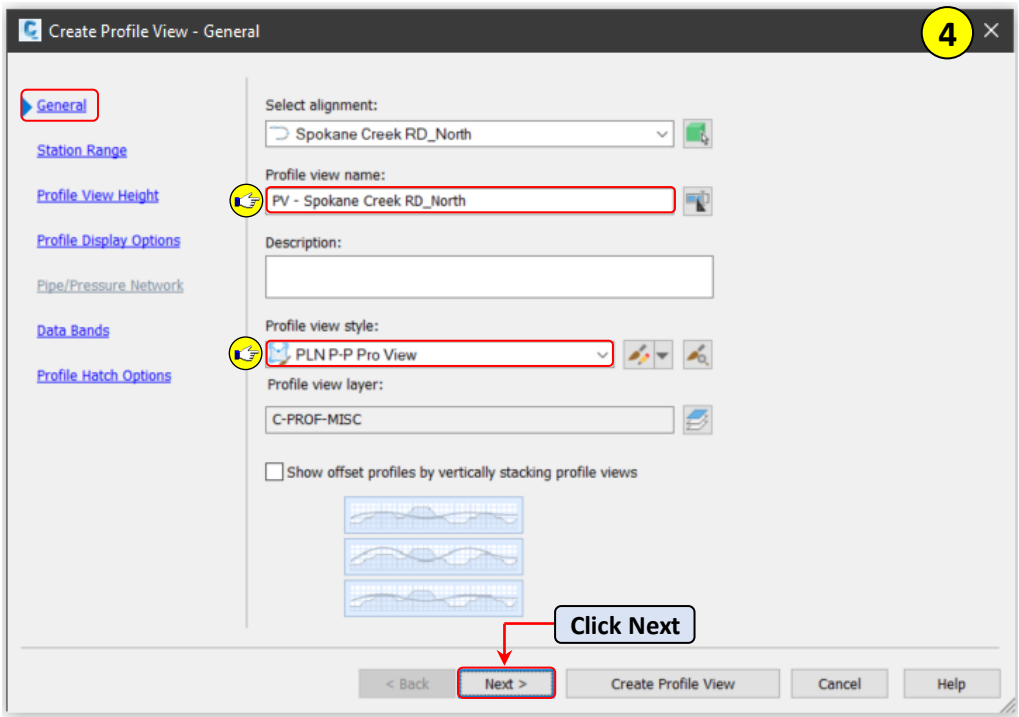
Step 2: **Select** **Spokeane Creek RD_North** alignment, **navigate** to the **Launch Pad panel**, **select** **Surface Profile**.



Step 3: Select 8684000DIEFF001, Click Add>>, select Standard from the style column, **select PLN EX Ground** from Pick profile style list, **select OK**, **click Draw in profile view**.

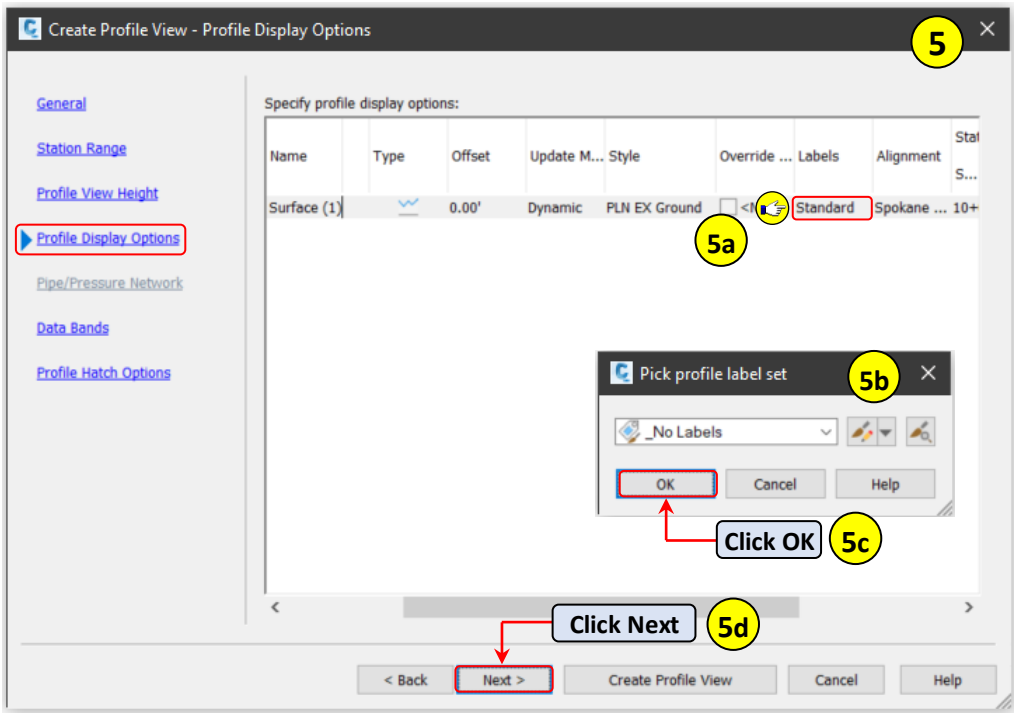


Step 4: From the Create Profile View wizard, **change** the following **parameters, click Next**.

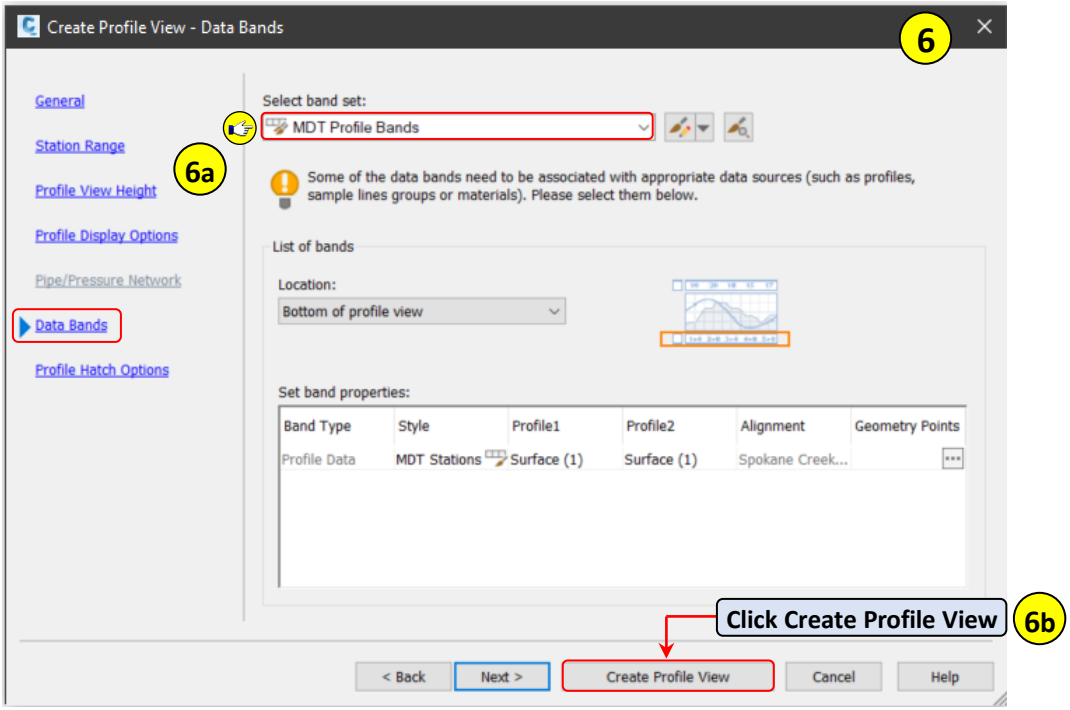


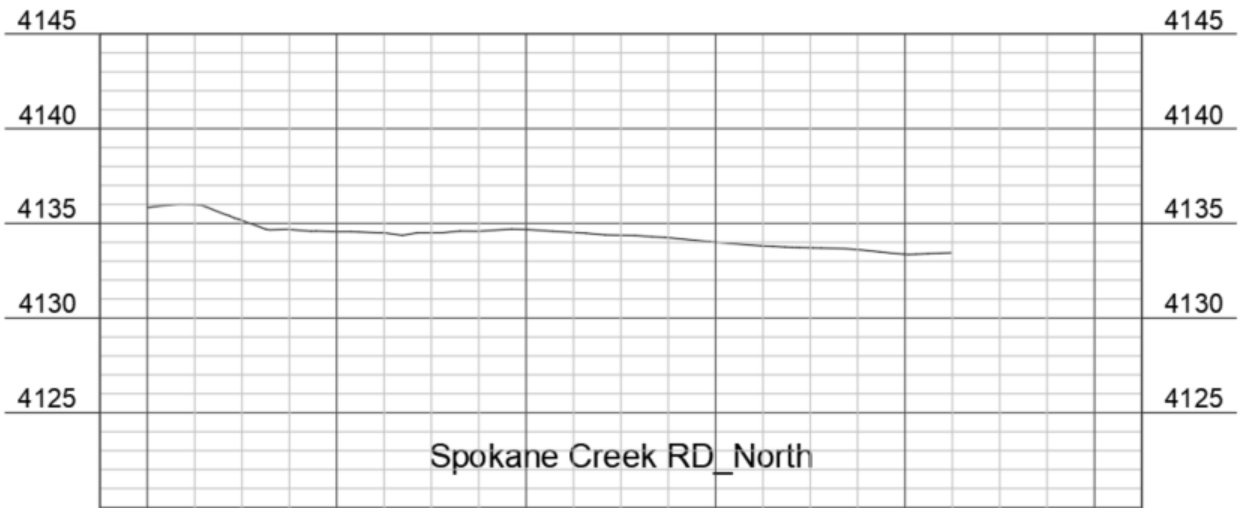
Step 4: Select Next for the Station Range, **select Next** for the Profile View Height.

Step 5: In the Profile Display Options, **select Standard** from the Labels column, **select _No Display**, **select OK**, **select Next**.



Step 6: In the Data Bands, **select MDT Profile Bands**, **select Create Profile View, select** a **point** within the drawing workspace to place the Profile View.



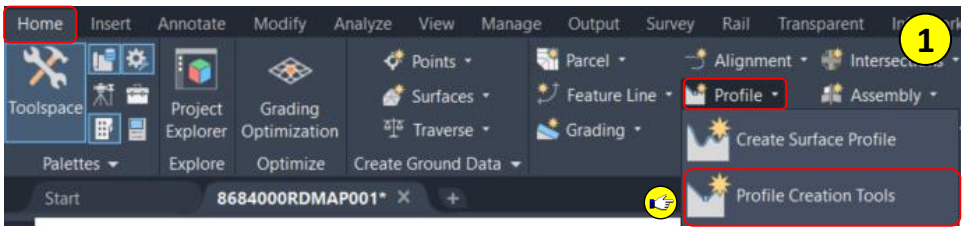


Profile Creation Tools

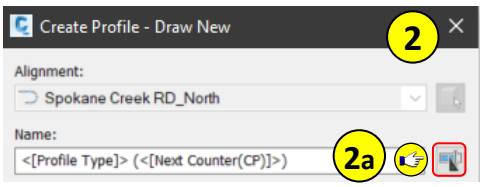
The Civil 3D Profile Creation Tools consist of commands used primarily for creating proposed or design profiles. A Profile View must exist prior to using the Profile Creation Tools. Profiles can be created with or without Design Criteria. The Design Criteria is based on AASHTO standards and an MDT design check set for the specific roadway type can be used. The MDT design checks use standards to verify curve lengths, vertical curves, and slopes are adhered to. Rural and Urban design criteria can be leveraged for freeways, collectors, arterials, and roads for level, rolling and mountainous terrain.

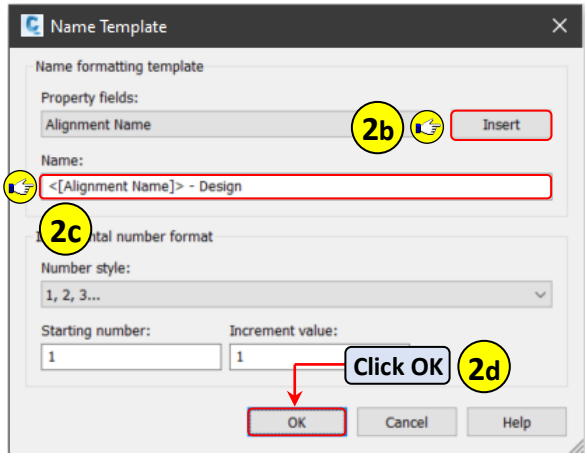
Creating a design profile.

Step 1: **Navigate** to Home tab > Create Design panel > **Profile**, **select** **Profile Creation Tools**, **Select** the **Profile View** for Spokane Creek RD_North when prompted to Select profile view to create profile.



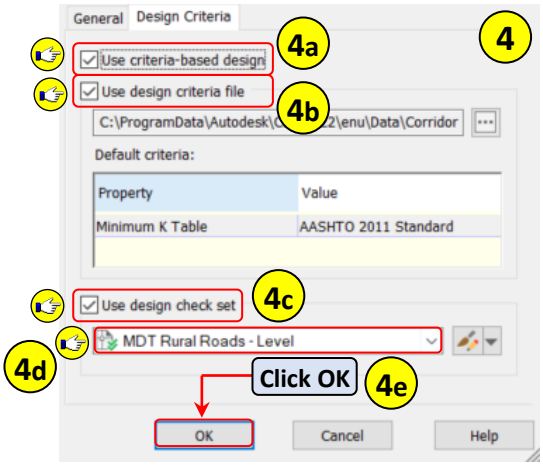
Step 2: **Select** the **name template** button from the Create Profile dialog box, **select Alignment Name** for the property field, **select Insert**, **type -Design** after the Alignment Name, **select OK**.

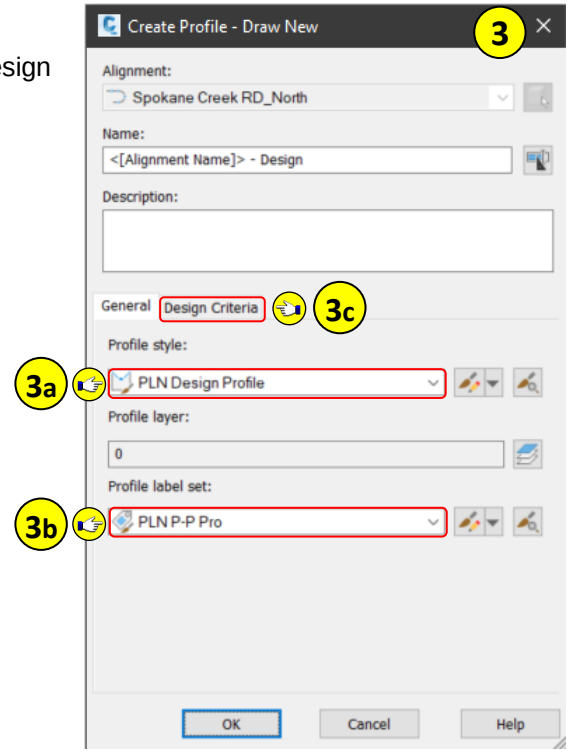




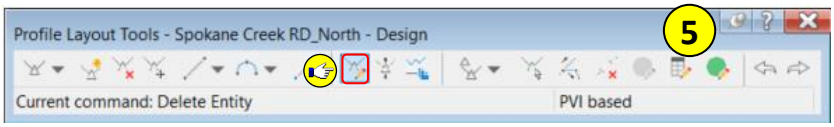
Step 3: **Select PLN Design Profile** for the style, **select PLN P-P Pro** for the label set, **select Design Criteria** tab.

Step 4: **Change** the following **parameters** for the Design Criteria, **click OK**.





Step 5: **Select Insert PVI's - Tabular** from the Profile Layout Tools.

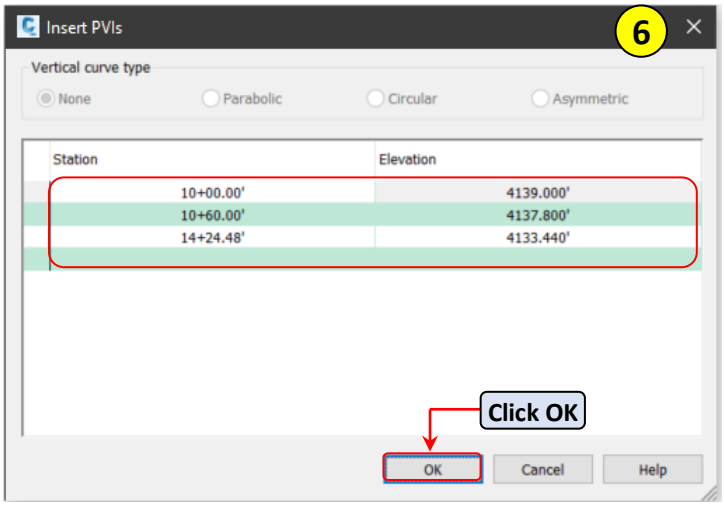


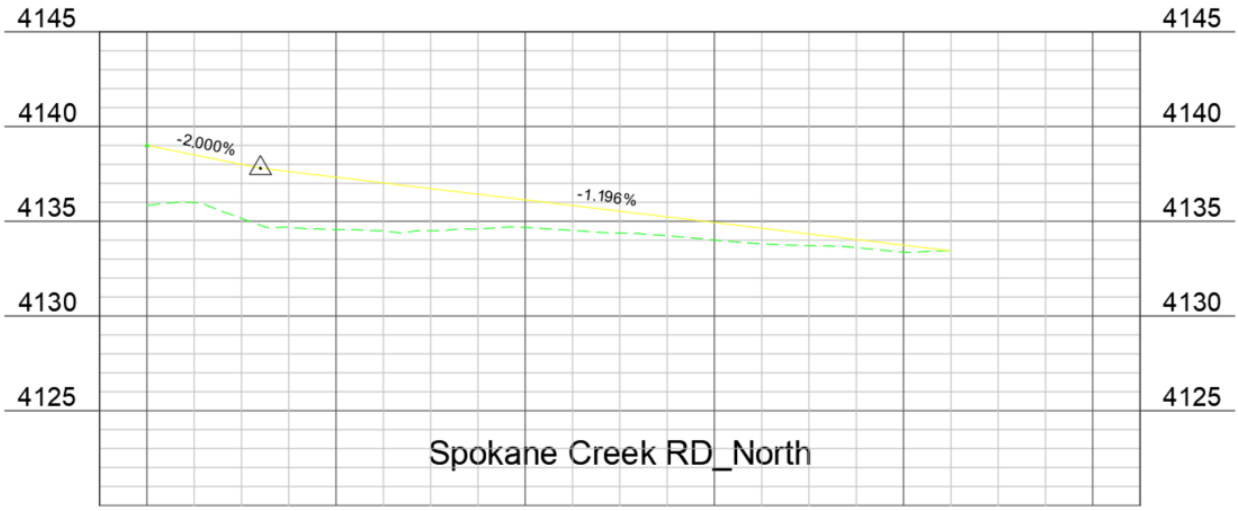
Step 6: From the Insert PVI dialog box **enter** the following **values** for Station and Elevation > **Clicking Enter** will advance to next Station or Elevation value (An additional Enter must be added after the last value), **click OK**.

Station 10+00.00 = Elevation 4139.00

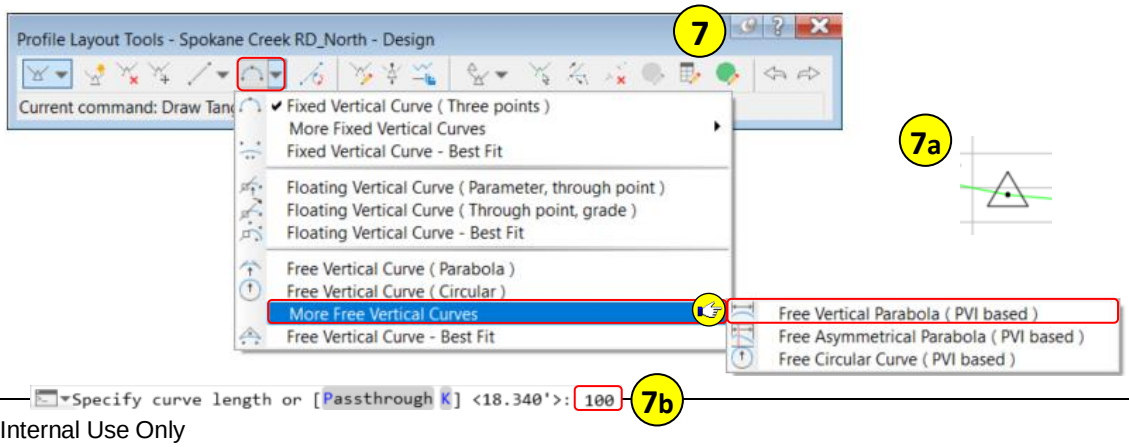
Station 10+60.00 = Elevation 4137.80

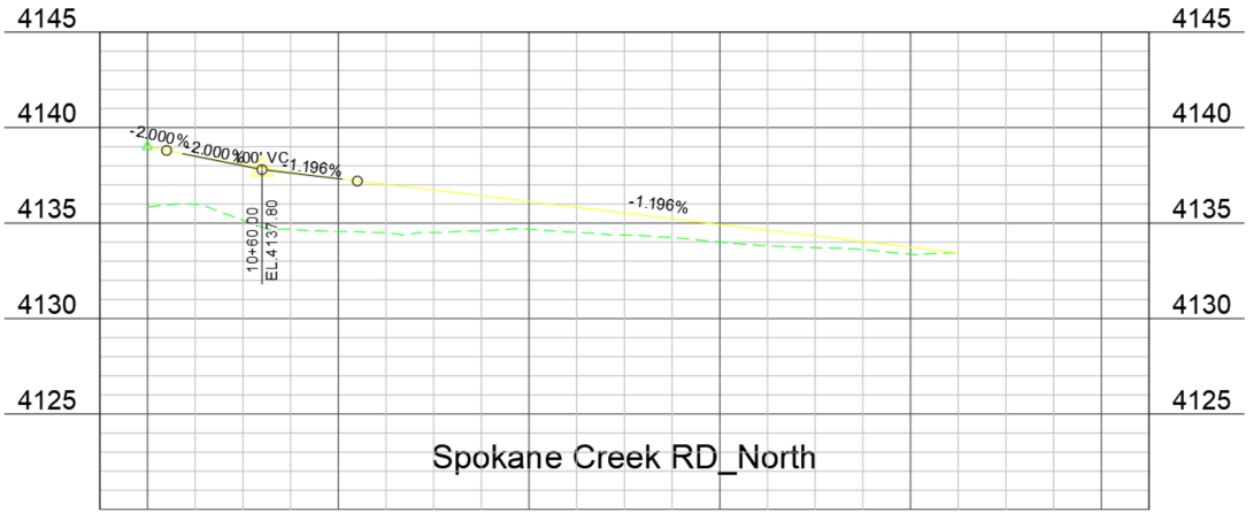
Station 14+24.48 = Elevation 4133.44





Step 7: **Select Free Vertical Parabola (PVI based)**, **pick** a **point** near the PVI marker, **type 100** for curve length, **select Enter**, **select Esc** to end the command.



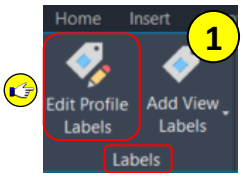


Profile Labels

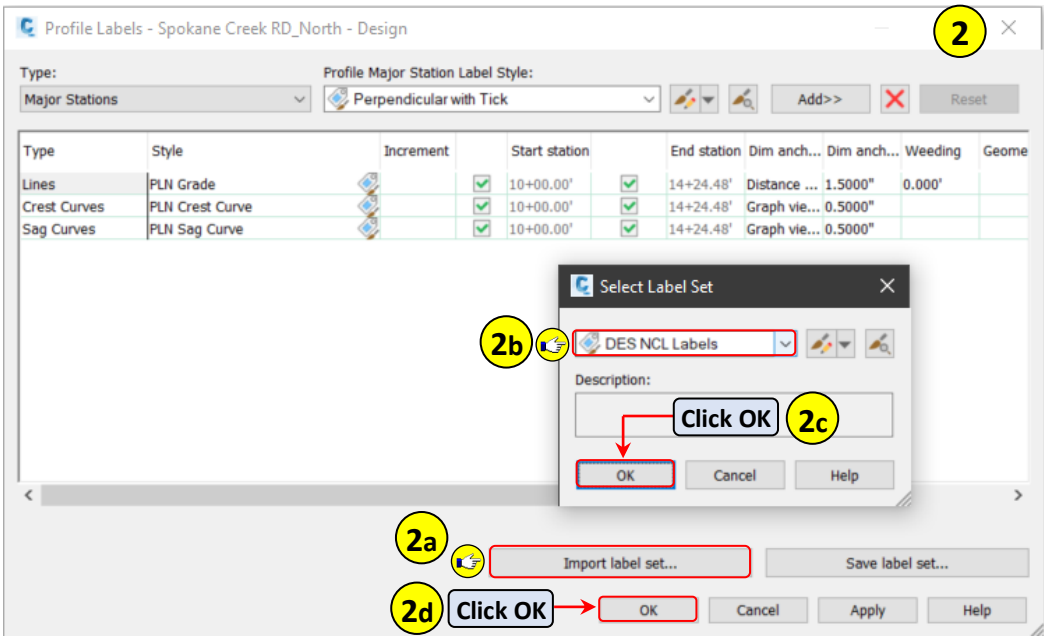
Profile label styles can include major and minor station of the alignment, horizontal geometry points, grade breaks, lines, sag and crest curves. Profile labels can include a combination of these labels, called a label set.

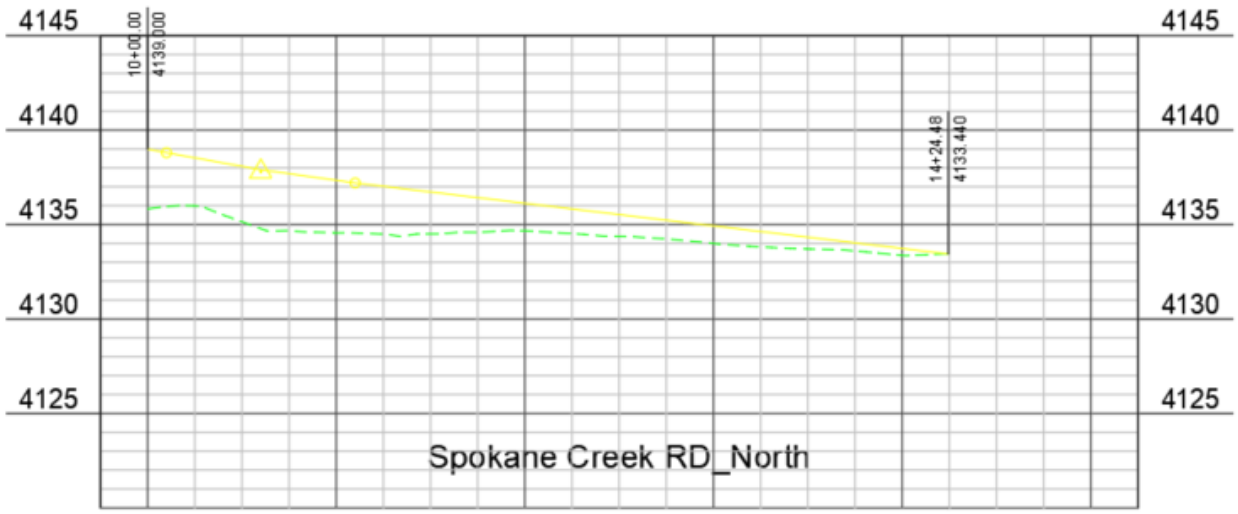
Assigning a Profile label set

Step 1: **Select** the Spokane Creek RD_North – Design **profile**, **navigate** to **Labels panel**, **select Edit Profile Labels**.



Step 2: From the Profile Labels dialog box, **select Import label set**, **select DES NCL Labels**, **select OK** on the Select Label Set dialog box, **Select OK** to close the Profile Labels dialog box.





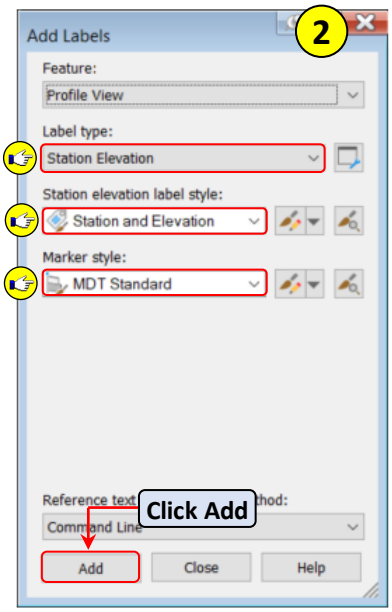
Profile View Labels

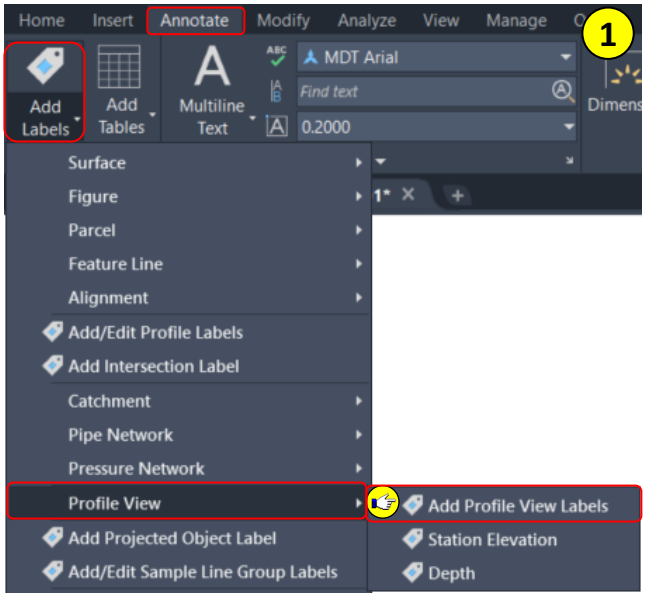
Profile View labels can be used to identify station and elevations of any selected point within the Profile View. Profile View Depth labels can be used to quickly determine the depth, grade or slope of objects within the Profile View.

Adding Profile View Labels

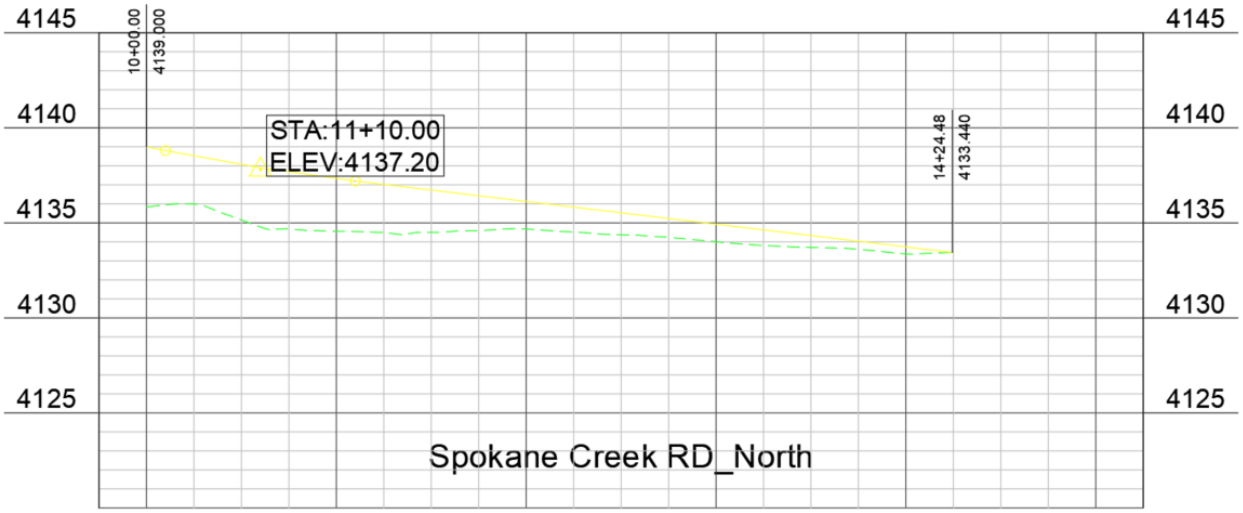
Step 1: **Navigate** to Annotate tab > Labels & Tables > Add Labels > **Profile View**, **select** **Add Profile View Labels**.

Step 2: From the Add labels dialog box, **select** the following **parameters**, **click** **Add**.

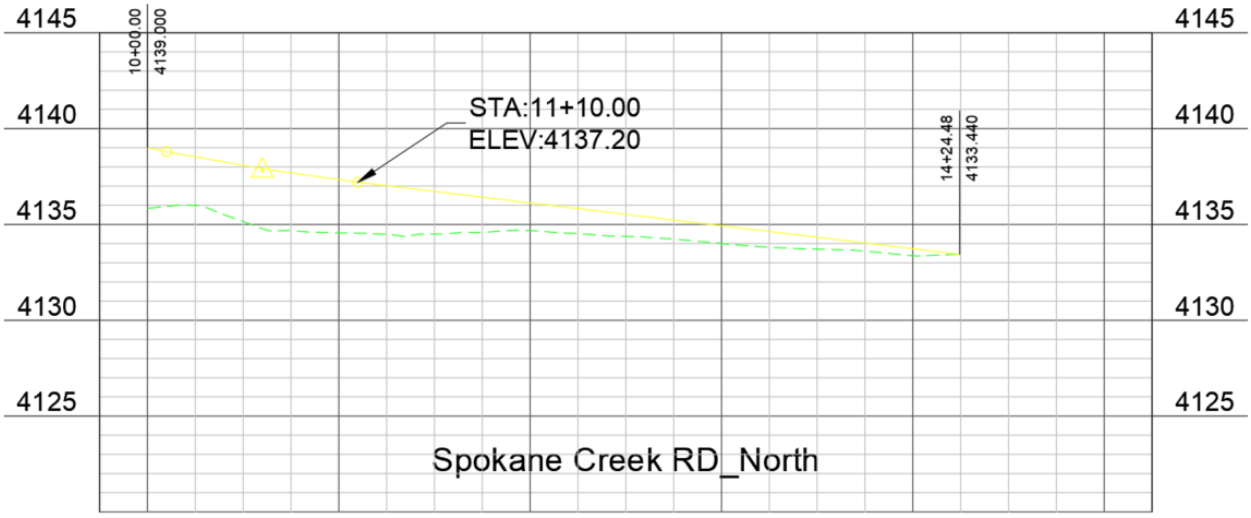




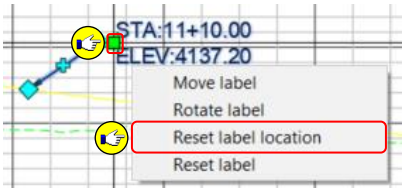
Step 3: **Select** the Spokane Creek RD_North **Profile View**, **type** **11+10** for station, **type** **4137.20** for elevation, **select** **Esc** to end command.

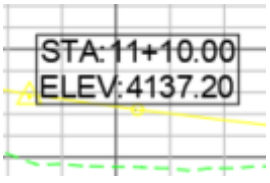


Step 4: **Select** the **Profile View label**, **select** the **square grip**, **drag** the **label** away from the insertion point.



Step 5: **Select** the **Profile View label**, **hover** the crosshairs over the **square grip** closest to the text, **select** **Reset Label location**.





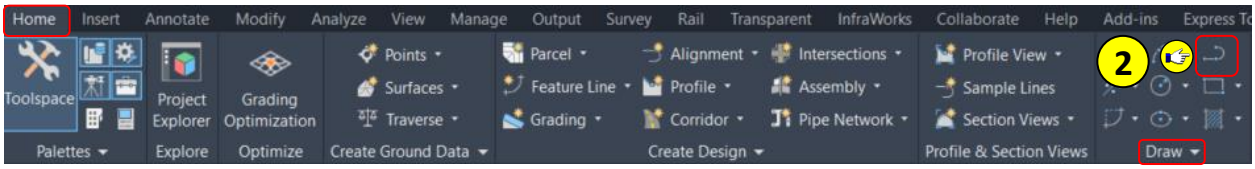
Transparent Commands

Transparent Commands are unique commands that can be leveraged when Civil 3D is prompting for a point, distance, or radius. Transparent Commands must be leveraged within an active command. They can be accessed from the Transparent ribbon, Transparent toolbar, entering the transparent command at the command line, or a right click of the mouse. All Transparent commands, descriptions and icons can be found in Appendix B of this document.

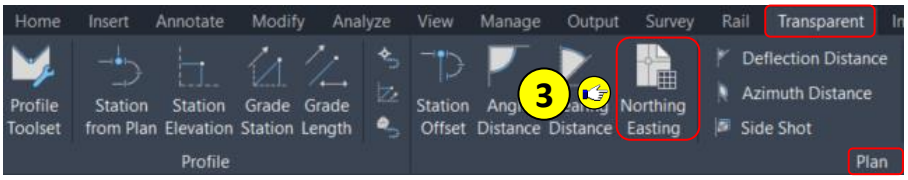
Creating a Polyline by Bearing and Distance

Step 1: **Type** **ZE**, **select** **Spacebar** to zoom extents of the current drawing.

Step 2: **Navigate** to Home tab > Draw panel, **select** the **Polyline** command.

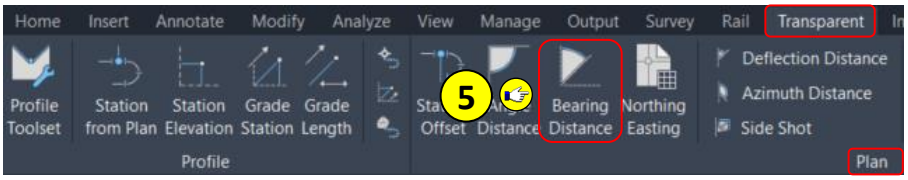


Step 3: **Navigate** to Transparent tab > **Plan** panel, **select** **Northing Easting** command.



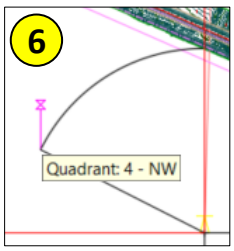
Step 4: **Enter** **850200.5306** for northing, **select** **Enter**, **enter** **1388032.2301** for easting, **select** **Enter**, **select** **Esc** to exit the Northing Easting Transparent command.

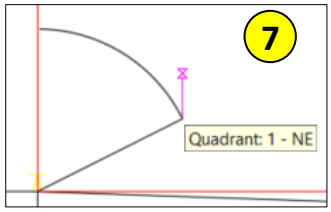
Step 5: **Navigate** to Transparent tab > **Plan** panel, **select** **Bearing Distance** command.



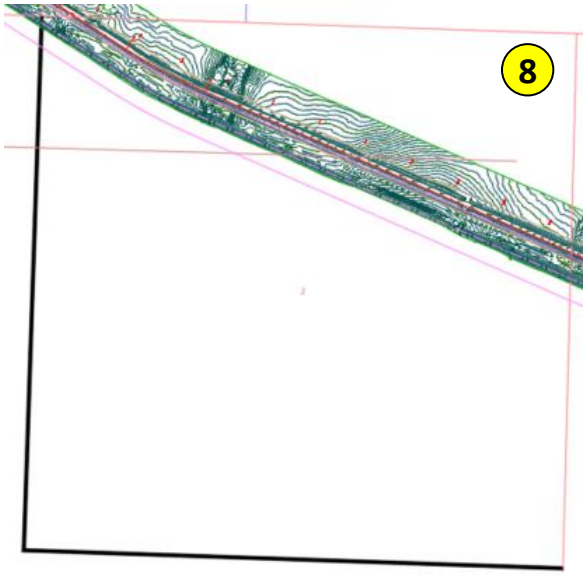
Step 6: **Click** in the **Northwest** quadrant, **type** **88.0426** for the bearing, **select** **Enter**, **type** **5356** for the distance, **select** **Enter**.

Step 7: **Click** in the **Northeast** quadrant, **type** **1.5533** for the bearing, **select** **Enter**, **type** **5321.50** for the distance, **select** **Enter**.



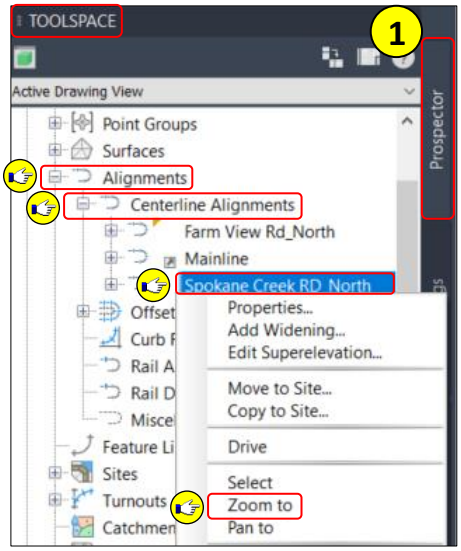


Step 8: **Select** **Esc** to end the Transparent Command**, select** **Esc** to end Polyline command.



Creating a Polyline by Station Offset

Step 1: **Navigate** to TOOLSPACE > **Prospector** tab, **expand** **Alignments**, **expand** **Centerline Alignments**, **right click** on **Spokane Creek RD_North**, **select** **Zoom to**.



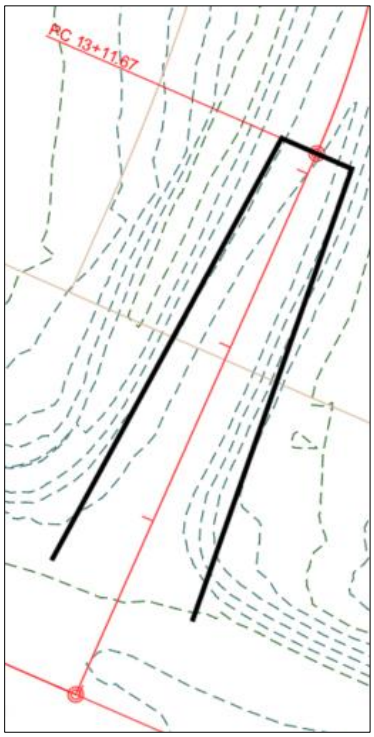
Step 2: **Type** **PL**, **select** **Spacebar** to start the Polyline command, **type** **'SO** to start the Station Offset Transparent Command.

Step 3: **Select** **Spokane Creek RD_North** alignment when prompted to Select alignment, **type** **1060** for the station, **select** **Enter**, **type** **40** for the offset distance, **select** **Enter**.

Step 4: **Type** **1311.67** for the station, **select** **Enter**, **type** **20** for the offset distance, **select** **Enter**.

Step 5: **Type** **1311.67** for the station, **select** **Enter**, **type** **-20** for the offset distance, **select** **Enter**.

Step 6: **Type** **1060** for the station, **select** **Enter**, **type** **-40** for the offset distance, **select** **Enter**, **select** **Esc** to end the Transparent command, **select** **Esc** to end the polyline command.



Appendix A

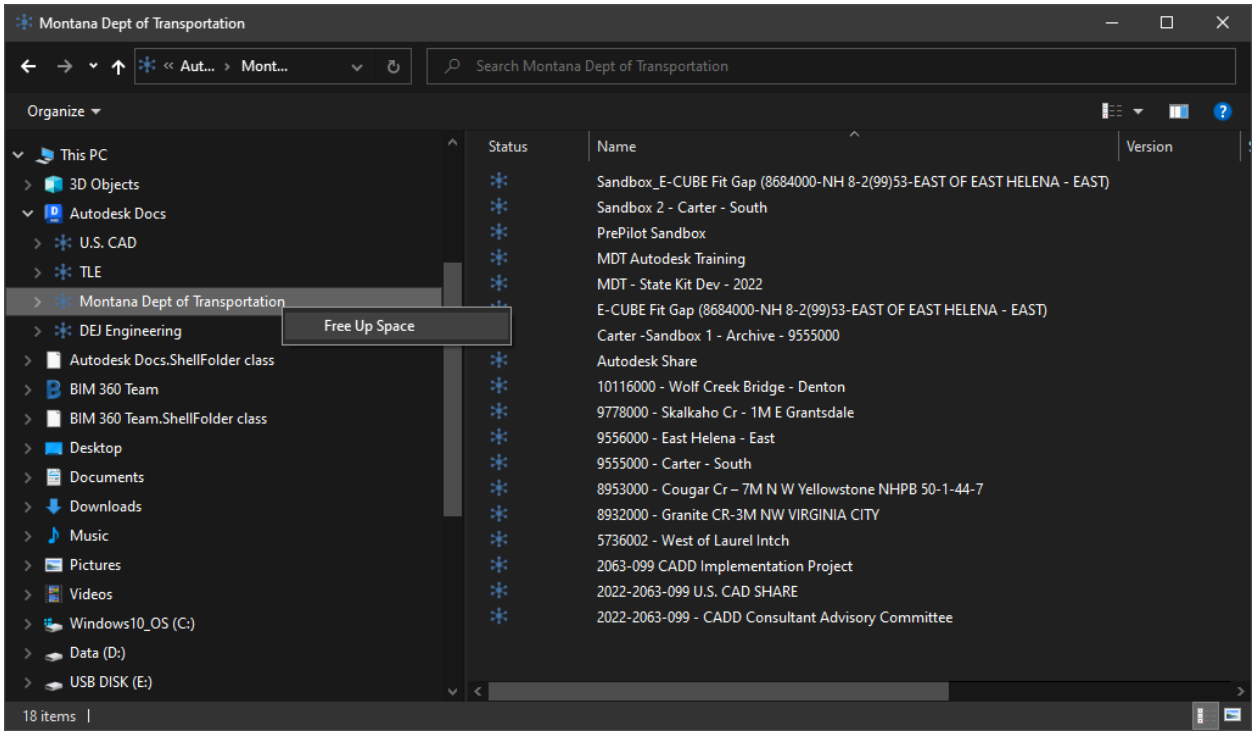
BIM 360

Free Up Space

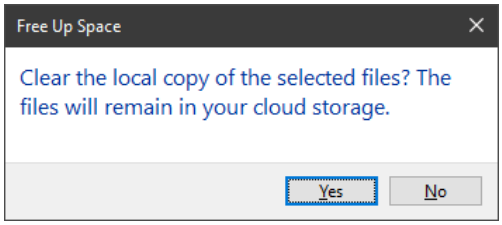
The Desktop Connector caches files locally when opening them from BIM 360. Eventually the cached files can use up more disk space than desired. The Free Up Space feature can be used at the account, project, project folder or individual file level.

Free Up Space at account level

Step 1: Open Windows Explorer, navigate to Autodesk Docs, right click on Montana Dept of Transportation account, select Free Up Space.



Step 2: Select Yes in the Free Up Space dialog box.



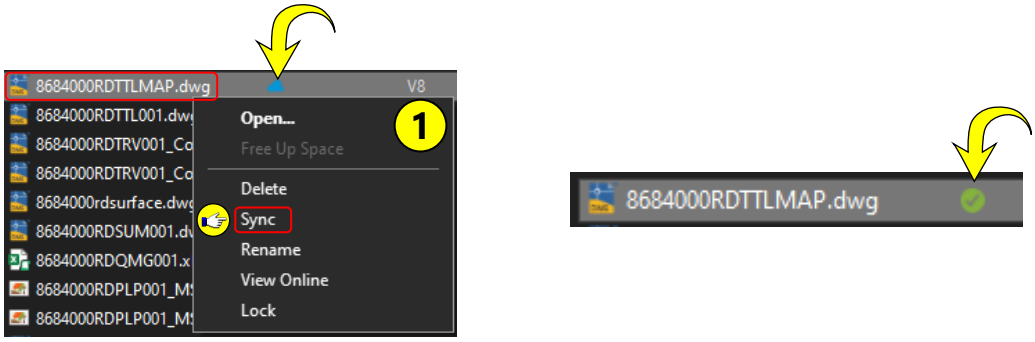
Syncing – Manual

Desktop Connector is a desktop service that integrates an Autodesk data management source (or data source) with your desktop folder and file structure for easy file management. The files in the data source are replicated in a connected drive. You can manage files in the data source through the connected drive, just as you would any other folder on your machine. Changes made in the connected drive are automatically uploaded to the data source.

The Autodesk Desktop Connector is a crucial part of using BIM 360. The Desktop Connector syncs, locks and unlocks files begin accessed in BIM 360. In some instances, a manual sync of a file or files may be needed. Syncing files manual can increase file opening times. If a file is visible in Windows Explorer or BIM 360 cloud environment, but not visible in Civil 3D, syncing the file can make it visible and accessible.

Syncing a Drawing file

Step 1: **Open** **Windows Explorer**, **navigate** to **Autodesk Docs**, **expand** **Montana Dept of Transportation** account, **expand** the **project**, **expand** **Project Files**, **expand** the **folder** containing the drawing, **right click** on the **drawing**, **select** **Sync**. *(Notice the status icon is a cloud symbol, once the file is synced the icon will turn to a green check).*



Status Icons

Autodesk Docs Status icons

Icon	Label	Description
	New	The local file has not been uploaded.
	Synced	The local file is up-to-date with the file in the data source.
	Online	The file has not been downloaded locally (the file will be downloaded on demand).
	Modified	The existing file has been modified locally and the modification has not uploaded.
	Conflict	Edits have been made to the file both locally and in the data source. Next time the file is read, the local file will be sent to recycle bin.
	Stale	The local file is an older version than what is in the cloud (the file will be downloaded on demand).
	Error	There was an error obtaining the local file Status value.
	Non-conforming	The file name doesn't conform to the naming standard (BIM 360 and Autodesk Docs).
	Locked	The file is currently locked by a user (BIM 360 and Autodesk Docs).

Appendix B

Transparent Command Reference Table

The following table lists the transparent commands that are used to specify point locations.

To specify a point location using this information...	Transparent Command	Icon
angle and distance	'AD	
bearing and distance	'BD	
azimuth and distance	'ZD	
deflection angle and distance	'DD	
northing and easting	'NE	
grid northing and grid easting	'GN	
latitude and longitude	'LL	
point number	'PN	
point name (alias)	'PA	
a point in a drawing	'PO	
station, elevation, grade, or length values when creating and editing profiles	'ProfileToolset	
side shot from a point	'SS	
station and offset	'SO	
station along the parent alignment of a profile view	'STAE	

To specify a point location using this information...	Transparent Command	Icon
station along the parent alignment of a profile view, elevation from surface	'SSE	
station along the parent alignment of a profile view, elevation from a COGO point	'SPE	
station and elevation in a profile view	'PSE	
grade and length in a profile view	'PGL	
grade and station in a profile view	'PGS	

The following table lists the point filters that you can use while a transparent command is running.

To specify a location using this information...	Enter this point filter	Icon
point number	.p	
a point in a drawing	.g	
known northing and easting	.n	

The following table lists the transparent commands that are not used to specify point locations:

To specify this information when prompted...	Use this transparent command	Icon
an object's length	'ML	
an object's radius	'MR	

To specify this information when prompted...	Use this transparent command	Icon
to zoom to a point name, a point number, or a range of point numbers	'ZTP	
curve parameters	'CCALC	