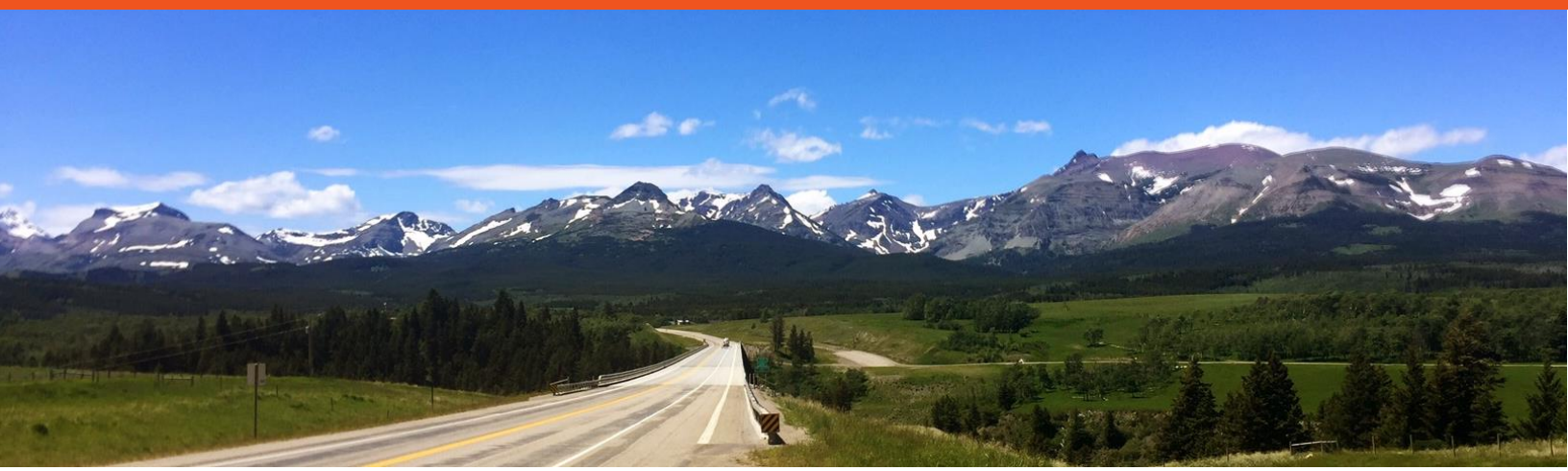

204 – C3D for Surveyors

User Guide

Prepared by:

U.S. CAD
ACHIEVE MORE.

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Course Description

This course equips surveyors and survey technicians with the knowledge required to use Civil 3D efficiently in their daily workflows. Building on the fundamentals shown in the 201, 202, and 203 courses, Civil 3D for Surveyors delivers the skills to gather, produce and share survey data effectively and exposes the surveyor and survey technician to the automation of Field to Finish workflows as well as many other advance survey tools and features within Civil 3D. At the conclusion of this course, the surveyor and survey technician will possess the expertise to proficiently produce survey data more adequately and precisely.

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

1. Automate the Survey workflow
2. Navigating Toolspace
3. How to properly manage COGO Points
4. Leveraging points and connective codes to automate the workflow
5. Importing Extended Survey Attributes
6. How to setup and share Survey Database settings
    - Utilizing the Survey Database for Field-to-Finish workflow
7. Produce manageable surface data
8. Become more efficient with Civil 3D surfaces
9. How to manage point cloud data
10. Using the Traverse Editor and Traverse Adjustment
11. Connecting to Georeferenced Imagery
12. Create reports for survey data
13. Migrating legacy project data to Autodesk

Topics Covered

1. Survey Processing in Civil 3D - Field to Finish
2. Survey Interface
3. COGO Points
4. Points and connective codes
5. Survey Point Attributes
6. Survey Database
7. Surfaces
8. Reducing surface size
9. Point clouds
10. Traversing
11. Georeferenced Imagery
12. Survey Reports
13. Migrating legacy project data to Autodesk

Pre-requisites

- 101 – AutoCAD Fundamentals for Bentley Users

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Survey Processing in Civil 3D

You can use the Autodesk Civil 3D survey features to download, create, analyze, and adjust survey data. The survey features extend the functionality of Civil 3D by streamlining the process of transferring field-captured survey data to and from the office.

Field to Finish

Field to Finish is a general term used to describe the surveying process that determines the connectivity and symbology of points surveyed in the field that match the feature name and field code that is defined in an Autodesk Civil 3D linework code set and the description keys that are defined for the current drawing.

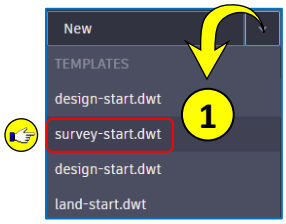
A field code is contained within the description of a survey point, and typically contains both the name of the point feature or line feature, and a special line segment or curve segment code to indicate connectivity between survey points of the same feature. During the processing of linework, the linework code set interprets the syntax of the field code within a survey point description. When points are inserted into the drawing, either from a survey database, or directly into the drawing, the display of the survey points is determined by a raw description match with the description keys in the drawing.

Drawing Template

The use of a standardized template will be key when utilizing the Field to Finish tools and functionality that C3D has to offer. Working with a standardized template will provide consistent results when processing survey data. The standard MDT survey-start template will be reviewed with greater detail in the coming pages.

Template files will contain standard items such as:

- Layers
- Linetypes
- Annotation
- Point Marker and Label Styles
- Description Keys
- Standard drawing settings (EX: Drawing coordinates and scale)



Drawing Creation

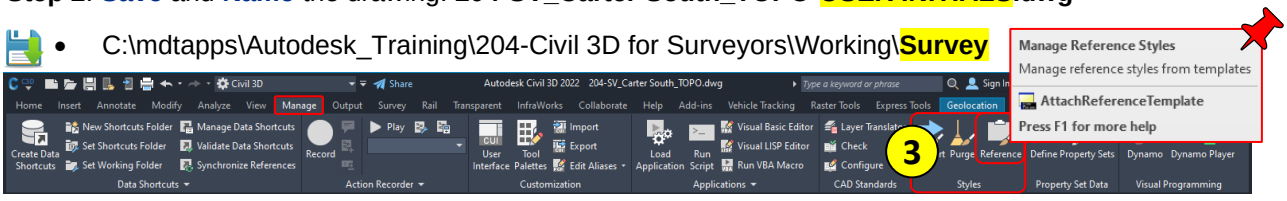
Create a New Drawing

Step 1: From the **Start** tab > **Create** a new drawing using the **Standard**: **survey-start.dwt**

- C:\MDOH\StateKit\Civil 3D\2022\Templates**_Start-Dwg**

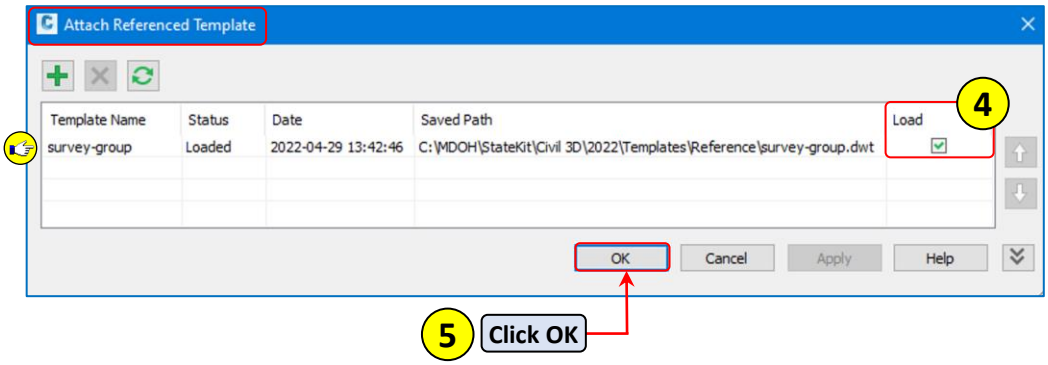
Step 2: **Save** and **Name** the drawing: **204-SV_Carter South_TOPO-USER INITIALS.dwg**

- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working**Survey**



Step 3: **Navigate** to the **Manage** tab > Styles panel > **Select Reference**.

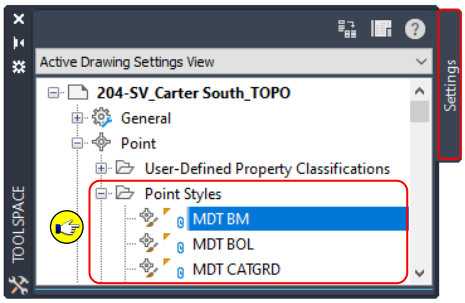
Step 4: **Verify** the attached **survey-group** reference template is loaded.



Step 5: **Click** **OK**.

Step 6: **Navigate** to TOOLSPACE > **Settings** tab.

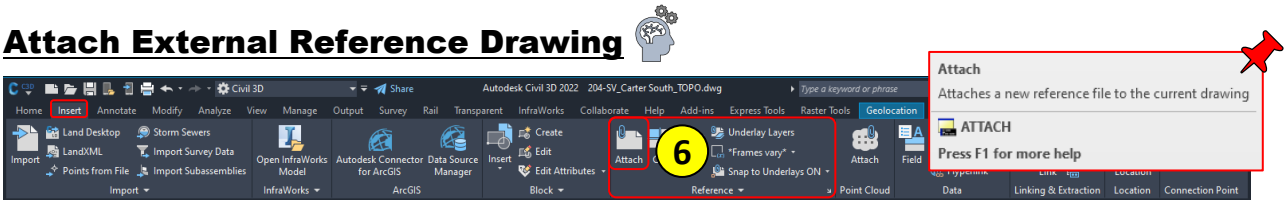
a. **Expand** the **Point** object collection > **Expand** **Point Styles**.



	Notice how all styles have a "blue" paperclip icon next to the style name. The paperclip icon signifies those styles are attached and being controlled by a source reference template.

External Reference

Attach External Reference Drawing

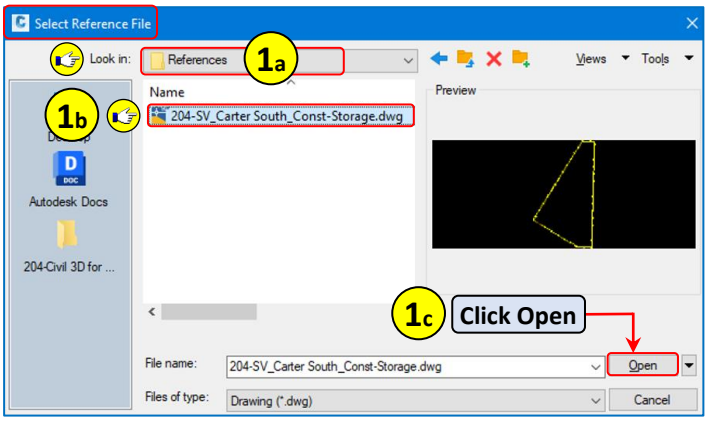


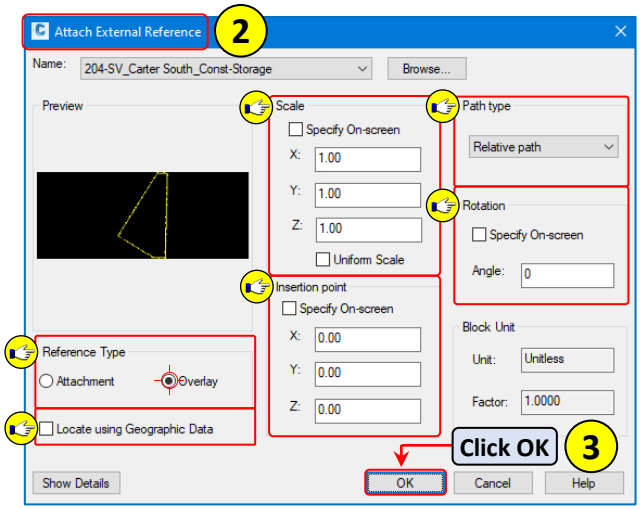
Step 1: **Navigate** to the **Insert** tab > Reference panel > **Select** **Attach**.

a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors**References**

b. **Select** > **204-SV_Carter South_Const-Storage.dwg**

c. **Click** **Open**.





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

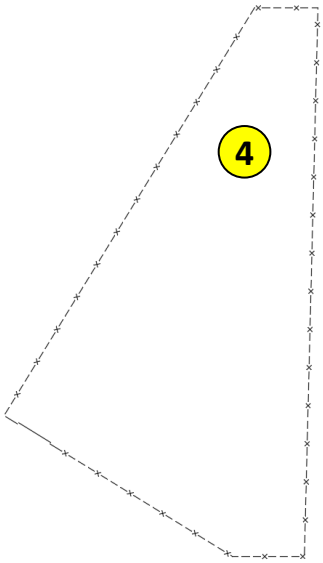
- **Reference Type** = Overlay
- **Scale** = Specify On-screen is unchecked
- **Insertion point** = Specify On-screen is unchecked
- **Path type** = Relative path
- **Rotation** = Specify On-screen is unchecked

Locate using Geographic Data:

If both the source and consumer drawing contain geographic data, the option is available. Both drawings require a matching **coordinate system** or Geolocation be assigned. If true, the drawing being consumed (referenced) will be inserted spatially correct.

Step 3: **Click OK**.

Step 4: **Zoom Extents** (**ZE**) > **See** the **attached** External Reference drawing in model space.

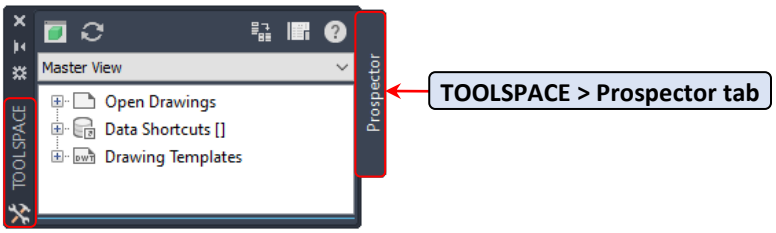


Survey Interface – Toolspace

Toolspace is an integral component of C3D used for accessing and managing objects, data, styles, and commands. Toolspace is used for accessing the Prospector, Settings, Survey, and Toolbox tabs.

	Standard “right-click” context commands are available for many of the items located on the individual tabs of the TOOLSPACE palette. The available commands vary depending upon which tab is active (Properties, Edit, Delete, Select, Zoom To, Pan To, Refresh, Execute, etc.).

Toolspace – Prospector Tab

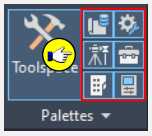


Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

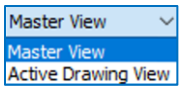
The Prospector tab is located on the TOOLSPACE palette. The Prospector tree found on the Prospector tab contains all drawing or project related objects that are arranged in a specific hierarchy. Each branch of the Prospector is referred to as a collection.

There are **four** main top-level collections used for managing all Civil 3D related objects.

- Open Drawings
- Data Shortcuts
- Drawing Templates (*only visible if Master View is active*).
- Projects *(only visible if Autodesk Vault client is installed*).

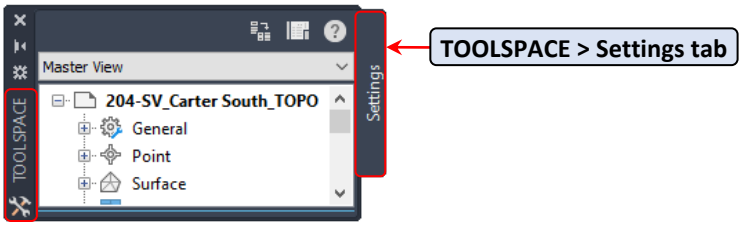
	The **Prospector**, **Settings**, **Survey**, and **Toolbox** tabs can either be turned on or off as needed by navigating to the Home tab > Palettes panel > **select desired tab**. 

Items displayed in the Prospector tree can be controlled using the drop-down list located at the top of the Toolspace palette. There are **two** different views for controlling which items are displayed in the Prospector tree.



- **Master View** = Displays all open drawing files and their drawing objects and drawing templates. The current active drawing will be identified with “bold” text.
- **Active Drawing View** = Displays only the items in the active drawing. Switching to another open drawing file will update the tree to reflect the active drawings content.

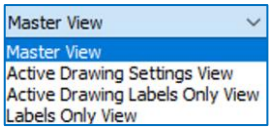
Toolspace – Settings Tab



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

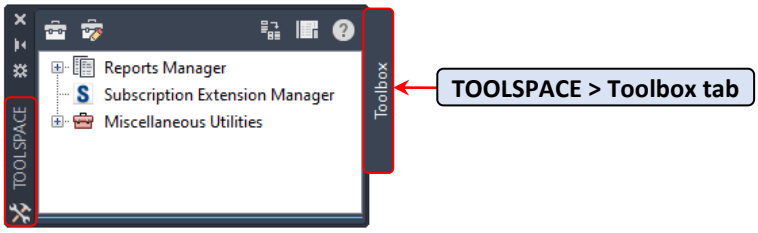
The Settings tab is located on the TOOLSPACE palette. The Settings tab is used for managing all C3D object styles and controlling drawing settings and commands. Like the Prospector tree, the Settings tree is categorized in a standard hierarchy of collections for each object type.

Items displayed on the Settings tree can be controlled using the drop-down list located at the top of the Toolspace palette. There are **four** different views for controlling which items are displayed in the Settings tree.



- **Master View** = Displays items for all open drawings.
- **Active Drawing Settings View** = Displays only the items for active drawing.
- **Active Drawing Labels Only** = Displays only label collections and label styles for active drawing.
- **Labels Only View** = Displays only label collections and label styles for all drawings.

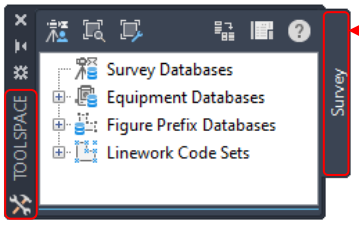
Toolspace – Toolbox Tab



Step 3: **Navigate** to TOOLSPACE > **Toolbox** tab

The Toolbox tab is located on the TOOLSPACE palette. The Toolbox provides primary access for running reports, access to installed extensions, and miscellaneous utilities. Like the other tabs found on the TOOLSPACE palette, the Toolbox tree contains collections that are categorized per object and or utility.

Toolspace – Survey Tab



CAUTION

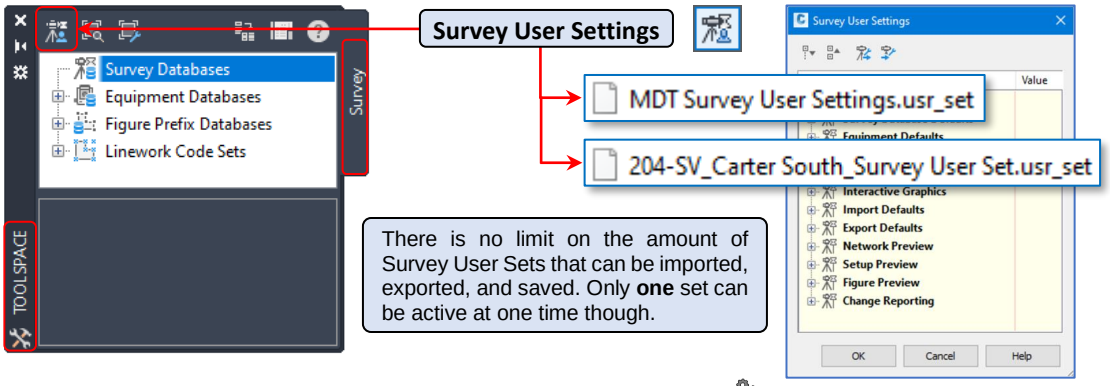
The data and settings stored on the Survey tab are not drawing specific. The Survey Databases found on the Survey tab reflect specific project survey data that is normally stored in a location that provides easy access for all users.

Step 4: **Navigate** to TOOLSPACE > **Survey** tab

The **Survey** tab is located on the TOOLSPACE palette and is used for managing survey user and survey system settings. Survey specific project data is also managed and accessed directly from the Survey tab of TOOLSPACE, unlike other objects that are managed on the Prospector tab. There are four collections found on the Survey tab, **Survey Databases**, **Equipment Databases**, **Figure Prefix Databases** and **Linework Code Sets**. Items within each collection can be accessed by expanding the collection and right-clicking on the item to display related commands.

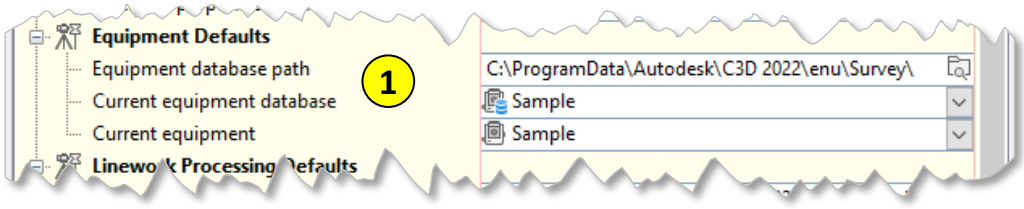
Survey User Settings

Survey user settings are specific to a Windows user login account and **effect only** the survey features, not project or drawing data. The user settings are intended to be shared amongst users to standardize workflows and survey data processing. Once user settings have been established, the files can be exported and stored in a central location for easy access. Then imported as needed.



Survey User Settings Properties

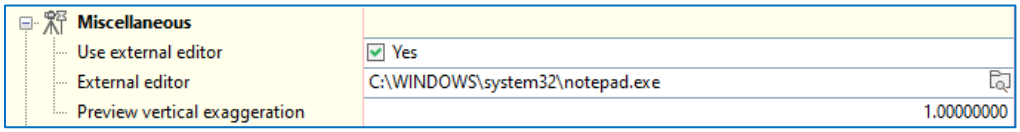
Step 1: For each **Survey User Setting** category, **review** and **verify** **Survey User Settings** are set correctly to the desired defaults.



Miscellaneous Defaults

User specified external editor for displaying analysis input and output. Also used for editing field book and batch files.

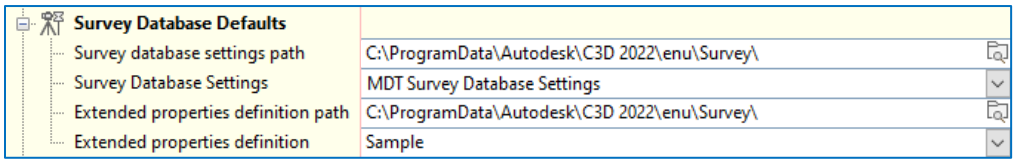
- **Expand Miscellaneous**



Survey Database Defaults

Survey Database Defaults are used for specifying settings specific to processing raw field survey data.

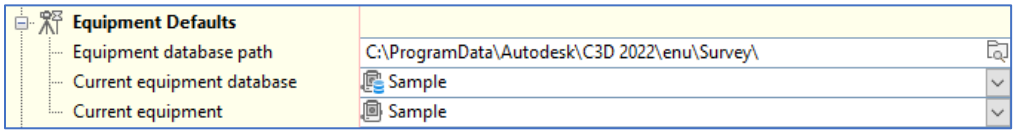
- **Expand Survey Database Defaults** – (File extension **.sdb_set**)



Equipment Defaults – Equipment Databases

The Survey Equipment Database is used to define and store specific parameters related to the equipment used for collecting survey data.

- **Expand Equipment Database Defaults** – (File extension **.edb_xdef**)



	The use of the **Survey Equipment Database** is not necessary if *Fieldbook* (.fbk) files are not being utilized in the processing of survey data.

Linework Processing Defaults – Line Work Code Sets

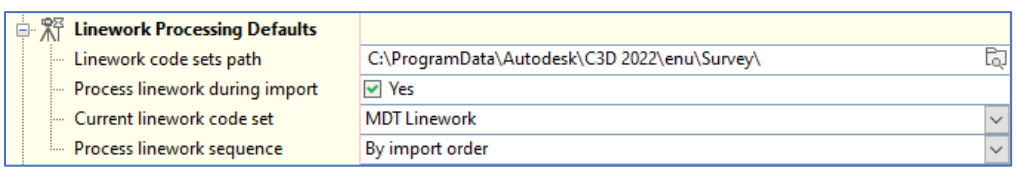
User specified path for selecting default line work code set. Linework Code Sets are special characters used by the survey crew when entering conditions into the data collector while collecting survey data in the field. When interpreted by C3D, the codes are used for automatic linework generation.

- **Expand Linework Processing Defaults** – (File extension **.f2f_xdef**)

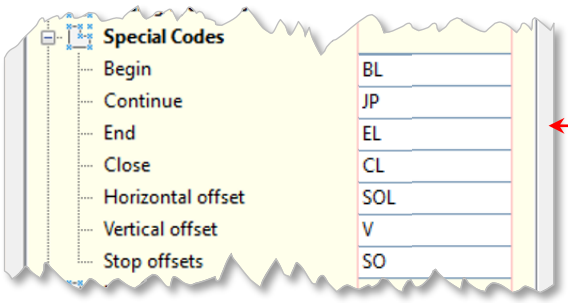
Process linework during import:

a. By **Import Order** = Process points in the order which they are imported

b. By **Point Number** = Process points sequentially by point number (ascending order only).



CAUTION	If importing .**fbk** files, **do not** check the box for **Process Linework** when using: • .fbk files created from the Survey Data Collection Link application. Linework Code Set definitions may not be recognized. However, the figure commands created using the Survey Data Collection Link are recognized. • .fbk files created in Autodesk Land Desktop or previous versions of C3D. Doing so when using these files may create duplicate or erroneous figures.



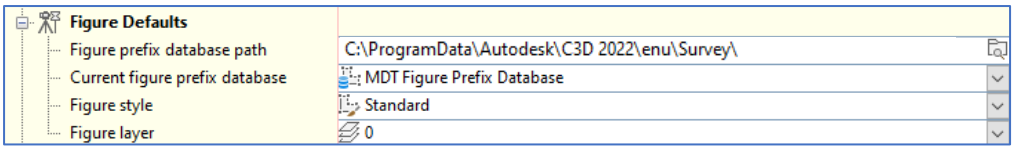
Example Linework Code Set

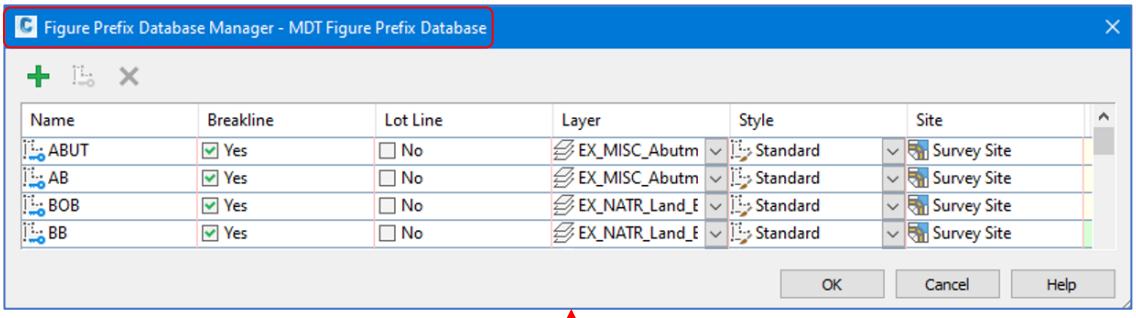
To view or edit the properties of a Linework Code Set, **Navigate** to **TOOLSPACE** > Survey tab > Linework Code Sets > **right-click** on the desired Code Set > **select Edit**….

Figure Defaults – Figure Prefix Databases

User specified path for selecting default figure prefix database. Figure prefixes determine specific figure properties such as layer, style, and if the figure is to be used as a breakline or lot line.

- **Expand Figure Defaults** – (File extension **.fdb_xdef**)





Example Figure Prefix Database

To view or edit the properties of a Figure Prefix Database, **Navigate** to **TOOLSPACE** > Survey tab > Figure Prefix Databases > **right-click** on the desired Figure Prefix Database > **select Manage Figure Prefix Database**…

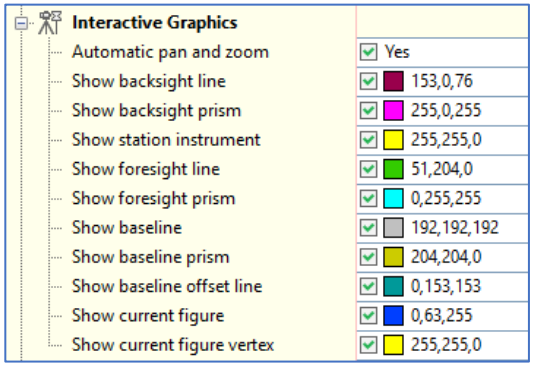
Interactive Graphics

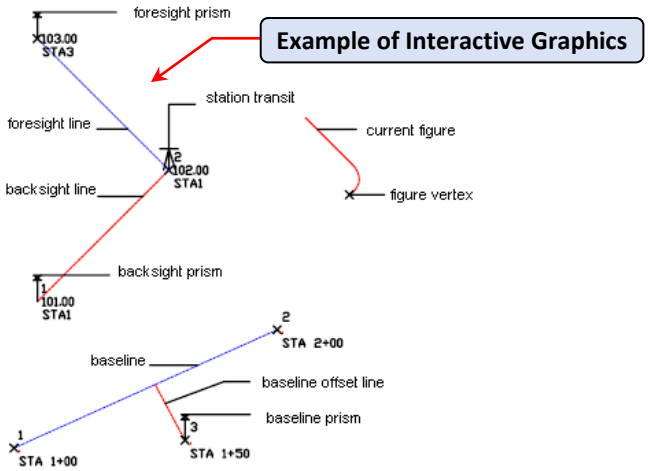
When enabled, the Interactive Graphics setting can be used to control the display of survey components during the **import** and **entry** of survey data.

Interactive Graphics are only displayed temporarily.

If Interactive Graphics are used when importing a field book file, the import process is significantly slower.

- **Expand Interactive Graphics**

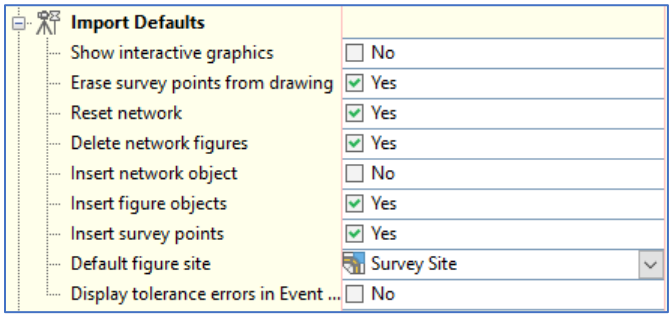




Import Defaults

User specified properties for importing field book or batch files into a selected project or network.

- **Expand Import Defaults**

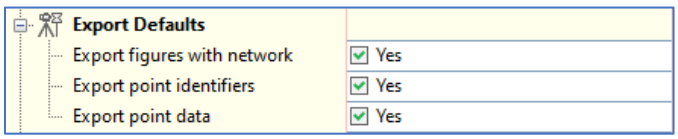


- For detailed descriptions of each import property, please see: Autodesk Knowledge Network – **Survey User Settings**.

Export Defaults

User specified properties for exporting survey data to a field book file.

- **Expand Export Defaults**

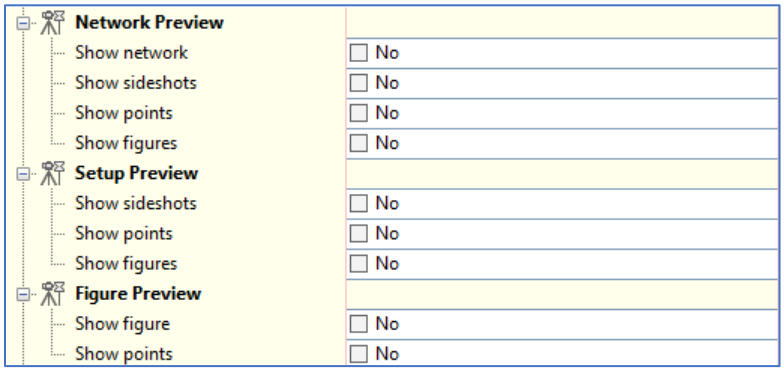


- For detailed descriptions of each export property, please see: Autodesk Knowledge Network – **Survey User Settings**.

Network, Setup, and Figure Preview Defaults

User specified preview properties for how survey objects are displayed when selected and viewed through TOOLSPACE > **Survey tab**.

- **Expand Network**, **Setup**, and **Figure Preview** defaults.



- For detailed descriptions of each property, please see: Autodesk Knowledge Network – **Survey User Settings**.

	The previews use the colors set by the Interactive Graphics settings.

Do not close the Survey Users dialog box – continue to next steps, Exporting Survey User Settings.

Exporting Survey User Settings

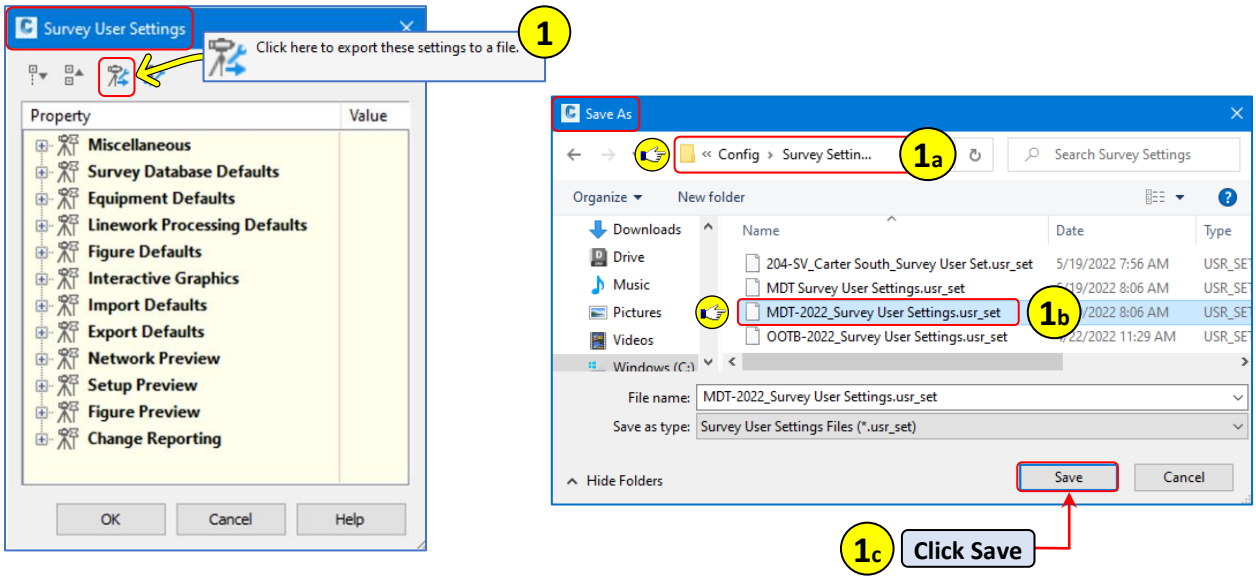
If changes were made to any of the Survey User Settings properties, proceed with exporting the settings for future use creating a new usr_set file or replacing the existing file.

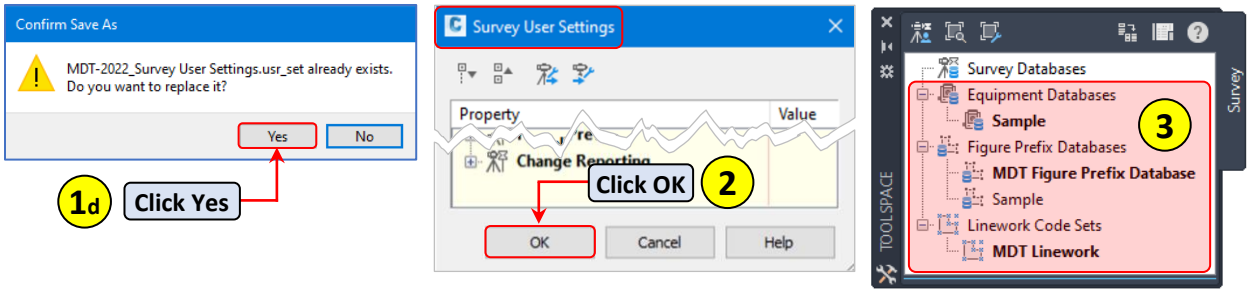
Step 1: From the **Survey User Settings** dialog box, **click** on **Click here to export settings from a file**.

a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Config**Survey Settings**

b. **Select** > **MDT-2022_Survey User Settings.usr_set**

c. **Click Save**.



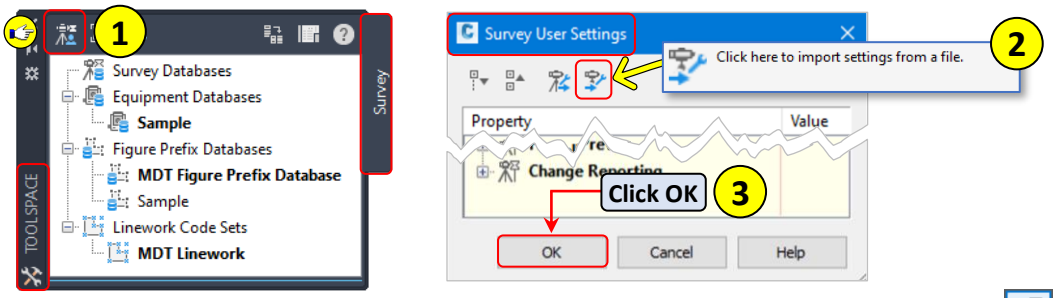


d. **Click Yes** if prompted to replace existing file.

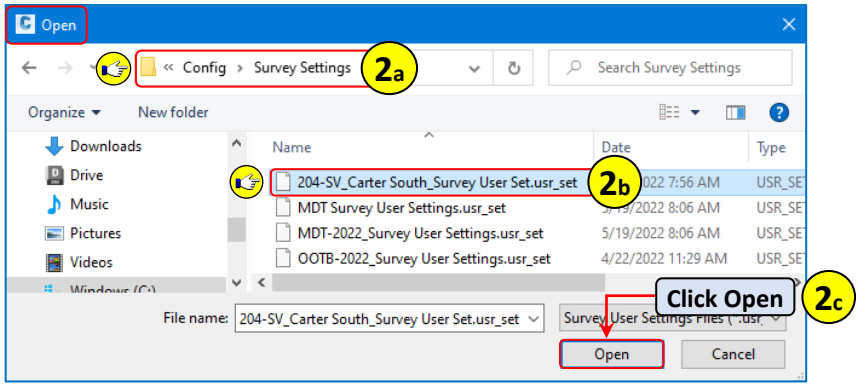
Step 2: **Click OK**.

Step 3: **Navigate** to TOOLSPACE > **Survey** tab > **Verify** selected **Survey User Settings** are active "**bold**".

Importing Survey User Settings



Step 1: **Navigate** to **TOOLSPACE** > Survey tab > **Click** edit **User Survey Settings** .



Step 2: From the **Survey User Settings** dialog box, **click** on **Click here to import settings from a file**.

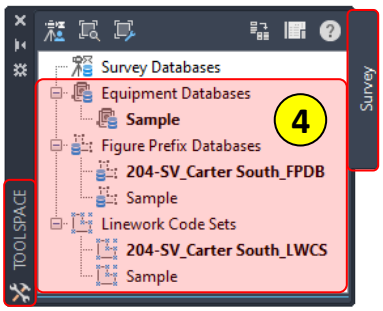
a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Config**Survey Settings**

b. **Select** > **204-SV_Carter South_Survey User Set.usr_set**

c. **Click Open**.

Step 3: **Click OK**.

Step 4: **Navigate** to TOOLSPACE > **Survey** tab > **Verify** selected **Survey User Settings** are active "**bold**".



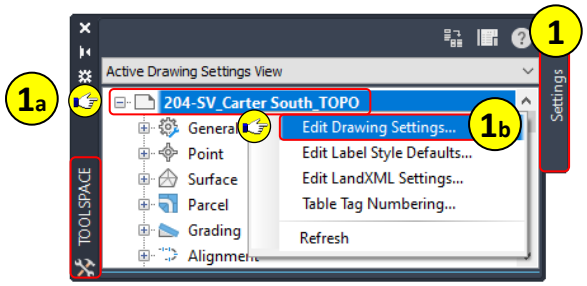
Drawing Templates

The use of a standard survey template will help to eliminate duplication efforts and maintain consistent standards across projects and drawing files.

Review MDT Survey Start Template

Coordinate Systems

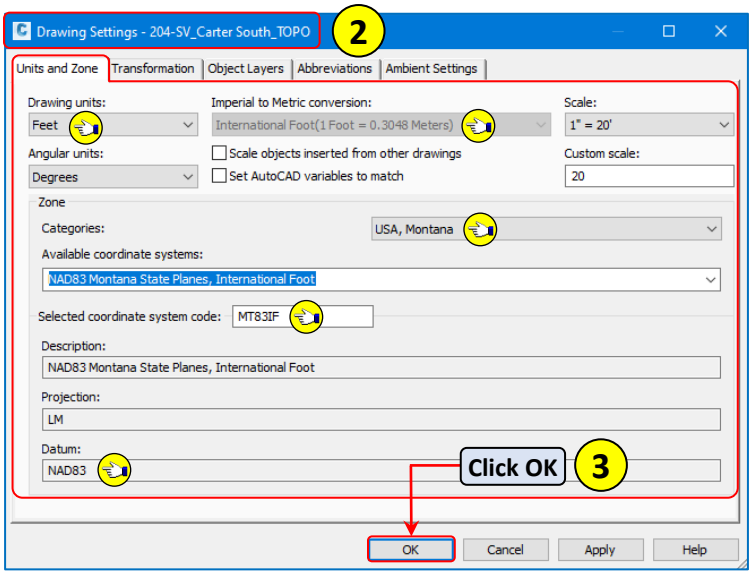
The coordinate system is pre-set to **MT83IF** in the standard survey-start drawing template. The coordinate system can be verified or changed if needed using the Drawing Settings in Toolspace.



Step 1: **Navigate** to TOOLSPACE > **Settings** tab.

a. **Right-click** on **204-SV_Carter South_TOPO**

b. **Select Edit Drawing Settings**…



Step 2: Review the **Drawing Settings – 204-SV_Carter South_Topo** dialog box > **Units and Zone** tab.

Step 3: **Close** the **Drawing Settings** dialog box.

	Drawing coordinates can also be verified/set using the **MAPSTATUSBAR** located on the Status Bar of the C3D workspace. If the MAPSTATUSBAR is not visible, it can be turned on by entering MAPSTATUSBAR in the command line > **Select Show**. Use the drop-down list to assign a coordinate system.

Point Styles

Point Styles control how point symbols are displayed in a drawing. Point styles are managed in the same way as all other C3D object styles using object style collections. Object style collections are stored on the Settings tab of TOOLSPACE. The Point object style collection will be used for creating, editing, copying, and managing all point related items.

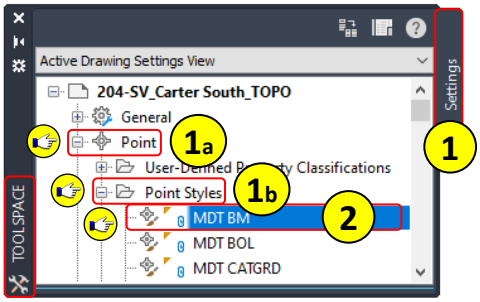
Step 1: **Navigate** to TOOLSPACE > **Settings** tab.

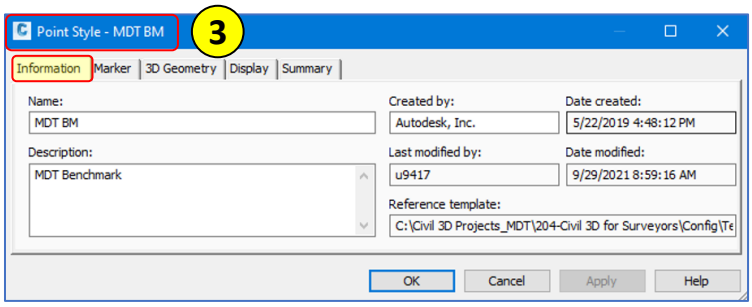
a. **Expand** the **Point** object collection.

b. **Expand Point Styles**.

Step 2: **Locate** and double **left-click** on the **MDT BM** point style.

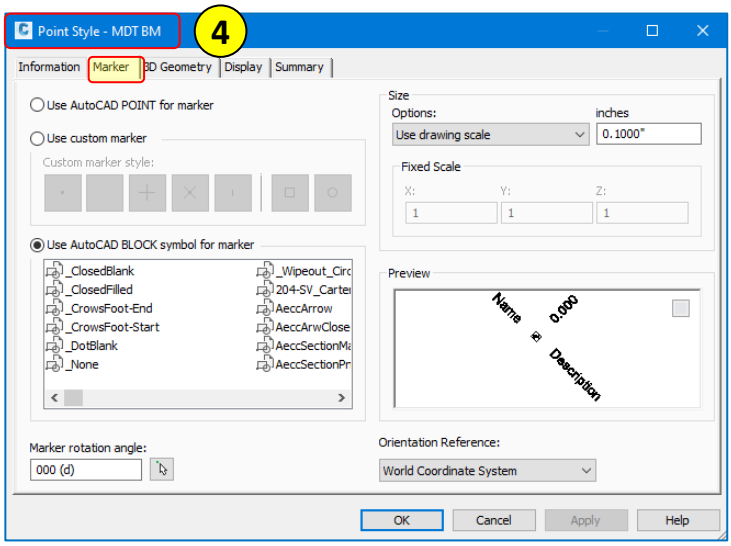
Step 3: From the **Point Style** dialog box **select** the **Information** tab and **review** the **values**:



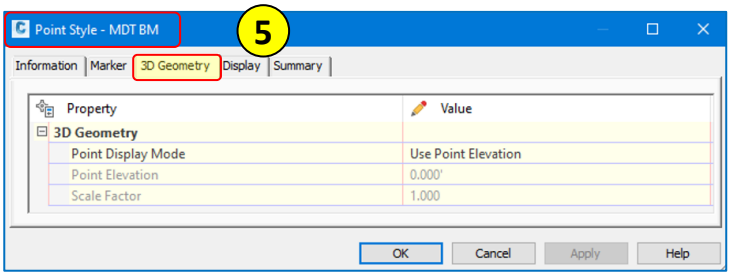


Step 4: **Select** the **Marker** tab and **review** the following:

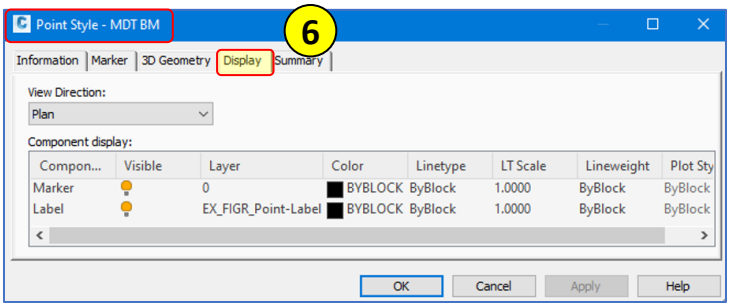
- Marker options
- Marker rotation angle
- Size
- Orientation reference



Step 5: **Select** the **3D Geometry** tab and **review** the **Point Display Mode**:



Step 6: **Select** the **Display** tab, then **expand** the **View Direction** drop down and **review** the **values**:



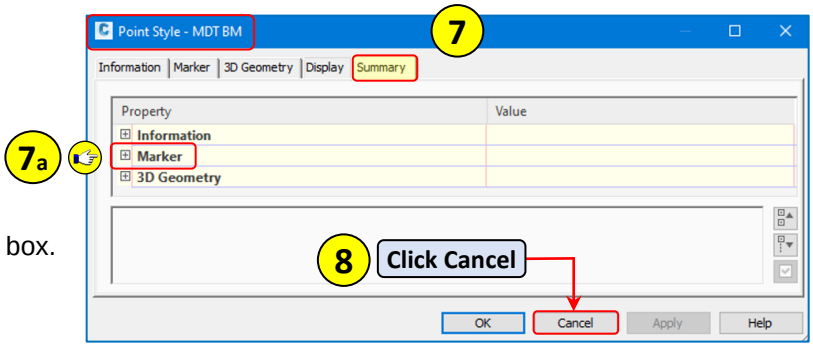
Assigning layer “0” to the components will allow the Description Key set to assign the point layer.

Step 7: **Select** the **Summary** tab and **review** the following:

a. **Expand Marker**

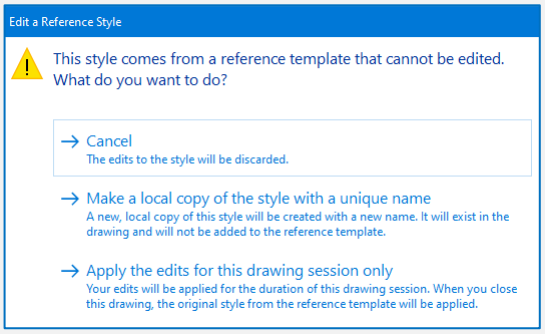
- Marker rotation angle
- Point Marker Size
- Point Marker Type

Step 8: **Close** the **Point Style** dialog box.



By **clicking OK** to close the Point Style dialog box, a pop-up window will be displayed stating that the style comes from a reference template and cannot be edited. A choice will then need to be made if there were actual edits made to a style.

This will be the case for **any style** on the Settings tab that comes from a reference template. Styles coming from a reference template are identified with the “blue” paper clip icon next to the style name in the collection tree .



Label Styles

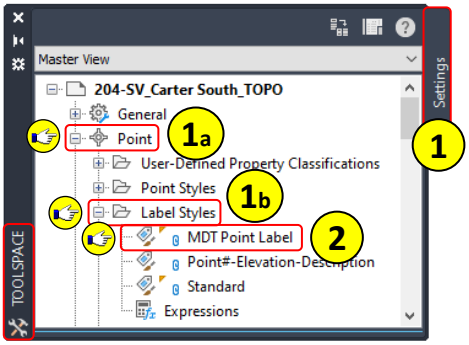
Label and table styles control the appearance and behavior of point labels and tables in a drawing. Label and table styles can be configured to display various types of point related data. Styles can be automatically assigned during point creation or controlled by point groups and description keys. If needed, text can also be edited on individual point labels.

Step 1: **Navigate** to TOOLSPACE > **Settings** tab.

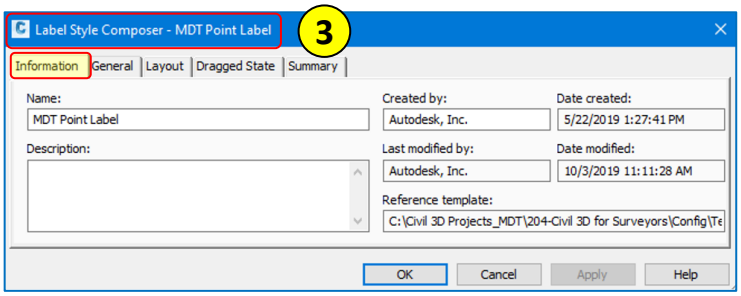
a. **Expand** the **Point** object collection.

b. **Expand Label Styles**.

Step 2: Double **left-click** on the **MDT Point Label** label style.

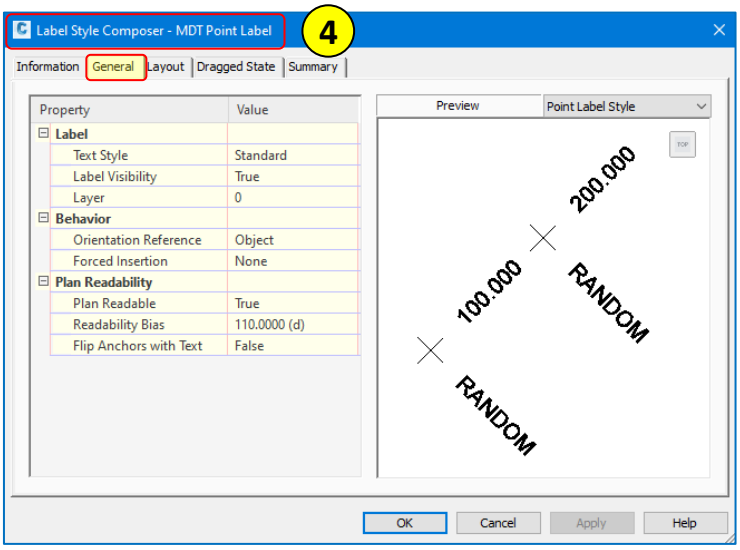


Step 3: From the **Label Style Composer** dialog box **select** the **Information** tab and **review** the **values**:



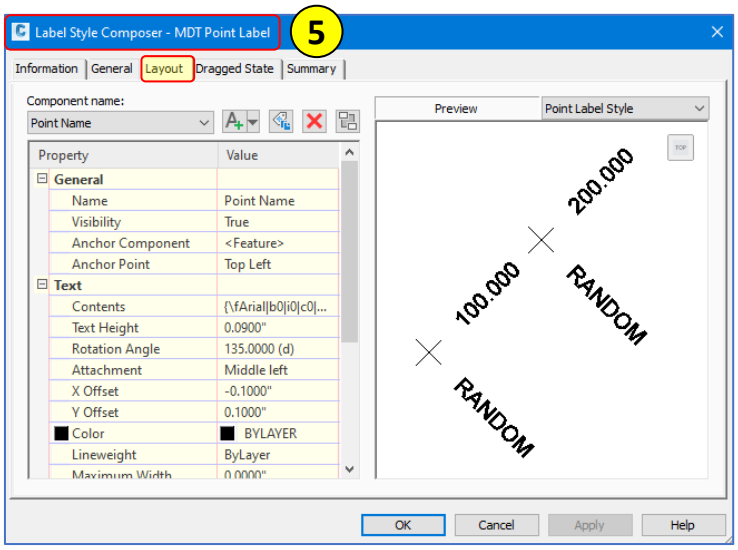
Step 4: **Select** the **General** tab, **review** the following:

- Label properties
- Behavior properties
- Plan Readability properties



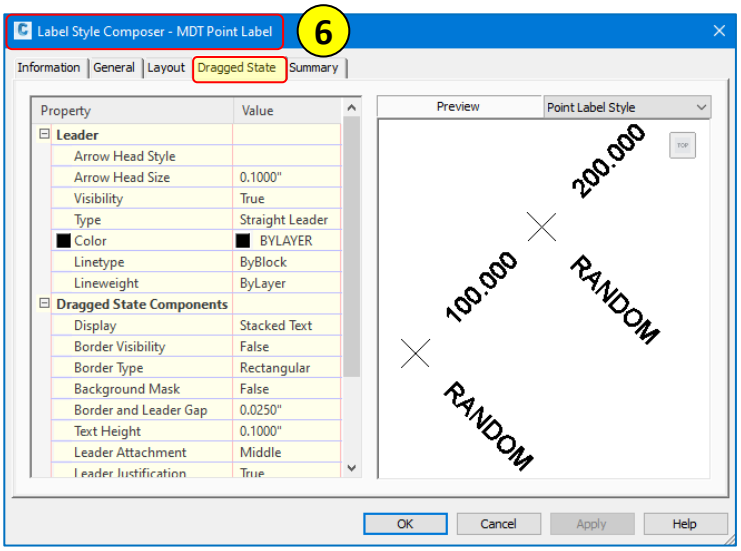
Step 5: **Select** the **Layout** tab, **review** the following:

- Component name
- Label Component Tools
- General properties
- Text properties
- Border properties



Step 6: **Select** the **Dragged State** tab, **review** the following:

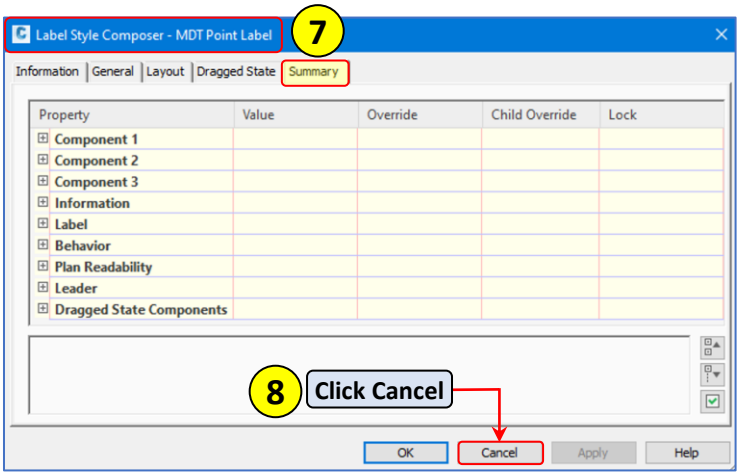
- Leader properties
- Dragged State Components properties



Step 7: **Select** the **Summary** tab, **review** the following:

- Leader properties
- Dragged State Components properties

Step 8: **Close** the **Point Label Style Composer** dialog box:



User-Defined Property Classifications

There are many default properties available that can be used to identify points. There are times though when OOTB defaults are not enough. Custom properties may be needed to correctly identify point data. User-Defined Property Classifications provide a way to identify custom properties if needed.

A common example requiring custom properties are points used for identifying trees. A User-Defined Property Classification could be created named Trees. Then properties can be created to identify name, species, and height.

User-Defined Property Classifications are stored in TOOLSPACE > Settings tab > **Point** collection.

User-Defined Properties can be used for:

- Importing points, Creating point groups, Labeling point, and Creating Point Tables

Point File Formats

Point files are used to translate point file data either when importing points to a survey database or directly into a drawing.

A *point file format* does not contain point data; it describes the layout of a *point data file* based on the location data of the point.

When points are imported, exported, or transferred, a point file format must be used that matches the point data file that read or written to. When importing points, the correct point file format must be used to ensure proper location and arrangement of points being imported. The same is true when points are exported. When points are transferred from one file to another, two formats are specified. One that describes the arrangement of the points in the source file and one that describes how the transferred data will be arranged in the destination file.

If needed, point file formats can be used to adjust elevations within a point data file. Specified values can either be subtracted or added to point elevations when imported.

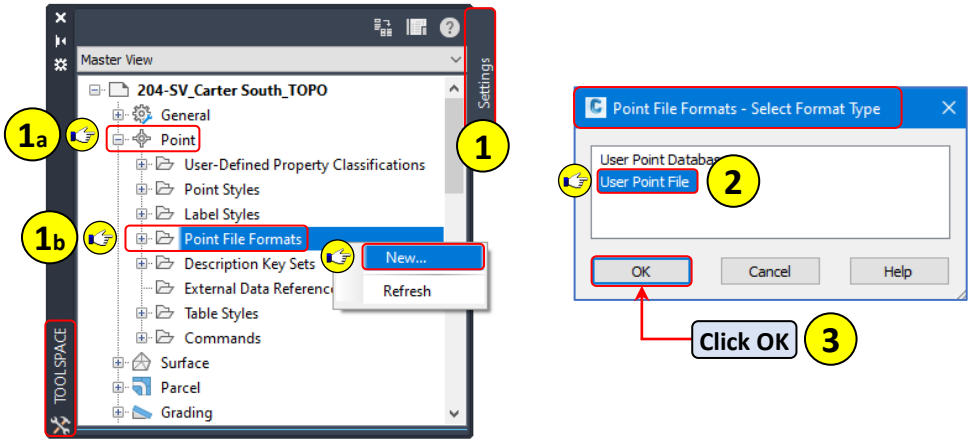
Step 1: **Navigate** to TOOLSPACE > **Settings** tab.

a. **Expand** the **Point** object collection.

b. **Right-click** on **Point File Formats** > **Select New**

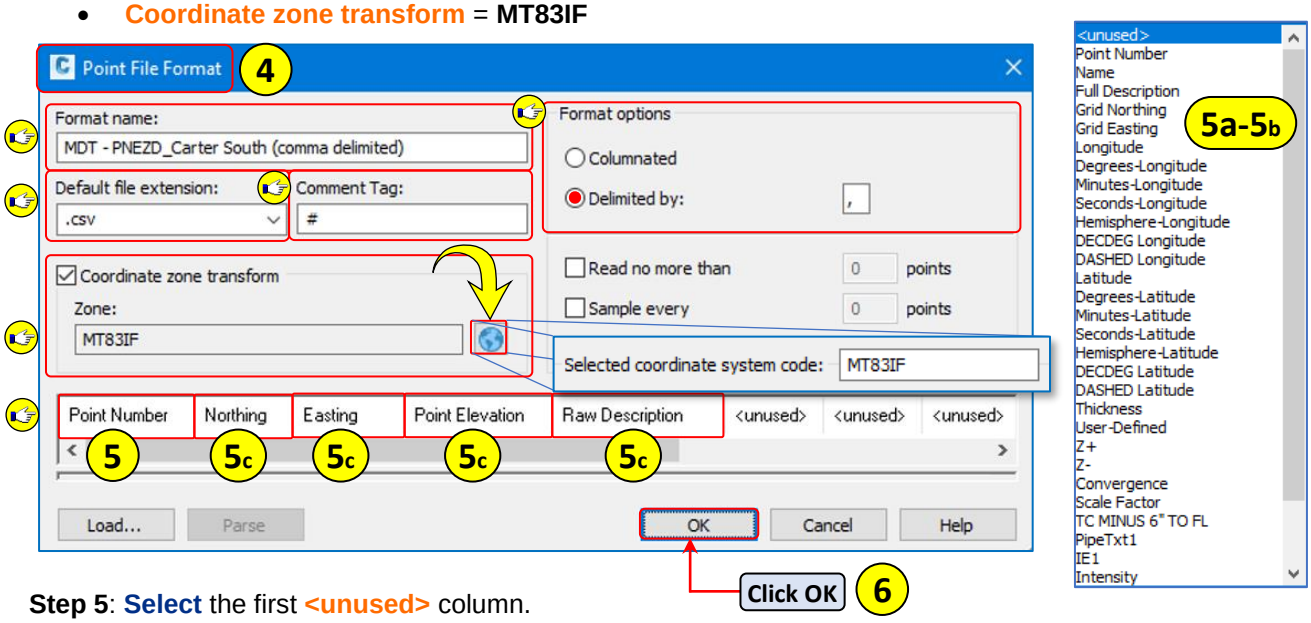
Step 2: From the **Point File Formats – Select Format Type dialog box** > **Select User Point File**.

Step 3: **Click OK**.



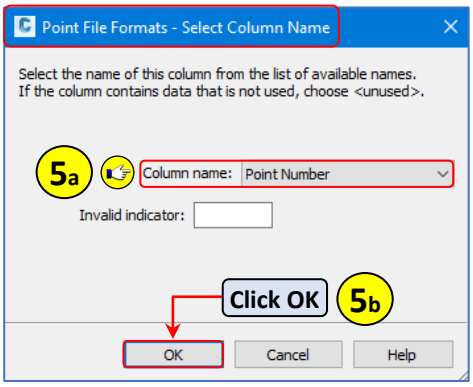
Step 4: From the **Point File Format** dialog box, populate the following parameters:

- **Format Name** = **MDT – PNEZD_Carter South (comma delimited)**
- **Default File Extension** = **.csv**
- **Comment Tag** = **#**
    - Specifies how descriptive text (field notes) is designated and processed in the point file. For example, any line in the point data file beginning with # sign, such as MDT-Point Data, will be ignored during import.
- **Format options** = **Delimited by: ,**
- **Coordinate zone transform** = **MT83IF**



Step 5: **Select** the first **<unused>** column.

a. From the Point File Formats – Select Column Name > **Click** the drop down for Column Name > **select Point Number** from the available options listed.



	User-Defined Property Classifications can be assigned as Reference File Column Names.
	When assigning column properties, make certain the order matches the order format of the point file being used.

b. **Click OK**.

c. **Continue assigning property formats** to the remaining columns as needed.

Step 6: **Click OK**.

Step 7: **Save** the **drawing** .

Description Key Set

Description Keys are used to automatically assign point marker and point label styles when importing or creating points manually in a drawing. Prior to creating or importing points, description keys need to be created and set up to align with the raw field codes used by the survey crew when collecting survey data.

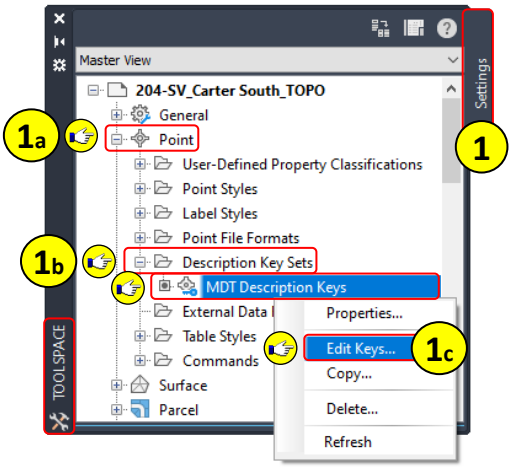
	Description Key Sets must be saved in the main template file. Description Key Sets cannot be loaded through a Reference Template, imported, or exported. Description Key sets can be inserted into any drawing file using the Import MDT Description Key Set tool found on the MDT Settings Tool Palette. Sets can also be copied from one file to another using TOOLSPACE > Settings tab > **Drag-n-Drop** between drawings.

Step 1: **Navigate** to TOOLSPACE > **Settings** tab.

a. **Expand** the **Point** object collection.

b. **Expand Description Key Sets**

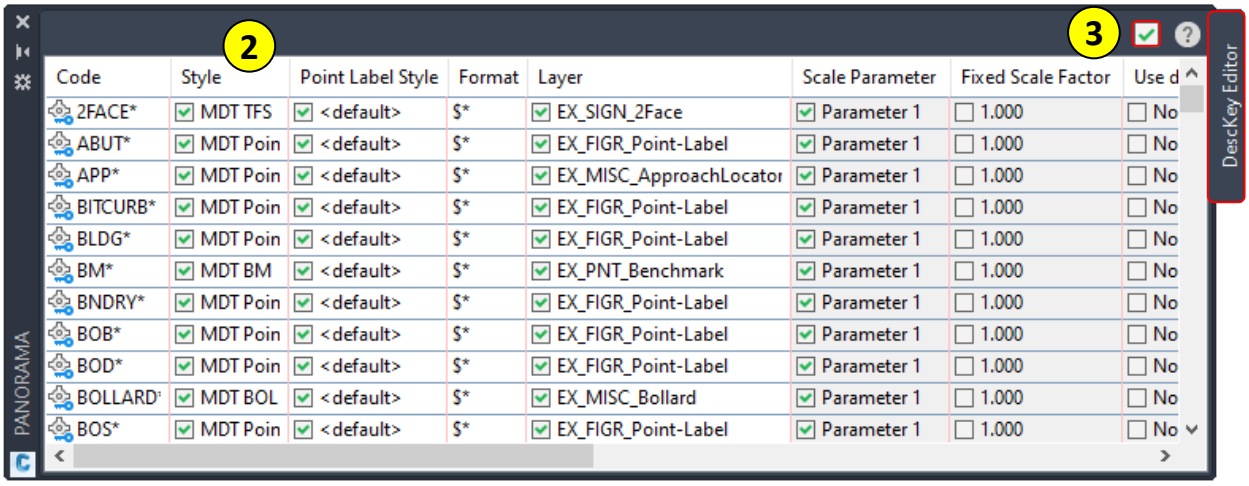
c. **Right-click** on MDT Description Keys > **Select Edit Keys**…



Step 2: In the Panorama > DescKey Editor vista, **review** the **Description Keys** and their properties:

- The **five** most utilized columns and **properties** are:
  - **Code**: Used for matching raw field codes with properties of description key if a match is found.
  - **Style**: Assigned point marker style.
  - **Point Label Style**: Assigned point label style and component text.
  - **Format**: Translates the point raw description into a full description. Default = **$***
    - For detailed descriptions of each import property, please see: Autodesk Knowledge Network – **Description Key Code Reference**.
  - **Layer**: Assigned layer.
- The remaining columns can be used for scaling and rotating point markers and point labels based on the translated data collected in the filed by the survey crew.

	Description Key matching is case-sensitive and must accurately match raw field codes accurately.



Code	Style	Point Label Style	Format	Layer	Scale Parameter	Fixed Scale Factor	Use d
2FACE*	MDT TFS	<default>	$*	EX_SIGN_2Face	Parameter 1	1.000	No
ABUT*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
APP*	MDT Poin	<default>	$*	EX_MISC_ApproachLocator	Parameter 1	1.000	No
BITCURB*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
BLDG*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
BM*	MDT BM	<default>	$*	EX_PNT_Benchmark	Parameter 1	1.000	No
BNDRY*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
BOB*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
BOD*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No
BOLLARD*	MDT BOL	<default>	$*	EX_MISC_Bollard	Parameter 1	1.000	No
BOS*	MDT Poin	<default>	$*	EX_FIGR_Point-Label	Parameter 1	1.000	No

Step 3: **Dismiss** the **Desckey Editor** vista ☑

Points and Point Groups

Every construction project will most likely have points associated with it. In the form of identifying existing site conditions, project site control/benchmarks, and staking points for construction. Points can be imported into a drawing using the Insert Points from File command, Survey Databases, or manually using the Points Create toolbar.

Survey Points

- Survey points are stored on the Survey tab of TOOLSPACE.
- Survey points can be displayed on both TOOLSPACE tabs, Survey and Prospector.
- Access to the Survey Database where the points originated is required for editing Survey points.
- Survey points cannot be moved or edited in the drawing without first being unlocked through the Survey Database.

COGO Points

- Points imported or created manually by C3D are Coordinate Geometry (COGO) points.
- COGO points contain coordinate data (XYZ values).
- COGO points contain a variety of additional properties such as, point number, point name, raw (field) description, and full (expanded) description.
- COGO points are not stored on the Survey tab of TOOLSPACE.

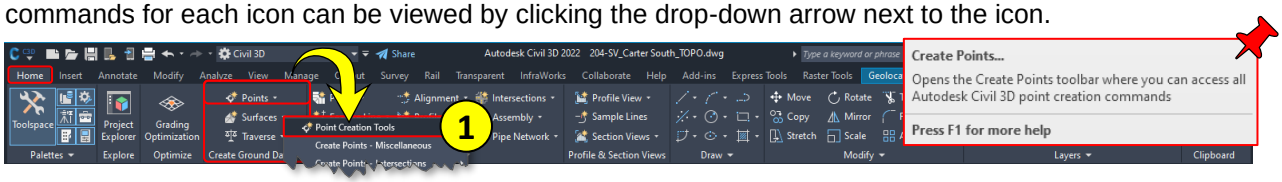
AutoCAD Points

- AutoCAD points only have (XYZ values).
- AutoCAD points cannot be shared.
- AutoCAD points do not contain additional properties.
- AutoCAD points are not intelligent.

Point Creation Tools

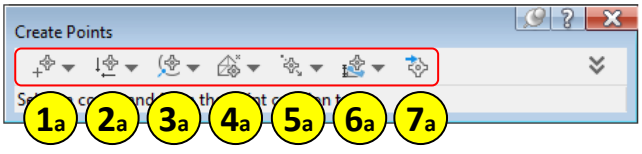
Create Points Toolbar

The Create Points toolbar is used when manual point creation is needed. The Create Points tools are separated into seven (7) basic categories that each contain a list of commands based on function. The commands for each icon can be viewed by clicking the drop-down arrow next to the icon.

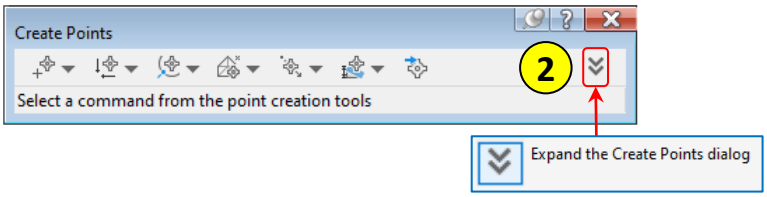


Step 1: **Navigate** to the **Home** tab > Create Ground Data panel > **Points** drop-down > **Select** **Point Creation Tools**

1a. **Miscellaneous**
2a. **Intersection**
3a. **Alignment**
4a. **Surface**
5a. **Interpolation**
6a. **Slope**
7a. **Imports Points**

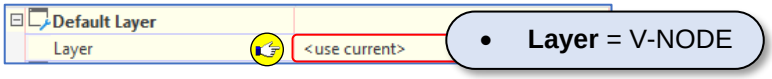


Before creating new COGO points, the starting point number, or next number in the sequence must be determined. Elevations and descriptions must also be identified and how to assign these properties to each point that is created. To set or adjust the point number, default elevations, descriptions, name format, and similar properties, use the Create Points toolbar's expanded view. The expanded view can be displayed by clicking on the icon.

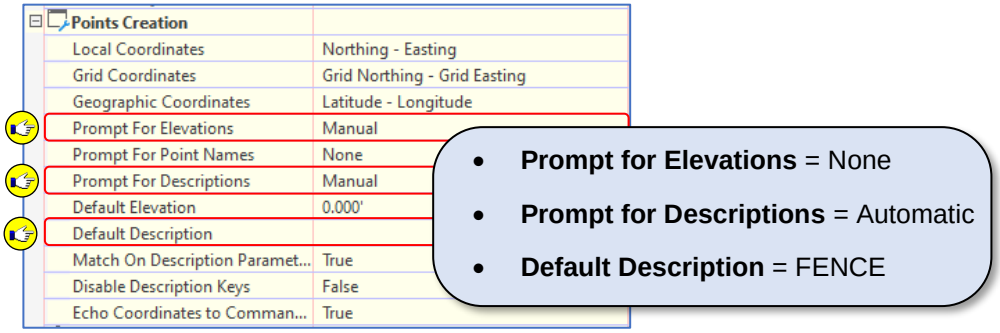


Step 2: For **each** Create Points Parameter, **expand** and **review/set** the properties for each parameter.

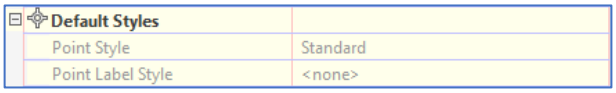
- **Expand Default Layer**



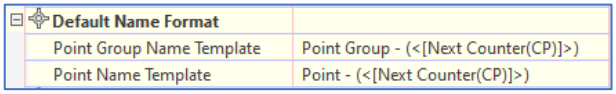
- **Expand Points Creation** > **revise properties** as shown.



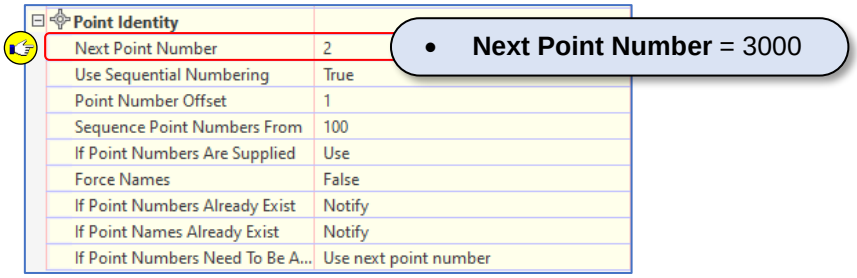
- **Expand Default Styles**



- **Expand Default Name Format**



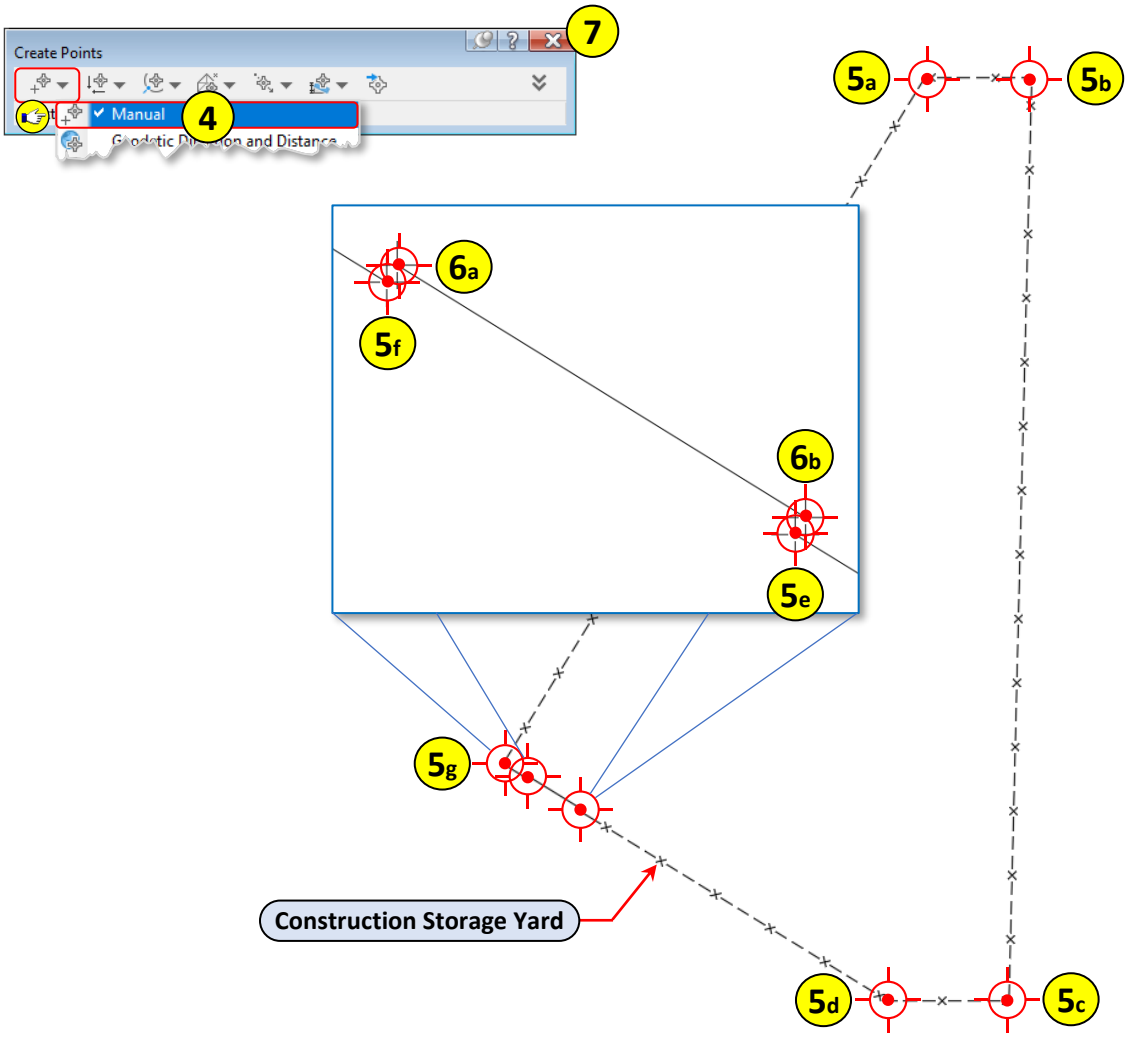
- **Expand Point Identity** > **revise properties** as shown.



	Default styles are only used when creating new COGO points and **ONLY** when "**Disable Description Keys**" is set to **TRUE** in the **Points Creation** parameter.

Step 3: **Navigate** to the proposed **Construction Storage Yard** area.

Step 4: Using the Create Points toolbar > **Miscellaneous** tools drop-down > **Select Manual**.



Step 5: When prompted to specify a location for a new the point:

```
CREATEPOINTMANUAL Please specify a location for the new point:
```

a. Using the external reference dwg > **Create** (7) **Fence Cogo Points** (5a-5f) as shown above.

- **Utilize** the **Endpoint** Osnaps (F3) for **picking** and **snapping** to each point location.
- **Continue selecting** points for the **remaining** corners > **Press Enter** to end the command

Step 6: **Repeat** Step 2 > **Expand Points Creation** > **Update Default Description** = **GATE**

a. Using the external reference dwg > **Create** (2) **Gate Cogo Points** (6a-6b) as shown above.

- **Utilize** the **Endpoint** Osnaps (F3) for **picking** and **snapping** to each point location.
- **Press Enter** to end the command.

Step 7: **Close** the **Create Points** tool bar > Click the

Step 8: **Save** the **drawing** .

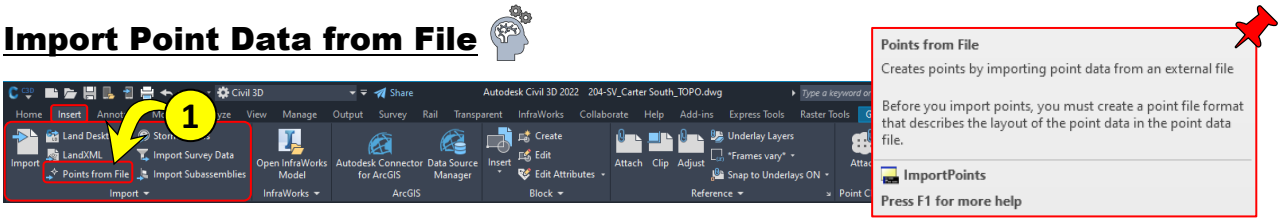
Import Point Data from File

Importing Points from File is a quick and effective way for inserting survey point data collected using a data collector directly into a drawing. The import process can be completed using an ASCII (text/csv) file. A corresponding point file format that correctly describes the point layout and orientation will be needed. The use of a Description Key Set that matches the current point data file will automate the creation of point markers and point labels.

	The highest point number allowed in C3D is 4,294,967,295. Point names or User Defined Properties can be used to reference number ranges greater than 4,294,967,295.

	When using the **Field to Finish** workflow and all parameters have been set-up to do so, the use of a Survey Database will provide automatic linework generation (figures) and the data can easily be shared with multiple users from one source. • Importing Points from File **is not** the most efficient workflow for sharing survey data.

Import Point Data from File



Step 1: **Navigate** to the **Insert** tab > Import panel > **Select Points from File**.

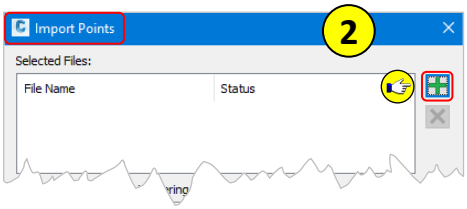
Step 2: From the **Import Points** dialog box > **Click** the "**green**" for selecting point file to be imported.

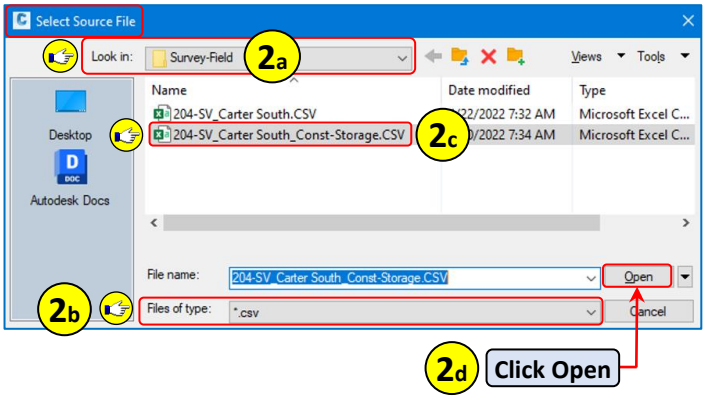
a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**Survey-Field**

b. **Verify** the **file type** = **.csv**

c. **Select** > **204-SV_Carter South_Const-Storage.CSV**

d. **Click Open**.

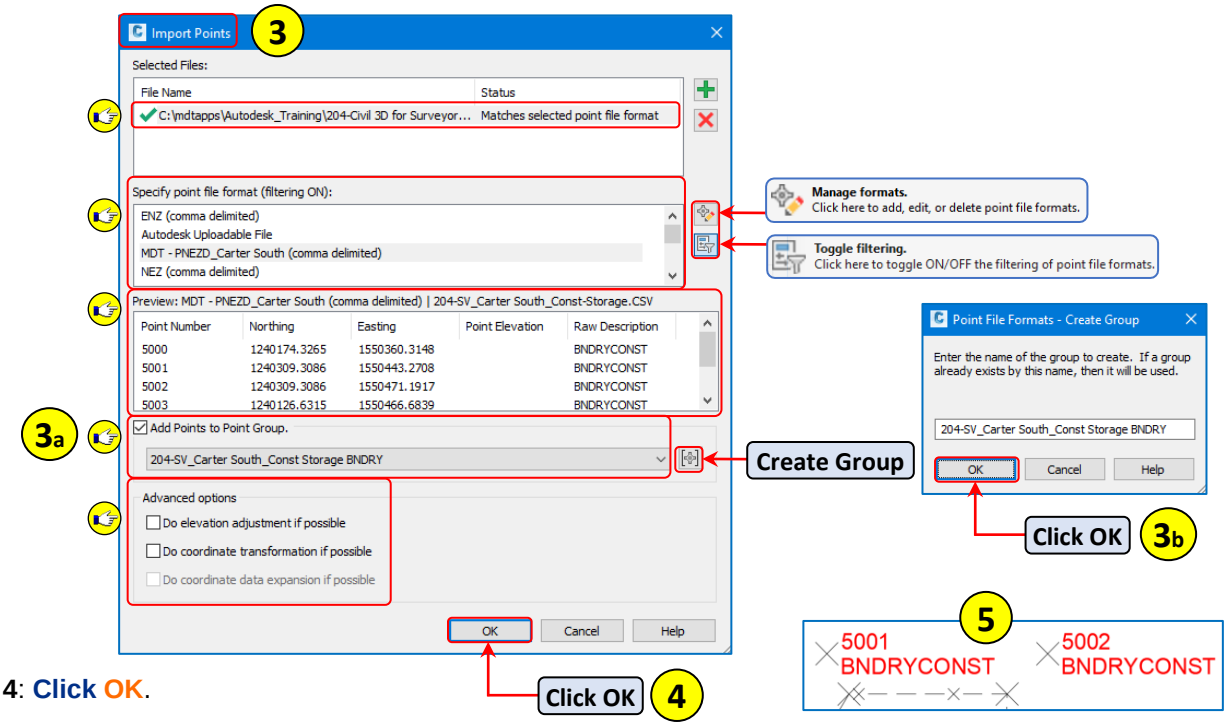




	It's common practice to have the point file open that will be inserted. If the point file is **open** while attempting to insert, you will be prompted with an error. Close the file prior to selecting. **Error**: C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data... No point file format match found

Step 3: From the **Import Points** dialog box, **set** and **verify** the following parameters:

- **Verify** selected file does not indicate any **errors**.
- **Specify Point File Format** = **MDT – PNEZD_Carter South (comma delimited)**
- **Verify** the **Point Preview**.
- If imported points are to be added to a point group:
  a. **Check** the box for **Add Points to Point Group**.
  b. **Create** a **new** point group named **204-SV_Carter South_Const Storage BNDRY** > **Click OK** (If left unchecked, points will be added to the defualt **All Points** group).
- If point adjustment and or transformation is needed, select the appropriate box.

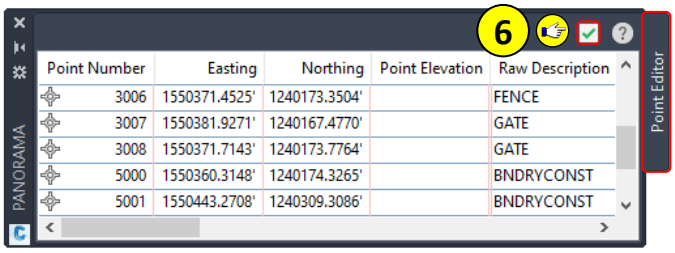


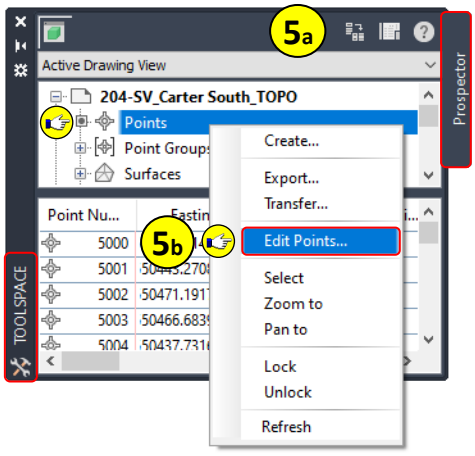
Step 4: **Click OK**.

Step 5: **Review** the **imported points** in the **drawing area** and the **points editor**.

a. **Navigate** to TOOLSPACE > **Prospector** tab.

b. **Right-click** on Points > **Select Edit Points**…





Step 6: **Dismiss** the **Points Editor** vista

Step 7: **Save** the **drawing** .

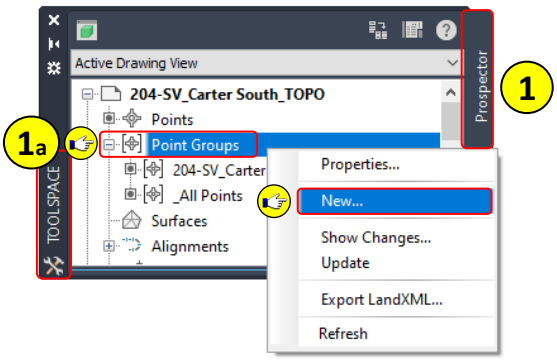
Point Groups

Point Management using Point Groups

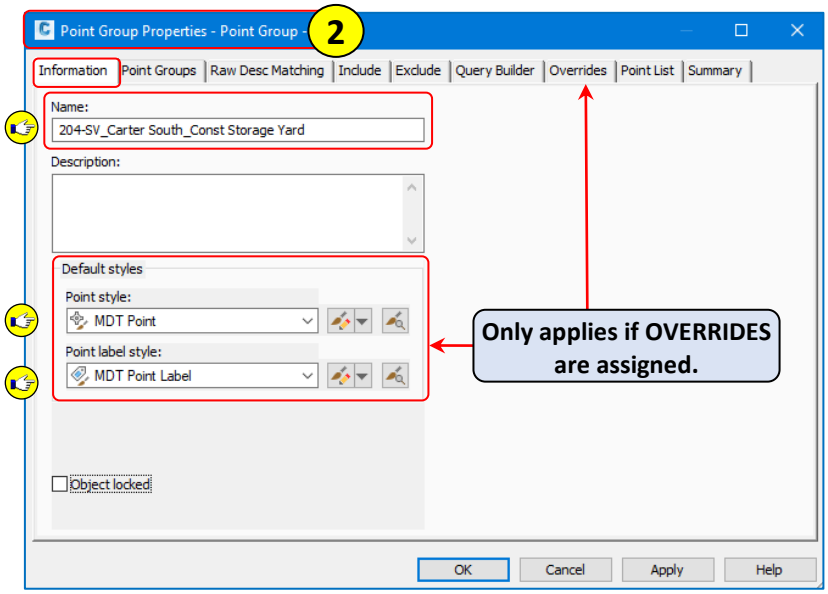
Point groups help to organize and stylize points in a drawing that share common descriptions and characteristics. When points are first inserted into a drawing file, the **_All Points** point group is automatically created. It cannot be deleted. For consistency, point groups can be created and stored in a standard template along with corresponding Description Keys. Points will then automatically be sorted and organized into the point groups based on point group properties when creating a new drawing from the standard template.

Step 1: **Navigate** to TOOLSPACE > **Prospector** tab

a. **Right-click** on **Point Groups** > **Select New**…



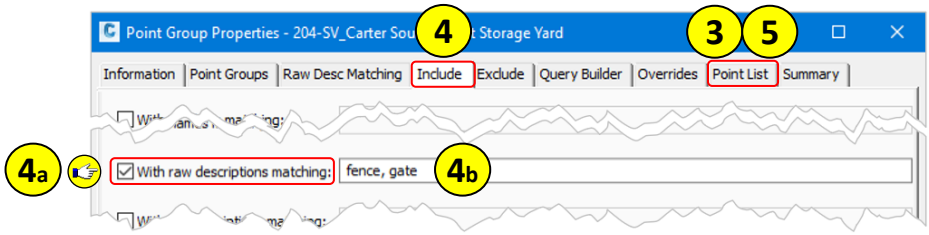
Step 2: From the **Point Group Properties** dialog box > Information tab > **Set** the following **parameters**:



- **Name** = **204-SV_Carter South_Const Storage Yard**
- **Point Style** = **MDT Point**
- **Point label Style** = **MDT Point Label**

	The **Object locked** function found on the Information tab of Point Group Properties will prevent any changes to the point group when “checked”.

Step 3: From the **Point Group Properties** dialog box > **Click** on the **Point List** tab. Notice it is **blank**.



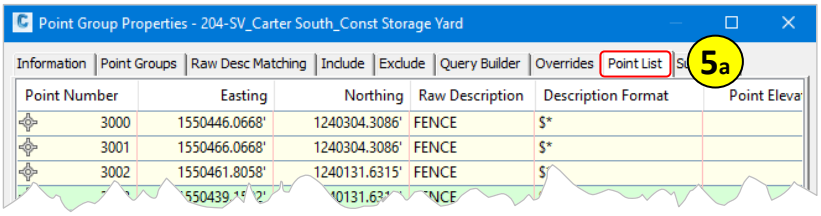
Step 4: From the **Point Group Properties** dialog box > **Click** on the **Include** tab.

a. On the **Include** tab > **Check** the box for **With raw descriptions matching**:

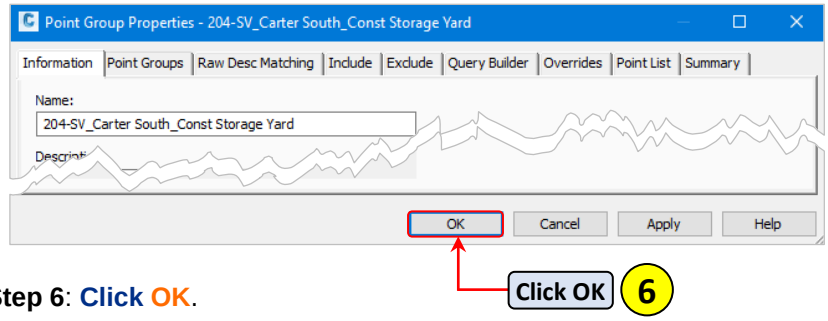
b. **Populate** the **raw descriptions** field to include: **fence**, **gate** (*not case sensitive here*).

	Point **inclusion** can also be identified using the **Description Keys** found on the **Raw Desc Matching** tab of the Point Group Properties dialog box if point file matches available Desc Keys.

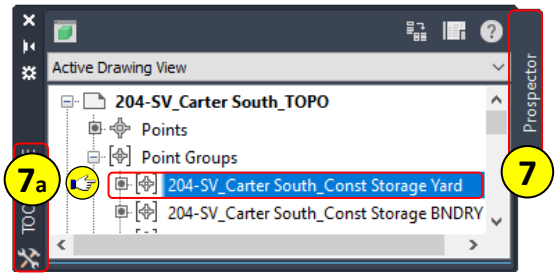
Step 5: From the **Point Group Properties** dialog box > **Click** on the **Point List** tab.

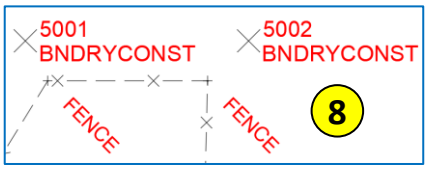


a. Notice the Point List is now **populated** with the points identified on the Include tab.



Step 6: **Click** **OK**.





Step 7: **Navigate** to TOOLSPACE > **Prospector** tab > **Expand** **Point Groups**.

a. **See** **204-SV_Carter South_Const Storage Yard** point group.

Step 8: **View** **Model space**. Notice how the **Fence** and **Gate** Points are now being displayed.

Step 9: **Save** the **drawing** .

Updating Point Groups

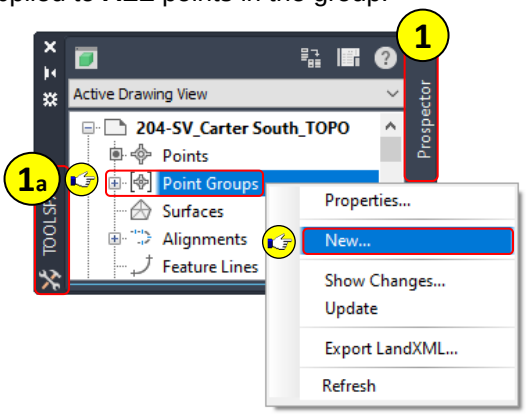
Once point groups have been defined and points are added to the drawing, the groups may be flagged as out of date. On groups that are out of date, right-click on the group and select **Show Changes**. The changes are displayed, and if correct, **Update** can be selected to approve and add the changes to the group.

If multiple groups are out of date and changes are to be accepted, ALL groups can be updated by right-clicking on the **Point Groups** collection and selecting **Update** from the menu.

- Out of date collections and objects in TOOLSPACE are identified with the icon. Any items flagged with this icon require the user's attention.

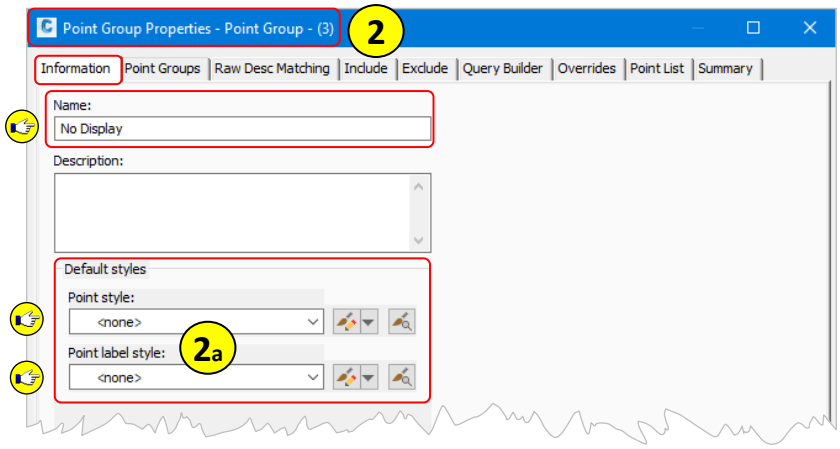
Point Group Overrides

Description Keys are used for assigning point markers and point labels to points in the drawing. The properties assigned to a point by a Description Key can be overridden using specific point group overrides applied to **ALL** points in the group.



Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Right-click** on **Point Groups** > **Select New**…

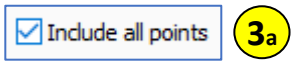


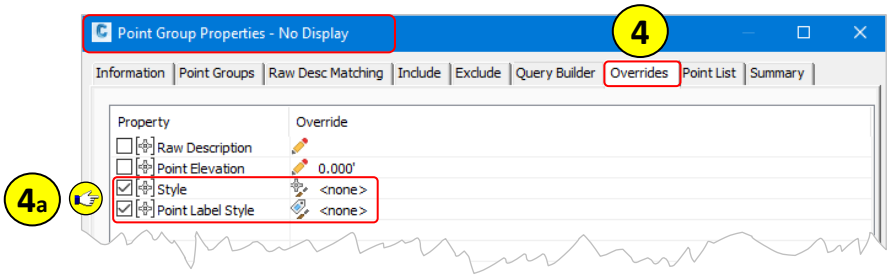
Step 2: From the **Point Group Properties** dialog box > Information tab > **Populate** the Point Group **Name** – **No Display**

a. **Select** <**none**> from the Default Styles drop-down list for both the **Point** style and **Point label** style.

Step 3: From the **Point Group Properties** dialog box > **Click** on the **Include** tab.

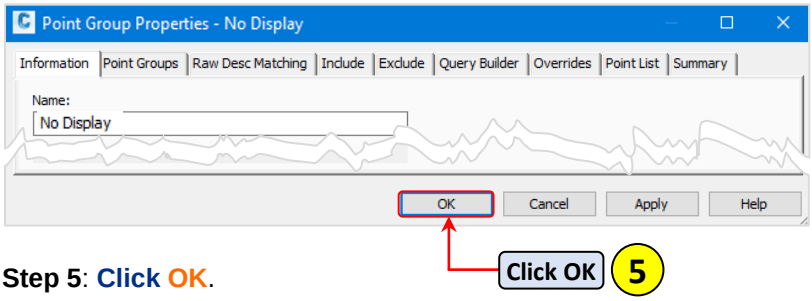
a. On the **Include** tab > **Check** the box for **Include all points**



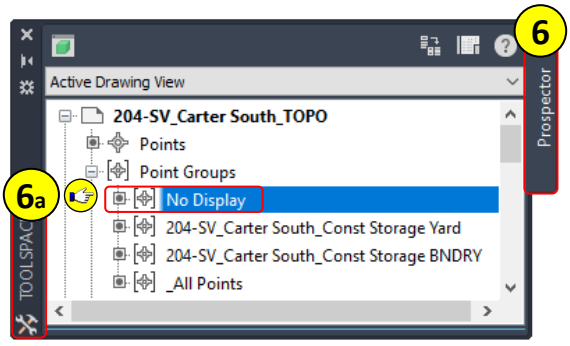


Step 4: From the **Point Group Properties** dialog box > **Click** on the **Overrides** tab.

a. On the **Overrides** tab > **Check** the boxes for **Style** and **Point Label Style**.

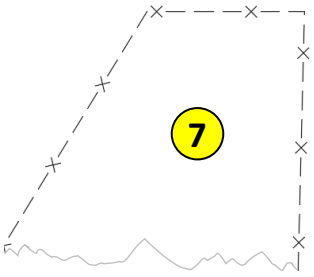


Step 5: **Click** **OK**.

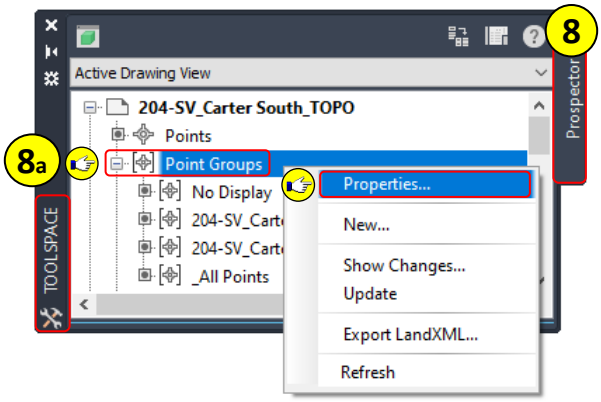


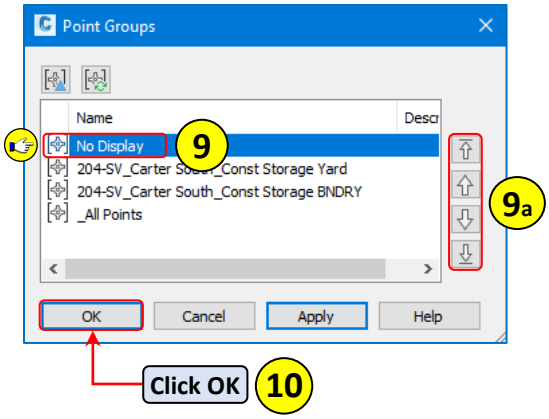
Step 6: **Navigate** to TOOLSPACE > **Prospector** tab > **Expand** **Point Groups**.

a. **See** **No Display** point group.



Step 7: **View** **Model space**. **See** how **ALL** points are no longer being displayed.





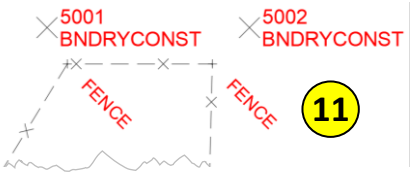
Step 8: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Right-click** on **Point Groups** > **Select Properties**…

Step 9: From the **Point Groups** dialog box > **Select No Display**.

a. Using the **hierarchy** controls > **Move** the **No Display** point group to the bottom.

Step 10: **Click OK**.



Step 11: View Model space. **See** how **ALL** Points are now being displayed.

Step 12: **Save** the **drawing** .

	Point Locking: To avoid accidental point editing or movement when points are not managed by a Survey Database, COGO points can be locked individually or by group. **To Lock ALL Points**: **Right-click** on Points collection > **Select Lock**. **To Lock Point by Group**: **Right-click** on Point Group name > **Select Lock Points**. **To Lock individual Points**: **Right-click** on Points, _All Points, or Point Group Name > **Select Edit Points**… > From the Edit Points vista > **Select points** to lock > **Right-click** > **Select Lock**.

Editing Points

Point groups provide an easy way for managing and grouping specific points together. However, there may be times when it is necessary to edit the point data directly rather than applying overrides using point groups. The allowable point data that can be edited will be determined if the points to be edited are “live” in the drawing file or part of a survey database. As well as being locked vs. unlocked.

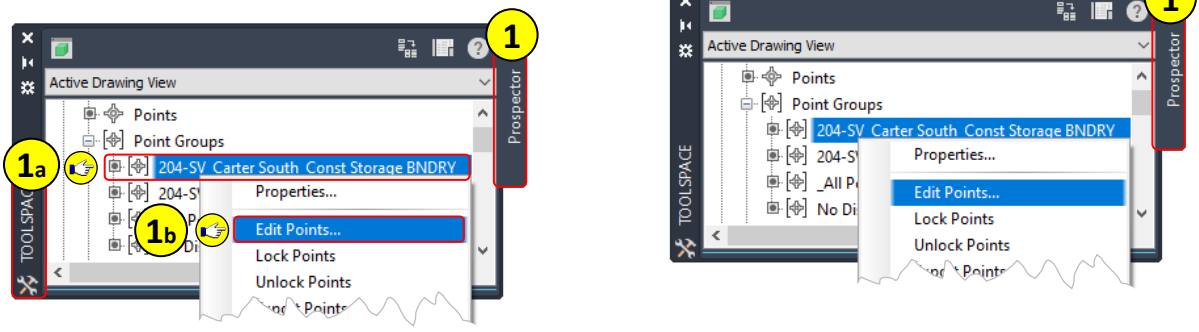
Allowable Point Data that can be edited – Basic minimum criteria:	
Point Origin = **Live in drawing**	Point Origin = **Survey Database**
Description, elevation, location, style, etc.	Point marker and label styles (if points are locked).

Points that are part of a Survey Database and remain locked in the drawing once inserted, will need to be edited using TOOLSPACE > Survey tab > **Project specific Survey Database**.

CAUTION	Points that have been inserted using a Survey Database and then “unlocked” **cannot** be re-locked through the Survey Database. The points are now live in the drawing.

For more information and specific Survey Database workflow, see **Survey Database** section of this user guide on Page **Error! Bookmark not defined.**.

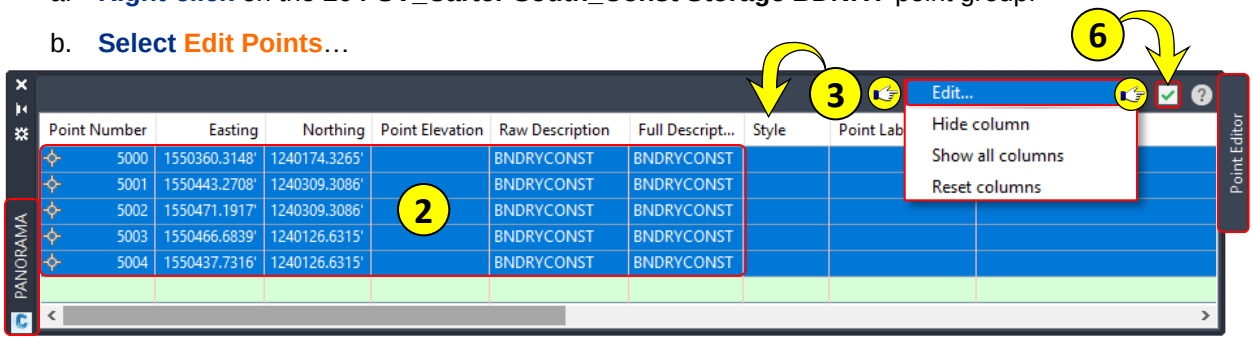
Editing Points



Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Right-click** on the **204-SV_Carter South_Const Storage BNDRY** point group.

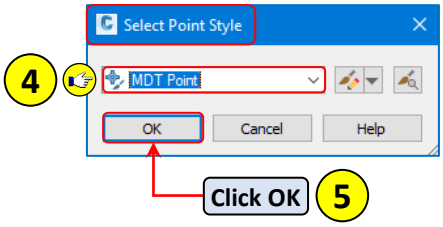
b. **Select Edit Points**…



Step 2: From the **Point Editor** PANORAMA > **Select** all **points**.

	Multiple rows can be selected using the standard selection methods (ctrl+a, shift, or control).

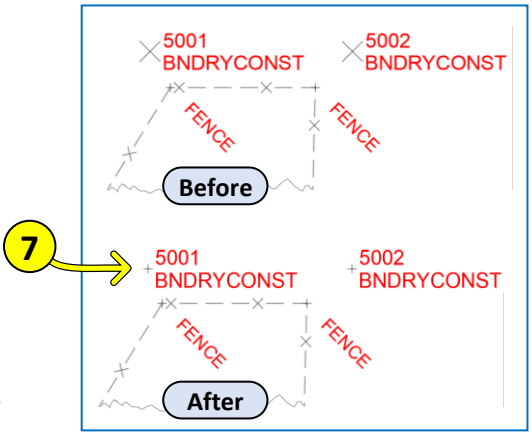
Step 3: **Right-click** on the **Style** column header > **Select Edit**.



Step 4: From the **Select Point Style** dialog box > **Select MDT Point** style from the drop-down list.

Step 5: **Click OK**.

Step 6: **Dismiss** the **Panorama** – **Figure Display** vista .

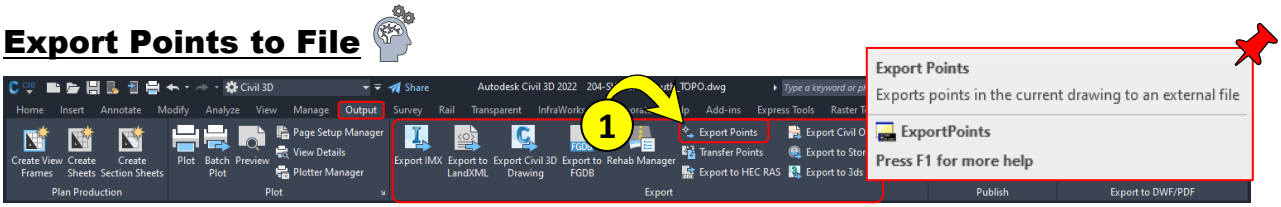


Step 7: **View Model space**. See how **ALL** Boundary Point markers now display with the **MDT Point** style.

Export Point Data to File

When exporting point data, points can be exported by selected point groups or all points in the drawing. Prior to exporting point data, a point file format must be available that matches the format of the point data. Same as when importing points. In addition to exporting point properties, coordinate transformation, grid northing, grid easting, latitude, and longitude properties can also be performed and exported if needed.

Export Points to File



Step 1: **Navigate** to the **Output** tab > Export panel > **Select** **Export Points**.

Step 2: From the **Export Points** dialog box > **Set** the following **parameters**:

a. **Specify** Point File **Format** = **MDT – PNEZD_Carter South (comma delimited)**

b. **Click** the **Browse** button for the **Destination File** .

c. From the **Select Destination File** dialog box > **Specify** **Destination File Path** and **Name**:

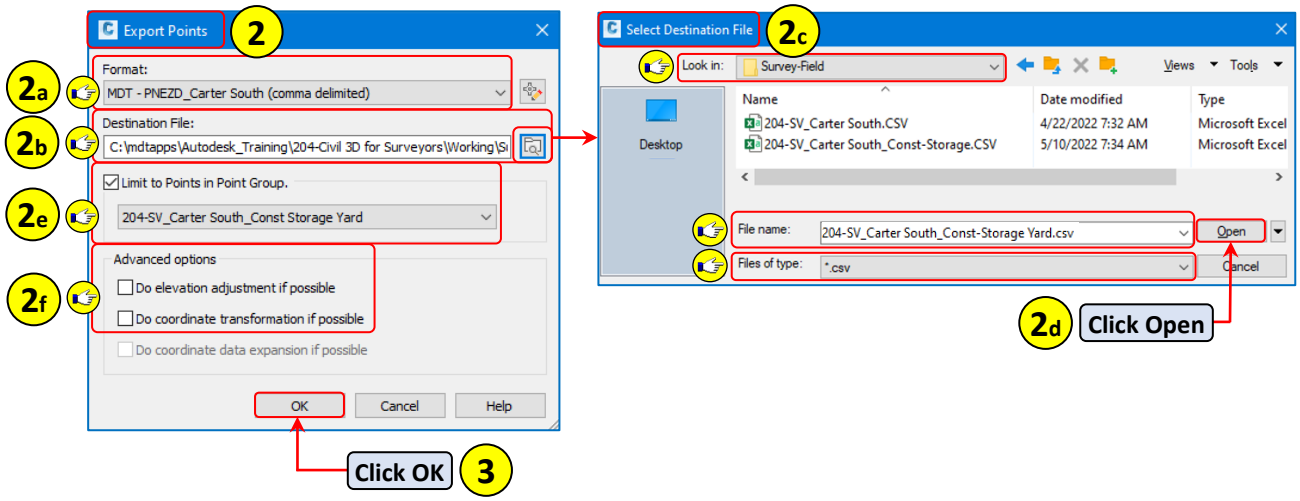
- **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**Survey-Field**
- **Name** = **204-SV_Carter South_Const Storage-Yard.CSV**
- **Files of type** = **.CSV**

d. **Click** **Open**.

e. **Check** the box for > **Limit to Points in Point Group** > From the drop-down list, **select**:

- **204-SV_Carter South_Const Storage Yard**

f. **Advanced options** = **Un-Check** for both elevation and coordinate transformation.



Step 3: **Click** **OK**.

Survey Data Base

A Survey Database contains survey figures, survey points, and survey networks if used. Prior to the creation of a Survey Database, it is recommended that all defaults for Survey User Settings be reviewed and set. The Survey Database creation process relies on some of the files associated with the Survey User Settings to correctly process the imported survey data. Files such as Equipment Database, Figure Prefix Database, Linework Code Sets and Survey Database defaults if previously created.

Survey Database Defaults

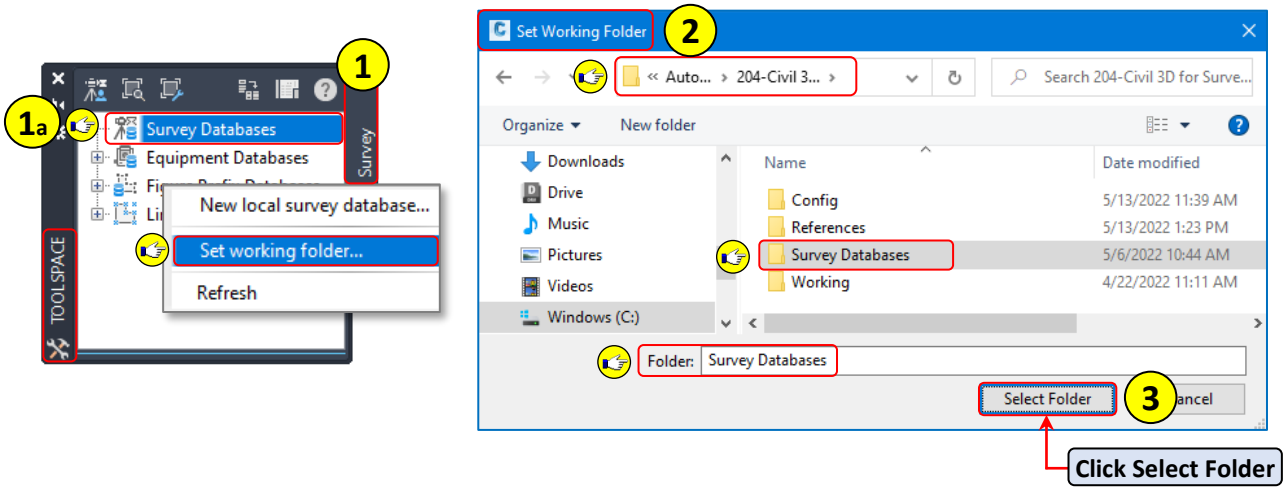
Survey Database defaults are user specified settings that are initially set during the creation of a Survey Database. The settings can be exported out for future use and sharing. After exporting and setting in Survey User Settings, a Survey User Settings file can be exported containing all user settings and database settings.

Setting the Working Folder

The Survey Database should be stored in a local environment where other users can easily access the database if needed. Survey Database files are accessed from the Survey tab in TOOLSPACE. The Survey tab contains four collections, **Survey Databases**, **Equipment Databases**, **Figure Prefix Databases**, and **Linework Code Sets**.

Step 1: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Right-click** on **Survey Databases** > **Select Set working folder**…

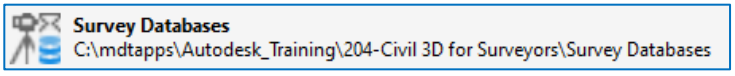


Step 2: From the **Set Working Folder** dialog box > **Navigate** to:

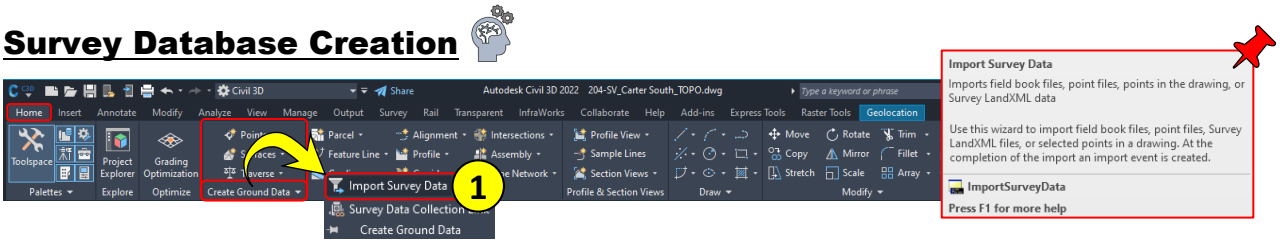
- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors**Survey Databases**

Step 3: **Click Select Folder**.

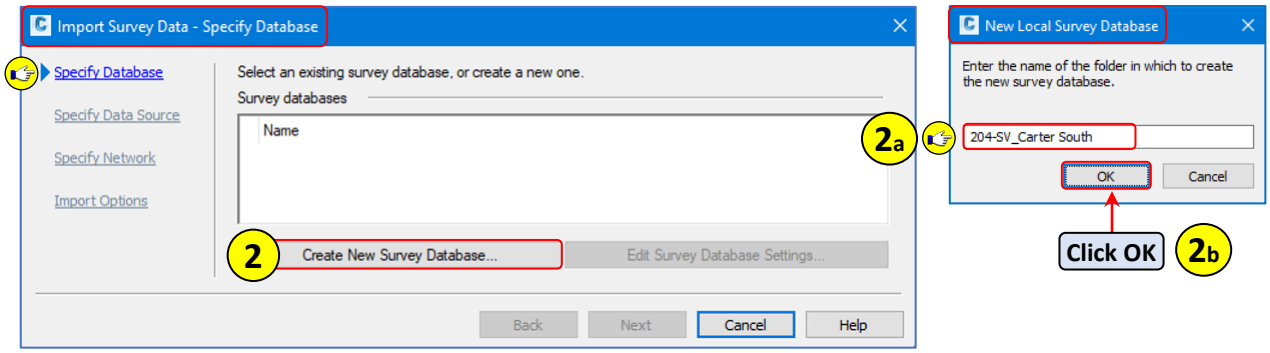
- The working folder location can be verified by **hovering** over **Survey Databases** in TOOLSPACE.



Survey Database Creation



Step 1: **Navigate** to the **Home** tab > Create Ground Data panel drop-down > **Select** **Import Survey Data**.



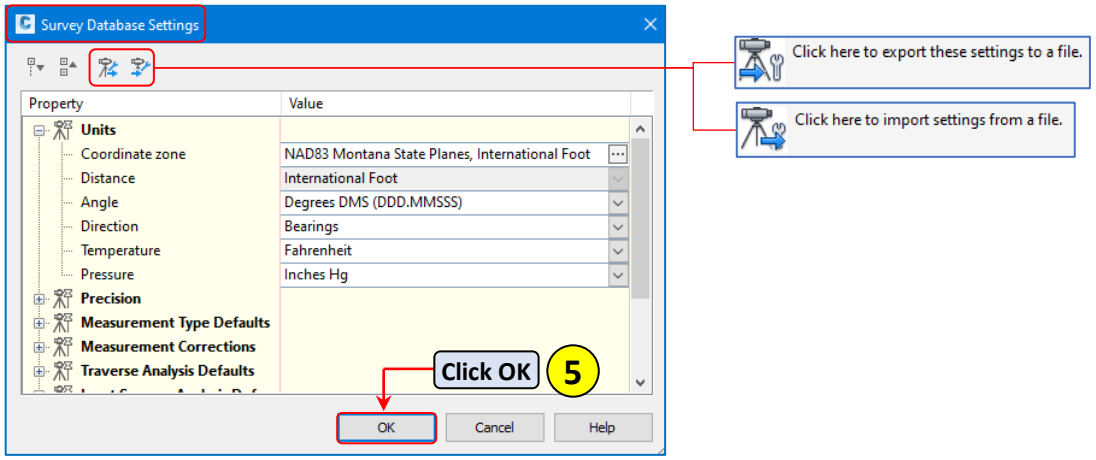
Step 2: From the **Import Survey Data** dialog box > **Select** **Create New Survey Database**…

a. When prompted for a folder name > **Enter** **204-SV_Carter South**

b. **Click** **OK**.

	Survey Databases can also be created directly from **TOOLSPACE** > Survey tab > **Right-click** on **Survey Databases** > **Select** **New local survey database**…

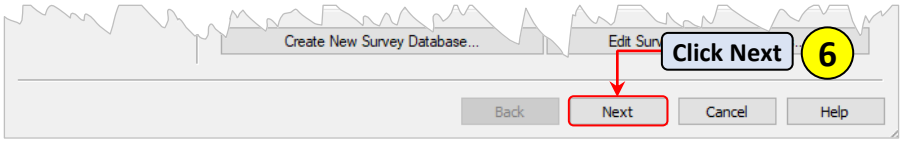
Step 3: From the **Import Survey Data** dialog box > **Select** **Edit Survey Database Settings**…



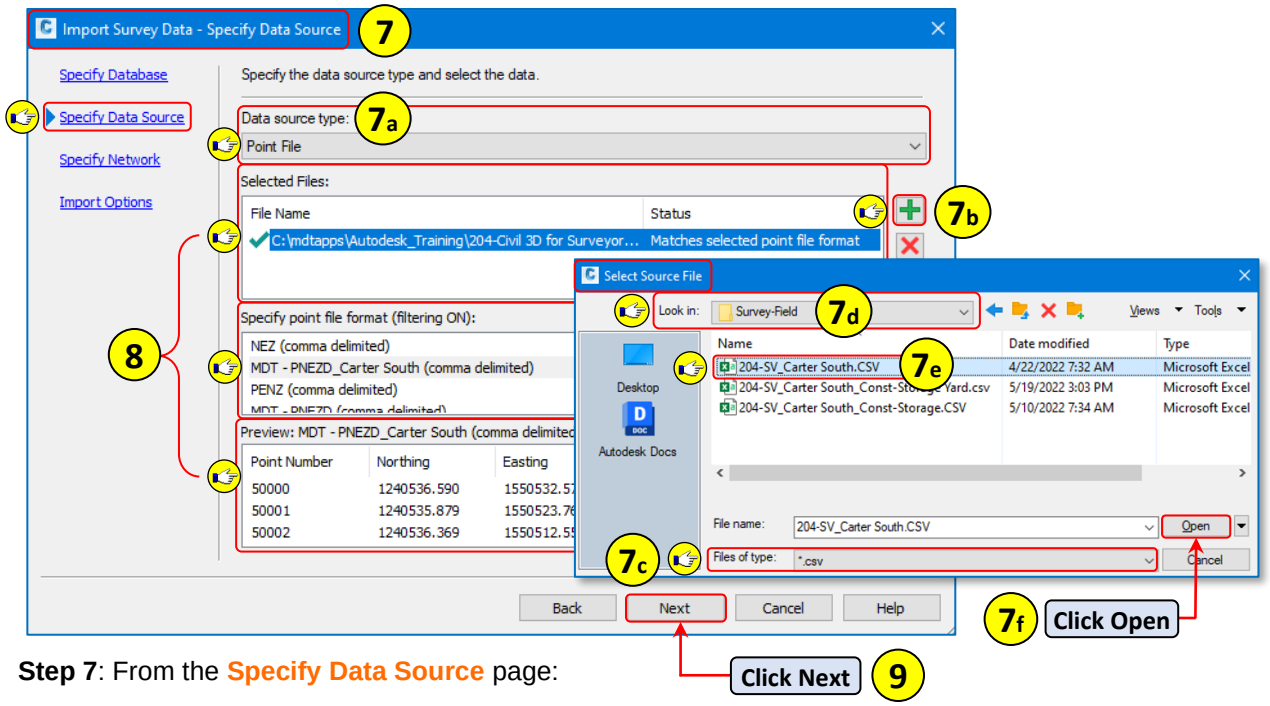
Step 4: From the **Survey Database Settings** dialog box > **Review** and **verify** the **properties**.

	After reviewing and setting the Survey Database Settings > the **sdb_set** file can be exported and included in the Survey User Settings file (.**usr_set**).

Step 5: **Click** **OK**.



Step 6: From the **Import Survey Data – Specify Data Source** dialog box > **Click Next**.



Step 7: From the **Specify Data Source** page:

a. **Specify** the **Data source type** > **Point File**.

b. **Click** the "**green**" for selecting point file to be imported.

c. From the **Select Source File** dialog box > **Verify** the **file type** = **.csv**

d. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**Survey-Field**

e. **Select** > **204-SV_Carter South.CSV**

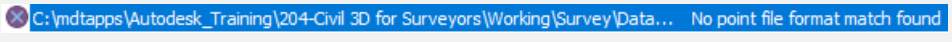
f. **Click Open**.

Step 8: From the **Specify Data Source** page, **set** and **verify** the following parameters:

- **Verify** selected file does not indicate any **errors**.
- **Specify Point File Format** = **MDT – PNEZD_Carter South (comma delimited)**
- **Verify** the **Point Preview**.

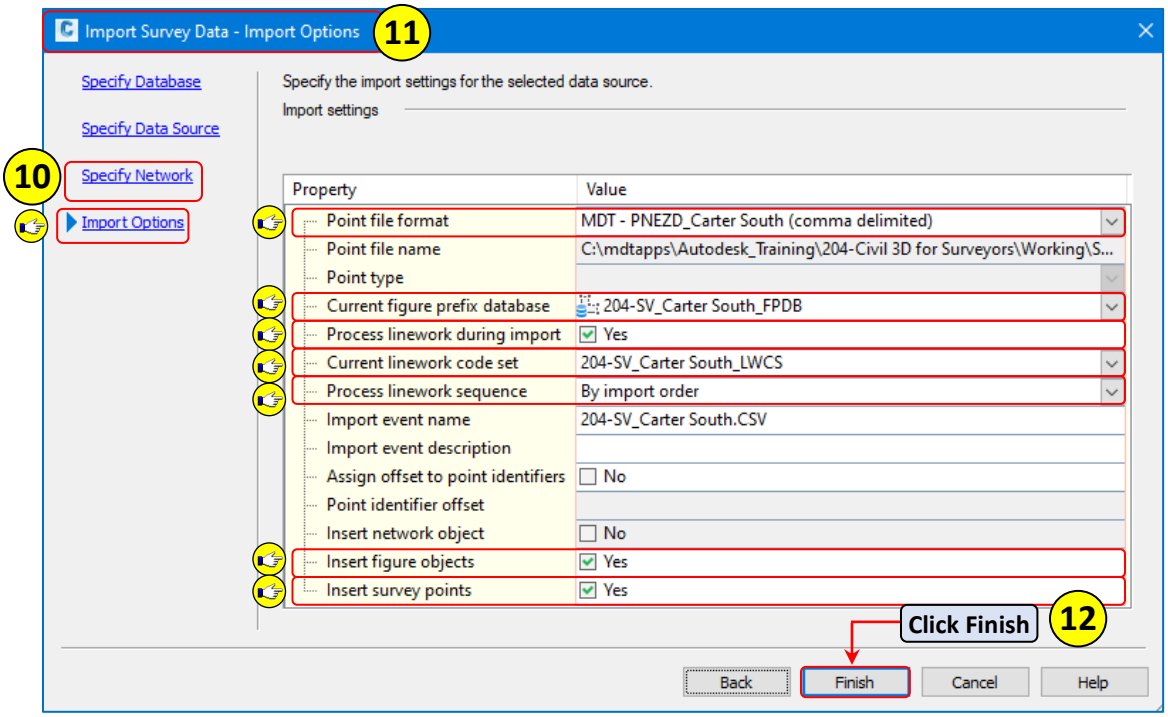
Step 9: **Click Next**.

It's common practice to have the point file open that will be inserted. If the point file is **open** while attempting to insert, you will be prompted with an error. Close the file prior to selecting.

Error: 

Step 10: On the **Specify Network** page > **Click Next**.

	When working with a **text** file (.txt, .prn, .xyz, .csv, etc.) a network is not used. Networks are used when working with Field Books.



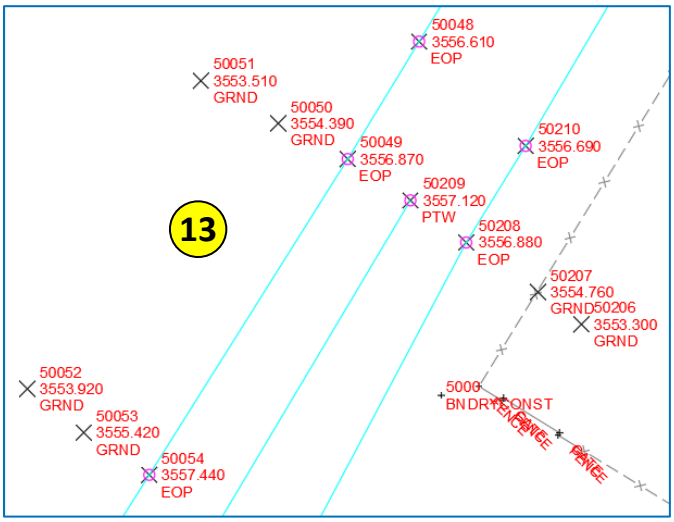
Step 11: From the **Import Options** page, **verify** and **set** the following parameters:

- **Verify/Set** the **Point Format** = **MDT – PNEZD_Carter South (comma delimited)**
- **Verify/Set Current figure prefix database** = **204-SV_Carter South_FPDB**
- **Check Process linework during import** = **Yes**
- **Verify/Set Current linework code set** = **204-SV_Carter South_LWCS**
- **Verify/Set Process linework sequence** = **By import order**
- **Check Insert figure objects** = **Yes**
- **Check Insert survey points** = **Yes**

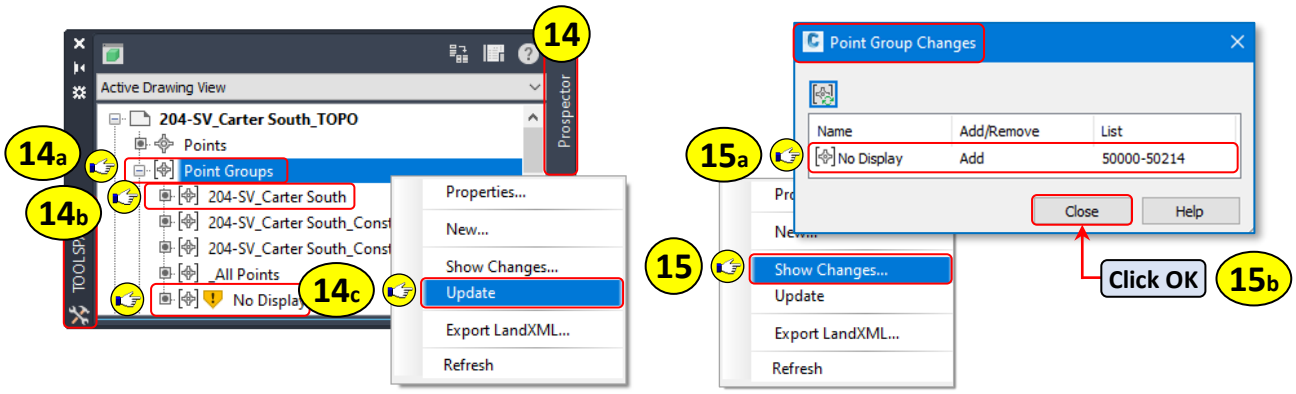
	Each time a point file is **imported**, a point group is created on the Prospector tab in TOOLSPACE if the points are inserted into the drawing. The point group name automatically matches the file name/**Import event name** being imported unless overridden at the time of import. There is no limit to how many point files can be imported to a single Survey Database.

Step 12: **Click Finish**.

The collected field survey points and auto-generated linework (figures) should now be in the drawing.



Step 13: **Review** the imported **survey points** and **figures** in model space and TOOLSPACE.



Step 14: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Expand** and **Review** **Point Groups**.

b. **See** the newly added **204-SV_Carter South** point group.

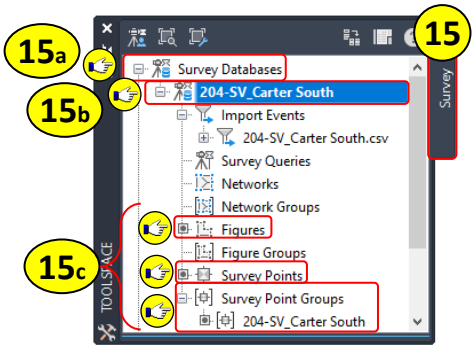
c. If point groups are out of date , **right-click** on **Point Groups** > **Select** **Update**.

Alternatively: Reviewing Point Group Changes

Step 15: **Select** **Show Changes**… if changes to the point group are to be **reviewed** before updating.

a. From the **Point Group Changes** dialog box > **Review** the listed changes.

b. **Click** **Close** > **Repeat** **Step 14c** > **Select** **Update**.



Step 16: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Expand** **Survey Databases**.

b. **Expand** **204-SV_Carter South**.

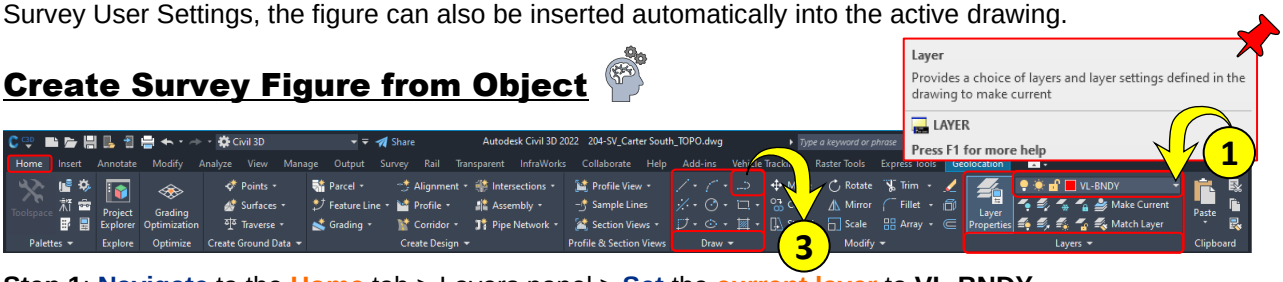
c. **Expand** and **review** **Figures**, **Survey Points**, and **Survey Point Groups**.

Step 16: **Save** the drawing .

Survey Figures from Object

Survey figures created from objects will be stored in the projects Survey Database. Depending on the Survey User Settings, the figure can also be inserted automatically into the active drawing.

Create Survey Figure from Object



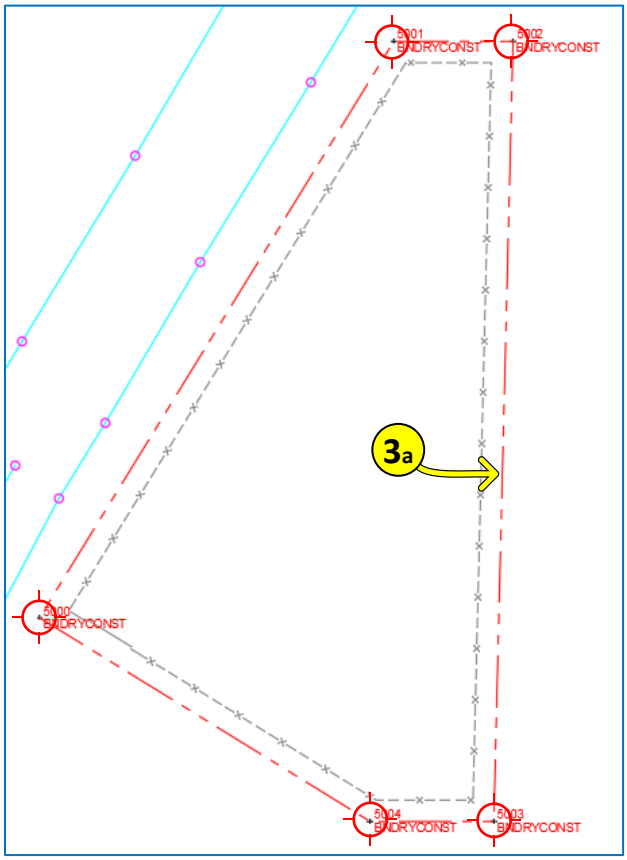
Step 1: **Navigate** to the **Home** tab > Layers panel > **Set** the **current layer** to **VL-BNDY**.

Step 2: **Navigate** to the **Status Bar** > **Open** the **Object Snap Settings**… flyout menu.

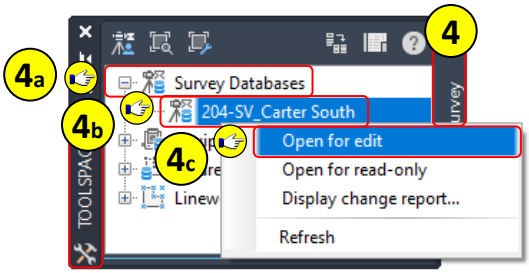
a. From the **Object Snap Settings**… flyout menu > **Select Node** > **Move** the cursor away from the flyout menu to dismiss the menu.

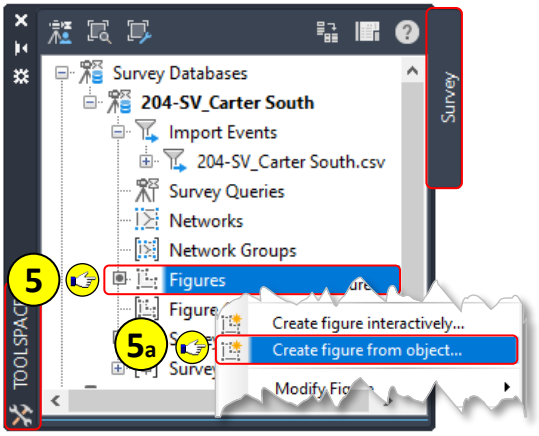
- Alternatively: Shift+Right-click snap overrides could be used at each point location.

Step 3: **Navigate** to the **Home** tab > Draw panel > **Select Polyline**.



a. From **Model Space**, using the BNDRYCONST points previously inserted > **Create** a **closed polyline snapping** to each point location.





Step 4: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Expand Survey Databases**.

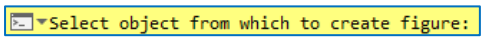
b. If not open already > **Right-Click** on **204-SV_Carter South**

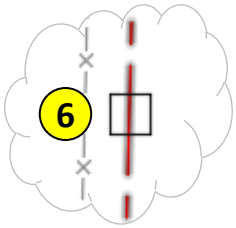
c. **Select Open for Edit**.

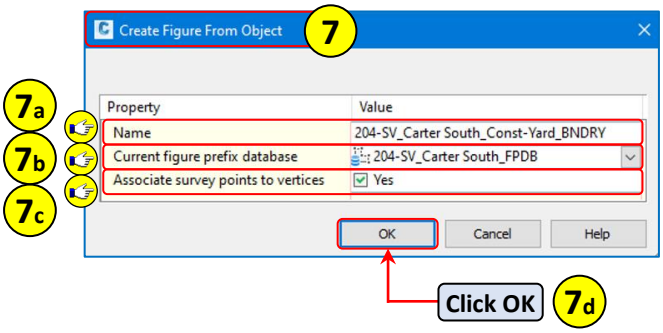
Step 5: With the **204-SV_Carter South Survey Database** open > **Right-click** on the **Figures** collection.

a. From the right-click menu > **Select Create figure from object**…

Step 6: When prompted > **Select** the **polyline** previous created.







Step 7: From the **Create Figure From Object** dialog box > **Set** and **verify** the following **properties**:

a. **Name** = **204-SV_Carter South_Const-Yard_BNDRY**

b. **Current figure prefix database** = **204-SV_Carter South_FPDB**

c. **Associate survey points to vertices** = **Yes**

d. **Click OK**.

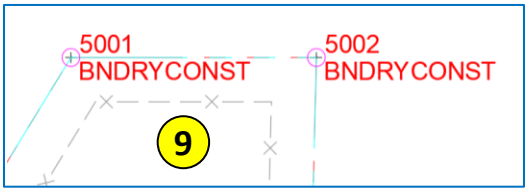
Associate Survey Points to Vertices, when checked:

- X-Y coordinates are checked for a match with any existing survey points in the database.
- If a match is found, then the figure vertex will reference the survey point in that location.

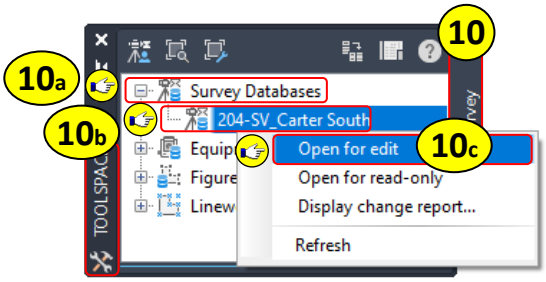
Step 8: **Press Enter** to end the selection command.

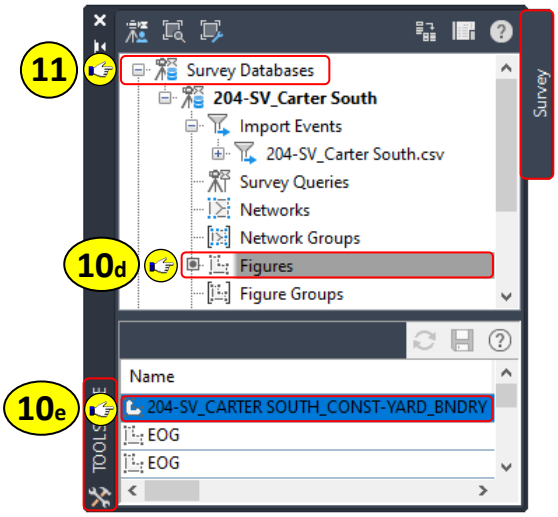
The vertices markers and survey figure are visible in model space and TOOLSPACE.

Step 9: **Review** the created **survey figure** in model space



Step 10: **Navigate** to TOOLSPACE > **Survey** tab > **Review** the created **survey figure**.





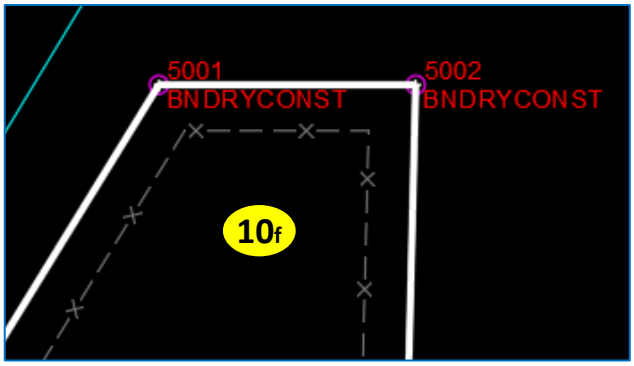
a. **Expand** **Survey Databases**.

b. If not open already > **Right-Click** on **204-SV_Carter South**

c. **Select** **Open for Edit**.

d. **Select** the **Figures Collections**.

e. From the TOOLSPACE list view > **Select** **204-SV_Carter South Const-Yard_BNDRY**.



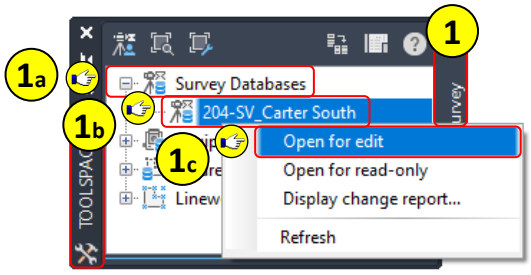
f. From **Model** space > **See** the highlighted **figure**.

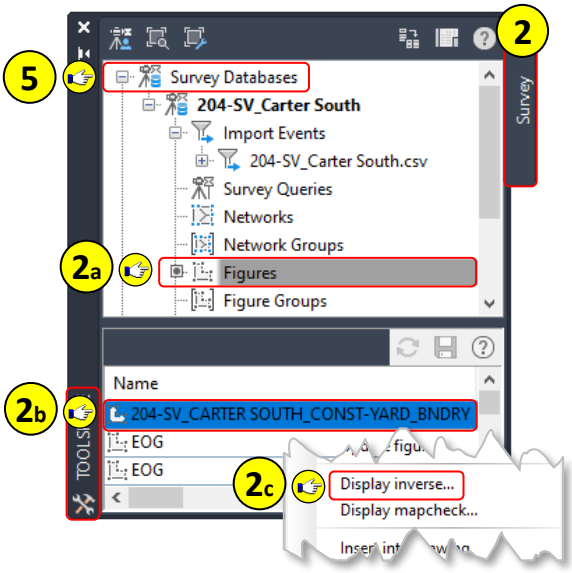
Step 11: From TOOLSPACE > **Click** on **Survey Databases** to deselect the figure

List Survey Figure Inverse Information

Survey Figure closure, perimeter, precision, and area values can easily be displayed through Toolspace by selecting Display Inverse or Display mapcheck from the Toolspace list view right-click menu.

List Survey Figure Inverse Information





Step 1: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Expand Survey Databases**.

b. If not open already > **Right-Click** on **204-SV_Carter South**

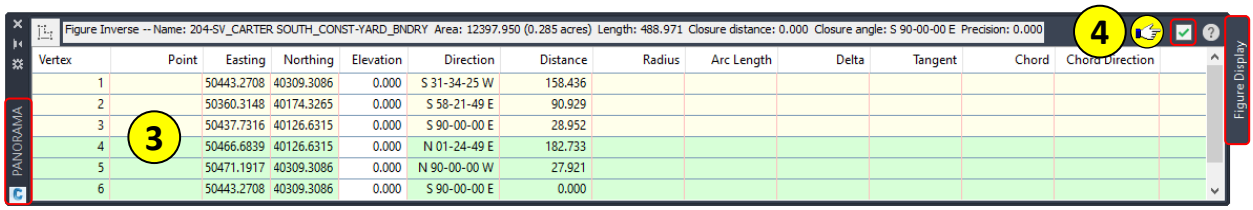
c. **Select Open for Edit**.

Step 2: From TOOLSPACE > **Survey** tab:

a. **Select** the **Figures Collections**.

b. From the TOOLSPACE list view > **Right-click 204-SV_Carter South Const-Yard_BNDRY**.

c. From the **Right-click** menu > **Select Display inverse**…



Step 3: **See** the **Figure Inverse** information displayed in the **Panorama** – **Figure Display** vista.

Step 4: **Dismiss** the **Panorama** – **Figure Display** vista .

Step 5: From TOOLSPACE > **Click** on **Survey Databases** to deselect the figure.

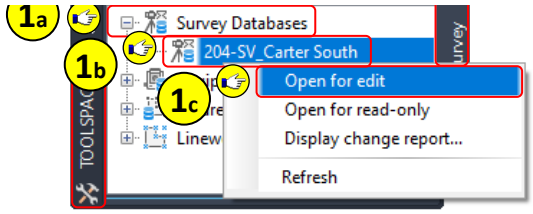
Step 6: **Save** the drawing .

Survey Point Attributes

This page is currently

Under Construction

Please check back soon

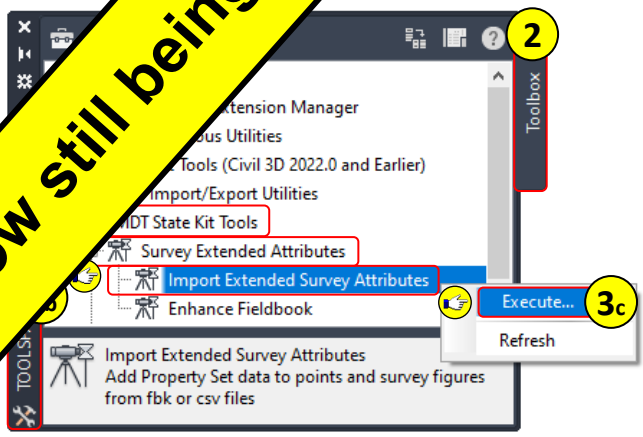


Step 1: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Expand Survey Databases**.

b. If not open already > **Right-Click** on **204-SV_Carter South**

c. **Select Open for Edit**.



Step 2: **Navigate** to TOOLSPACE > **To**

Step 3: **Expand MDT State Kit To**

a. **Expand Survey Exten**

b. **Right-click** on **Imp** **vey Attributes**.

c. **Select Execute**

- Alt **e-click** on **Import Extended Survey Attributes** to **Execute**…

```
Collecting points...
Processing import e                    k_Training\204-Civil 3D for Surveyors\Working\Survey\Data\Survey-Field\204-SV_Carter South.csv
Processed 229 poi
```

The Comm t the Processing import event and total number of points processed.

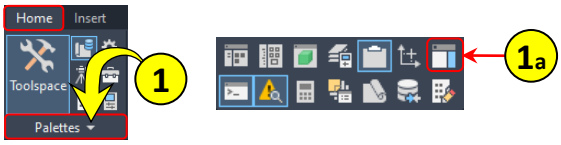
Tool function and workflow still being validated.

Georeferenced Imagery

Georeferenced Imagery contains the spatial data (internal coordinate system) needed to correctly overlay and align with objects on the ground that are using the same geographic coordinates.

Connect to Georeferenced Imagery

Connect to Georeferenced Imagery using the Map Task Pane.

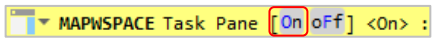


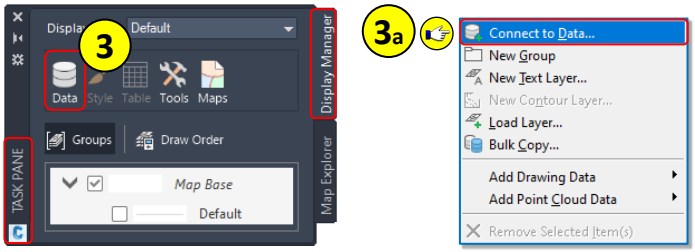
Step 1 : **Navigate** to the **Home** tab > Palettes panel > **Click** on the **Palettes** panel **drop-down**.

a. From the **Palettes** drop-down panel > **Select Map Task Pane**.

- Alternatively, **MAPWSPACE** can be **entered** in the **Command Line**.

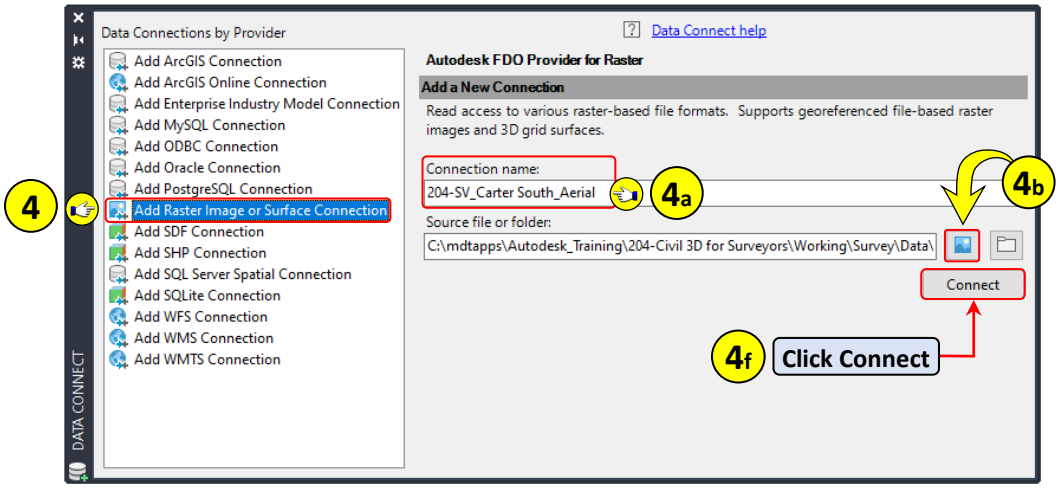
Step 2: From the **Command** line > **Click ON**.





Step 3: From the **MAP TASK PANE** > Display Manager tab > **Click Data**.

a. From the Data pop-up menu > **Select Connect to Data**…



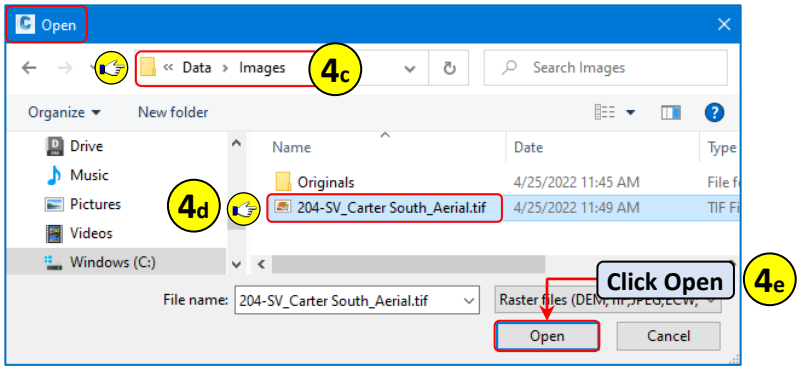
Step 4: From the **Data Connect** palette > Provider list > **Select Add Raster Image** or Surface Connection.

a. **Enter** a **Connection name**: **204-SV_Carter South_Aerial**

b. **Click** the **Source file** icon .

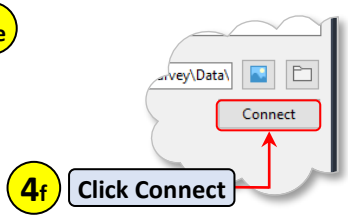
c. From the **Open** Source File dialog box > **Navigate** to:

- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**Images**

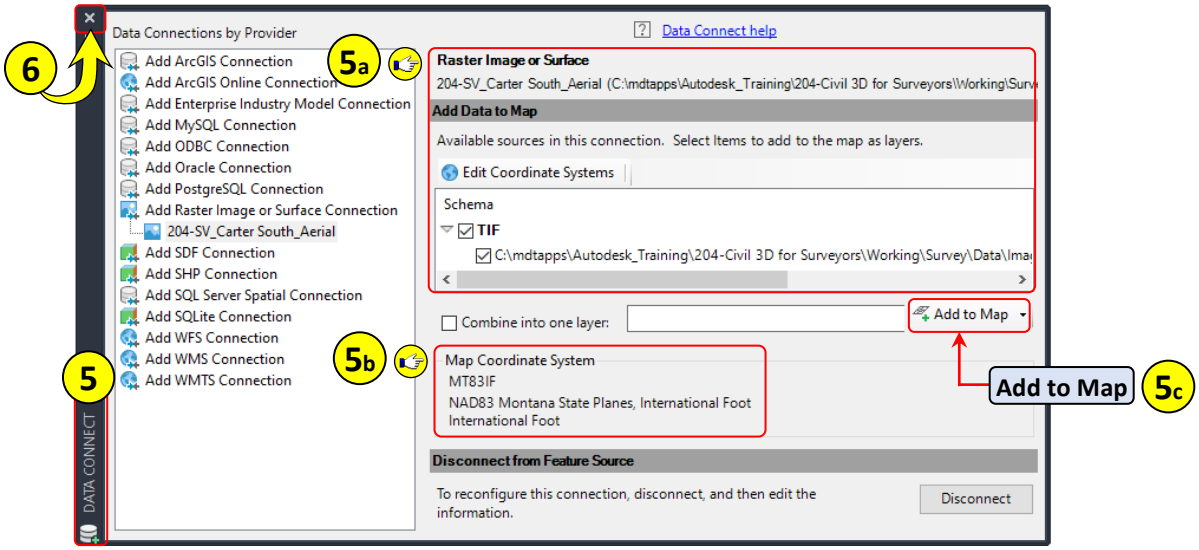


d. **Select** > **204-SV_Carter South_Aerial.tif**

e. **Click Open**.



f. From the **Data Connect** palette > **Click Connect**.



Step 5: From the **Add Data to Map** page:

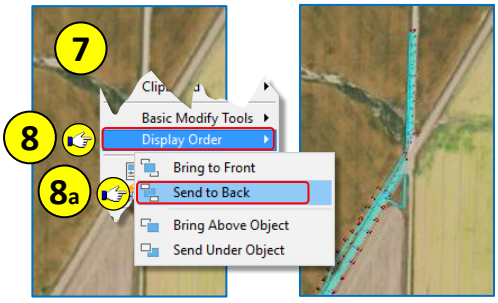
a. **Verify items to be added** = **TIF**

b. **Verify Map Coordinate System** = **MT83IF**

c. **Select Add to Map**.

Step 6: **Close** the **Data Connect** palette.

Step 7: From **Model** Space > **See** the added **aerial image**.

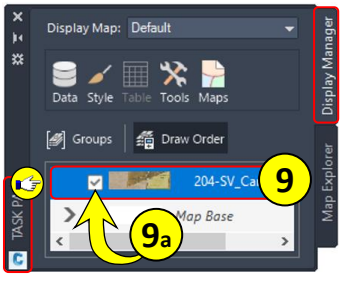


Step 8: From **Model** space > **Select** the **image** > **Right-click**.

a. From the **Display Order** flyout > **Select Send to back**.

Step 9: From the **Map Task Pane** > **See** the **added image layer**.

a. **Uncheck** the box next to the layer. The image is now removed from the drawing. The connection will remain, and the image can be re-loaded by checking the box.



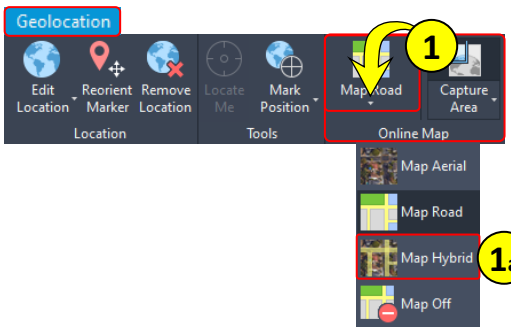
Step 10: **Save** the **drawing** .

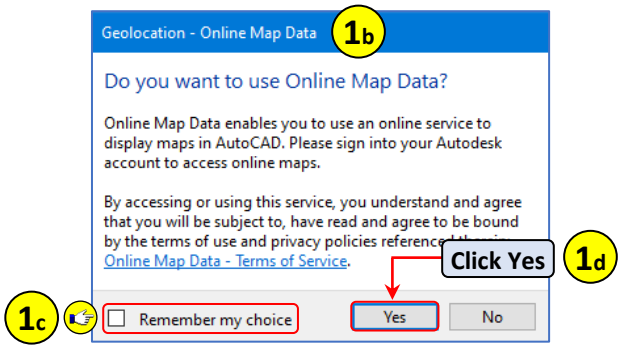
Online Map Service

Online Map provides a temporary dynamically linked graphic supplied by the online map service. To utilize the service, you must have an Autodesk Account and be signed in. The images supplied do not plot unless the area of interest is first captured. The captured image area is embedded into the drawing as a map image and can then be plotted. Images can be displayed in one of three visual styles, Aerial Map, Road Map, and Hybrid Map.

Access to the Online Map is found on the Geolocation contextual tab of the ribbon. The Geolocation tab is only present and accessible when the drawing has a known coordinate system set.

Connect to Online Maps





Step 1: **Navigate** to the **Geolocation** tab > Online Map panel > **Click** the **Map drop-down** arrow.

a. **Select Hybrid Map**.

b. If prompted > **Do you want to use Online Map Data?**

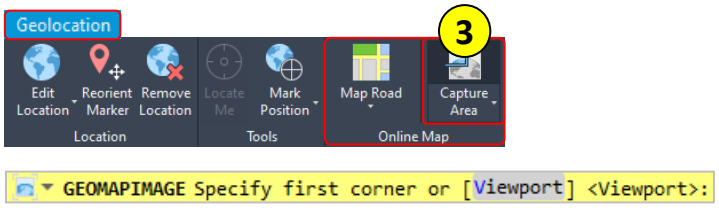
c. **Select Remember my choice** option if you want to avoid seeing this splash screen in the future.

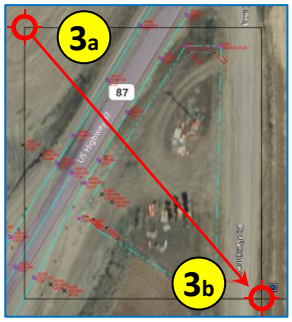
d. **Click Yes**

	If **Remember my choice** was selected and needs to be cleared, in the case where "No" was selected, the splash screen can be restored through Options > Systems tab > **Hidden Messages**.

Step 2: From **Model** Space > **Zoom** into the **Storage Yard area**.

Step 3: **Navigate** to the **Geolocation** tab > Online Map panel > **Select Capture Area**.

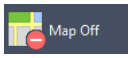




a. When prompted > **pick** a **point** to the upper left from the **Storage Yard** area.

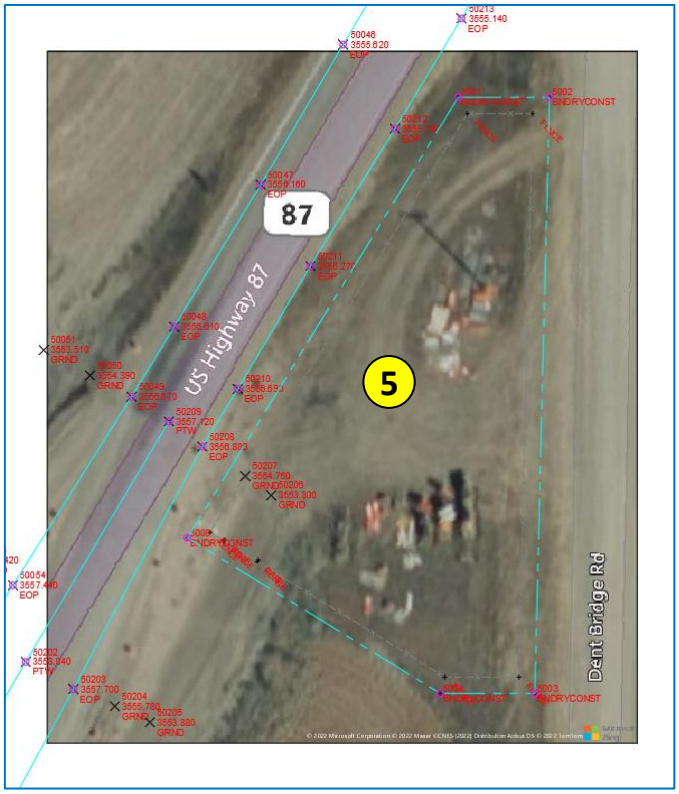
b. **Drag** the cross hairs and **pick** a **point** near the lower right from the **Storage Yard** area.

Step 4: **Navigate** to the **Geolocation** tab > Online Map panel > Map drop-down > **Select Map Off**.



	The captured image area will be placed on whatever layer is current in the drawing.

By turning off the Online Map, the imagery is no longer displayed to the extents of the viewable drawing area. The captured image area is now displayed in its place.

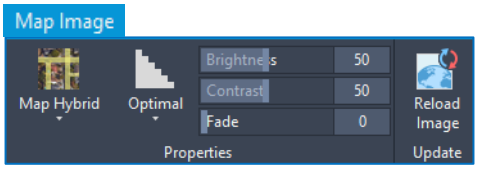


Step 5: From **Model** space > **See** the **captured image**.

	The captured image area is dynamically linked to the online source. If the image area needs to be adjusted, it can be done so by simply selecting the image in Model space and repositioned using the hot grips. The image can also be moved used the basic move command. Wherever the image is placed, the image contents will be updated to the current location.

Online Map Image Properties

The properties of a captured image can be modified from the **Map Image** contextual ribbon tab. Properties such as Brightness, Contrast, and Fade can be adjusted. The type of image displayed can also be set to Map Aerial, Map Road, or Map Hybrid.



- To delete a captured image: **Select** captured image > **Press Delete**.
- Layer tools can be used to **Turn Off**, **Turn On**, or **Freeze** a captured image.
- There is no limit to the number of images that can be captured in a single drawing.

Surfaces

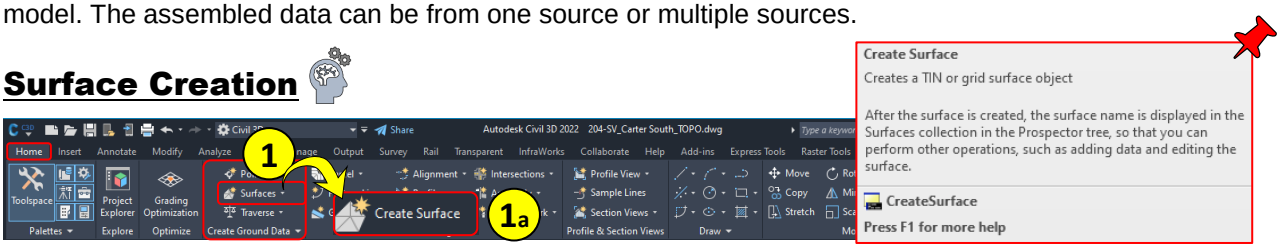
A surface normally consists of points and contours used for generating a three-dimensional geometric representation of an area of land. To further define a surface, a surface may be supplemented with breaklines and boundaries. Volume surfaces can also be generated in which two surfaces are generated to perform volume analysis between the two, such as cut and fill.

In simple terms, a C3D surface starts out as an empty container and data from various sources is then added to define the true characteristics of the ground. If available, surfaces can also be generated from point cloud data collected from scanning, lidar, or photogrammetry, etc.

Surface Creation

Surface creation consists of first, collecting and assembling data that will be used to define the surface model. The assembled data can be from one source or multiple sources.

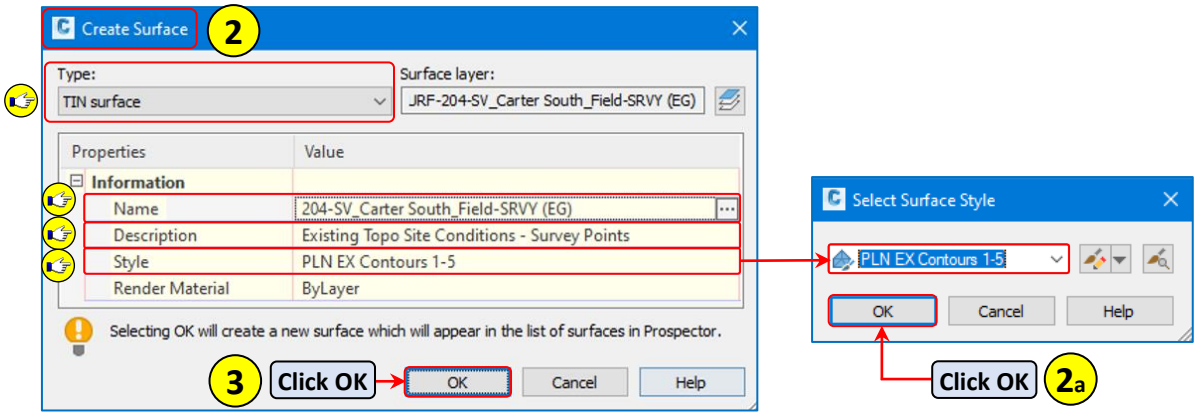
Surface Creation



Step 1 : **Navigate** to the **Home** tab > Create Ground Data panel > **Click Surfaces** drop-down.

a. From the **Surfaces** drop-down list > **Select Create Surface**.

- Alternatively, you can use the Prospector > Surfaces > **right-click** > **Select Create Surface**…



Step 2: From the **Create Surface** dialog box, **set** the following **properties**:

- **Type** = **TIN surface**
- **Name** = **204-SV_Carter South_ Field-SRVY(EG)**
- **Description** = **Existing Topo Site Conditions - Survey Points**
  (It's always best practice to describe the surface)
- **Style** = **PLN EX Contours 1-5**

Step 2a: **Click OK**.

Step 3: **Click OK**.

The previous steps outlined for Surface Creation has provided a repository '**container**' in which definition can now be added to the surface. Currently, the surface has no definition. Adding the accepted types of definition objects will define the surface conditions.

Step 4: **Repeating** Steps 1-3 > **Create** an additional **surface**.

- **Type** = **TIN surface**
- **Name** = **204-SV_Carter South_ Aerial-SRVY(EG)**
- **Description** = **Existing Topo Site Conditions – Aerial Points**
- **Style** = **PLN EX Contours 1-5**

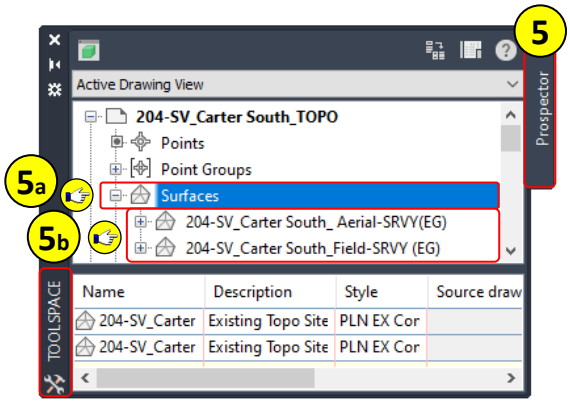
Step 5: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Expand Surfaces** collection.

b. **See** both surfaces for the west and east side.

- **204-SV_Carter South_ Field-SRVY(EG)**
- **204-SV_Carter South_ Aerial-SRVY(EG)**

There now two '**empty**' surfaces residing in the Surface collection on the Prospector tab.



Step 6: **Save** the **drawing** .

Surface Definition

Surface definition is comprised of a collection of the surface build, data, and edits made to the surface. All operations performed on the surface are also included in the surface definition collection. The types of objects that can be used for defining a surface depends on the type of surface being created.

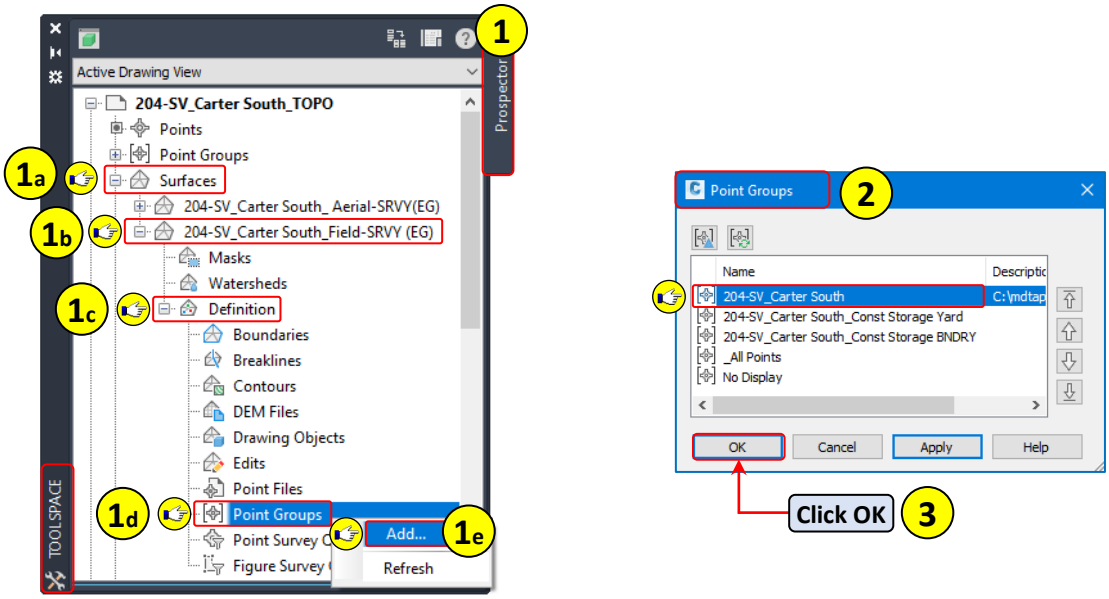
The table shown below identifies the supported data categories and the corresponding surface type.

Supported Data Objects	TIN Surface	TIN Volume Surface	GRID Surface	GRID Volume Surface
Boundaries	Yes	Yes	Yes	Yes
Breaklines	Yes	No	No	No
Contours	Yes	No	No	No
DEM Files	Yes	No	Yes	No
Drawing Objects	Yes	No	No	No
Point Files	Yes	No	No	No
Point Groups	Yes	No	No	No

Adding Surface Definition – Inserted Survey Points

Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Expand Surfaces** collection.



b. **Expand 204-SV_Carter South_Field-SRVY(EG)**

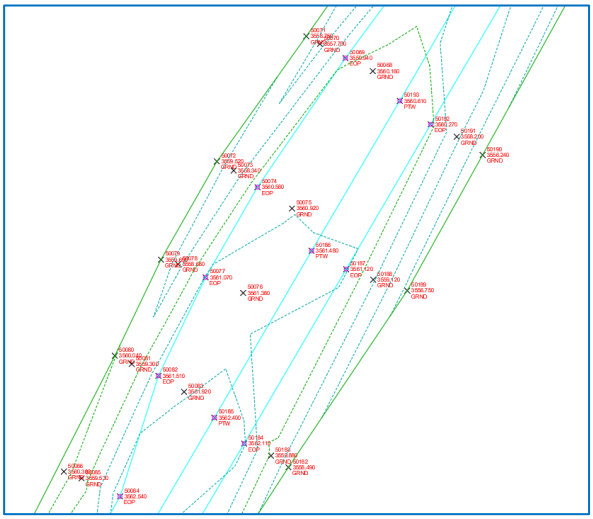
c. **Expand Definition**.

d. **Right-Click** on Point Groups

e. **Select Add**…

Step 2: From the **Point Groups** dialog box > **Select 204-SV_Carter South**

Step 3: **Click OK**.



Step 4: From **Model** space > **Zoom** to the **surface** area (surface is visible per style selected).

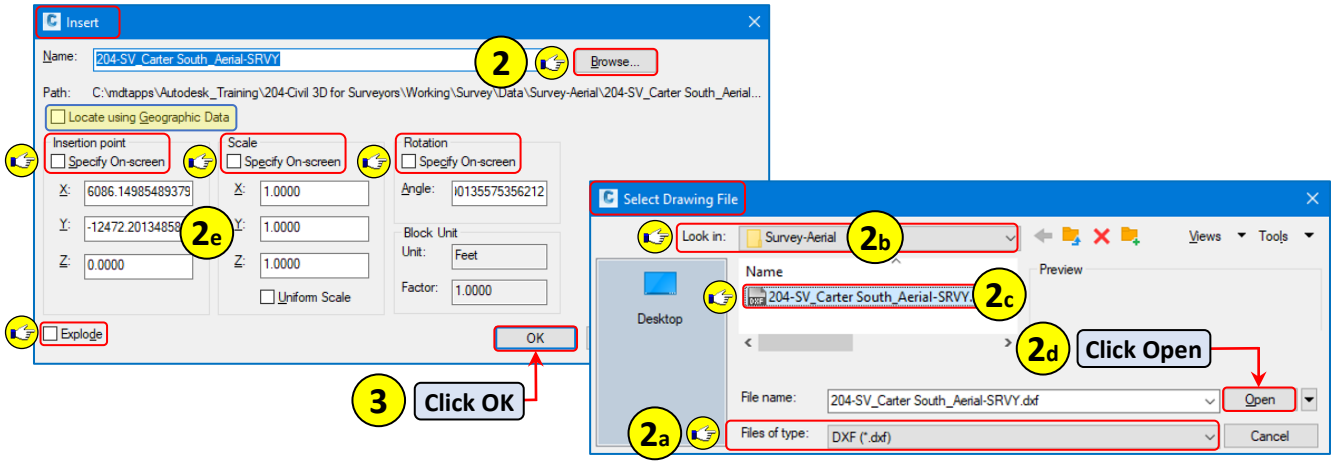
	After reviewing the surface contours, the generated surface is acceptable based on the available survey data. It is also recognized that the surface accuracy could be further refined by adding breaklines and manually editing erroneous triangulation lines. These edits will be addressed in the **Surface Editing** section.

Step 5: **Save** the **drawing** .

Adding Surface Definition – Drawing Objects from DXF

Step 1: From the **Command** line > **Enter** the command **CLASSICINSERT** > **Press Enter**.

- Alternatively > **navigate** to the **Insert** tab > Block panel > **Select Insert**.



Step 2: From the **Insert** dialog box > **Click Browse**…

a. From the **Select Drawing File** dialog box > **Set Files of type** to **DXF**.

b. **Navigate** to:

- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data\ **Survey-Aerial**

c. **Select** > **204-SV_Carter South_Aerial-SRVY.dxf**

d. **Click Open**.

e. From the **Insert** dialog box > **Verify** the following **parameters**:

- **Locate using Geographic Data** = **UNCHECKED**
- **Insertion** point = **UNCHECKED**
- **Scale** = **UNCHECKED**
- **Rotation** = **UNCHECKED**
- **Explode** = **UNCHECKED**

	Locate using Geographic Data is only available if both drawings have a coordinate system set and share geographic data. Otherwise, the option remains greyed out.

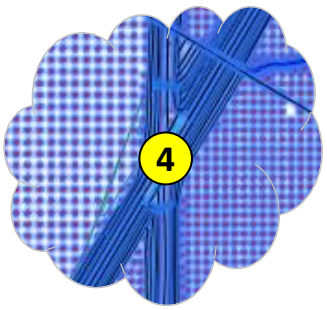
Step 3: **Click OK**.

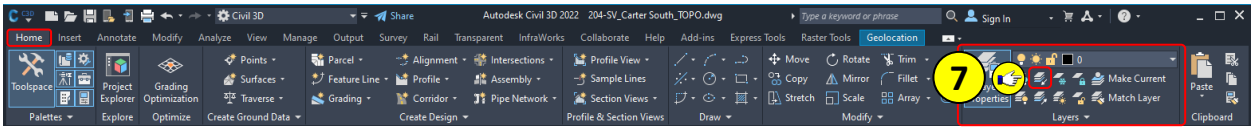
Step 4: From **Model** space > **See** and **select** the **inserted** **204-SV_Carter South_Aerial-SRVY.dxf**

Step 5: From the **Command** line > **Enter X** for **explode** > **Press Enter**.

EXPLODE Select objects:

Step 6: **Save** the **drawing** .





Step 7: **Navigate** to the **Home** tab > Layers panel > **Click Isolate** .

- Before selecting any layers, **verify** the following **settings** from the command line:

a. **Type S** or **select Settings**.

```
LAYISO Select objects on the layer(s) to be isolated or [Settings]:
```
7a

b. **Select Off**.

```
LAYISO Enter setting for layers not isolated [Off Lock and fade] <Off>:
```
7b

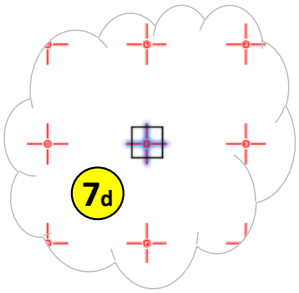
c. **Select Off** again.

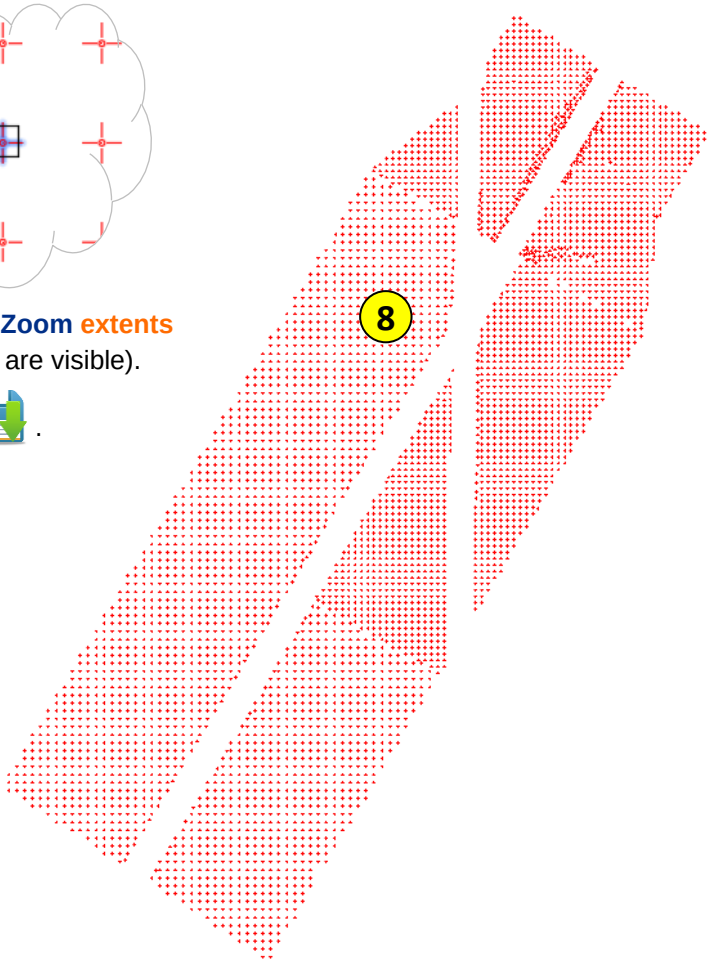
```
LAYISO In paper space viewport use [Vpfreeze Off] <Off>:
```
7c

Any layers now selected can be toggled on/off using the button or **layiso** command vs. being frozen.

d. From **Model** space > **Select** any **one** of the **EX_DTM_Points inserted from the 204-SV_Carter South_Aerial-SRVY.dxf**

```
LAYISO Select objects on the layer(s) to be isolated or [Settings]:
```
7d





Step 8: From **Model** space > **Zoom extents** (inserted point blocks are visible).

Step 9: **Save** the **drawing** .

Step 10: **Navigate** to TOOLSPACE > **Prospector** tab.

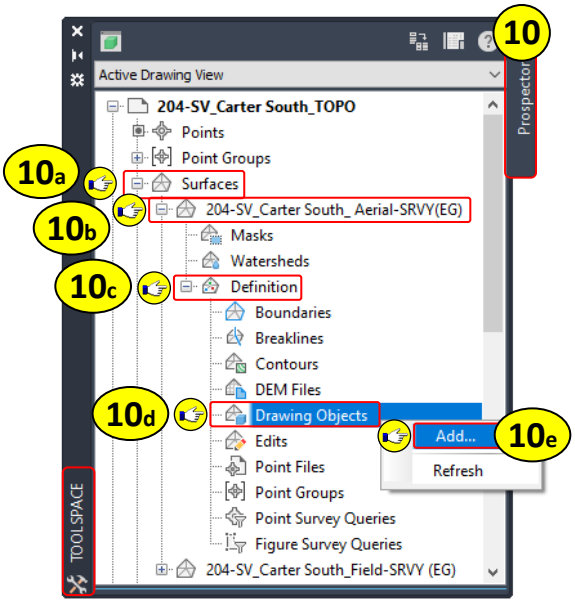
a. **Expand Surfaces** collection.

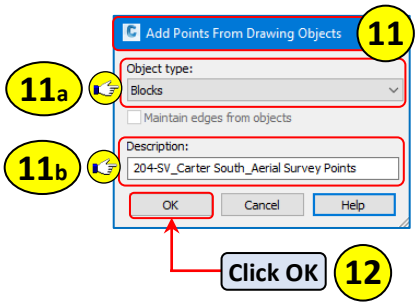
b. **Expand 204-SV_Carter South_ Aerial-SRVY(EG)**

c. **Expand Definition**.

d. **Right-Click** on **Drawing Objects**.

e. **Select Add**…



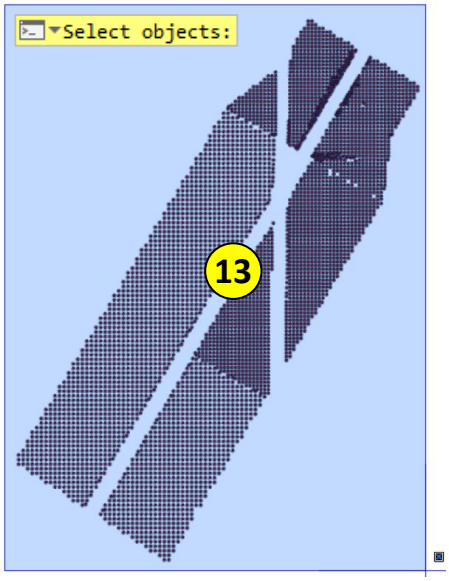


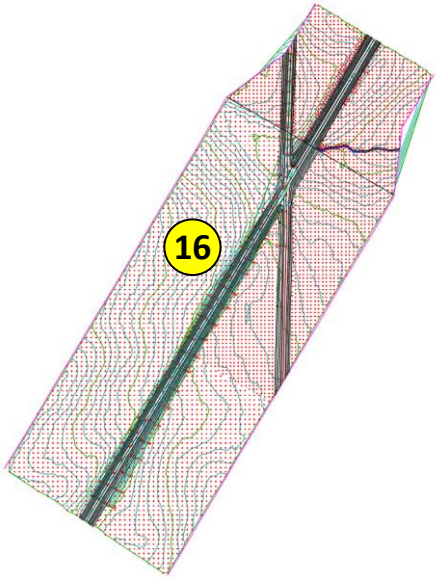
Step 11: From the **Add Points From Drawing Objects** dialog box, **verify** and **set** the following parameters:

a. **Object type** = **Blocks**

b. **Description** = **204-SV_Carter South_ Aerial Survey Points**

Step 12: **Click OK**.





Step 13: From **Model** space > **Select** all **EX_DTM_Points** objects using the AutoCAD selection window (blue). C3D reports back how many objects were found in the selection.

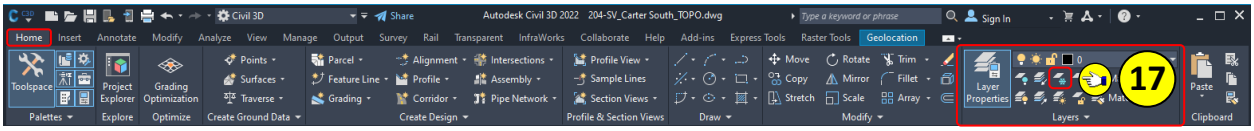
```
Select objects: Specify opposite corner: 4915 found
```

Step 14: **Press Enter** to end the command.

Step 15: **Navigate** to the **Home** tab > Layers panel > **Click Unisolate** .

Step 16: From **Model** space > **Zoom** extents (both surfaces are visible per styles selected).

- With the layer state restored, the surface layers are now visible along with all other previous layers.

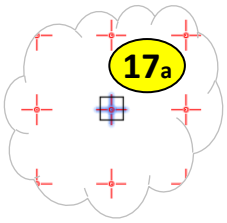


Step 17: **Navigate** to the **Home** tab > Layers panel > **Click Freeze**.

a. From **Model** space > **Select** any **one** of the **EX_DTM_Points inserted from the 204-SV_Carter South_Aerial-SRVY.dxf**

```
LAYFRZ Select an object on the layer to be frozen or [Settings Undo]:
```

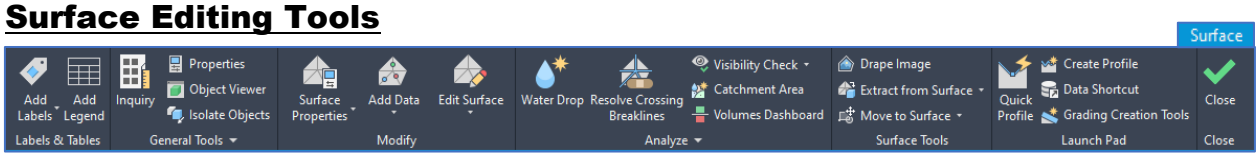
b. **Press Enter** to end the selection and exit the command.



Surface Refinement and Editing – Part 1

Once the initial data objects have been added to the surface, it is very common that additional work will be needed to increase the accuracy of the surface. These edits may come in the form of adding additional data objects such as figures, breaklines, boundaries or manually editing the triangulation of the surface.

Surface Editing Tools



Surface editing tools can easily be accessed from the Modify tab of the ribbon, Ground Data panel. The tools are located on the Surface contextual tab. Accessing the tools in this manner will require identifying the surface to be edited. Alternatively, selecting a surface object will directly open the Surface contextual tab and related tools for the surface selected.

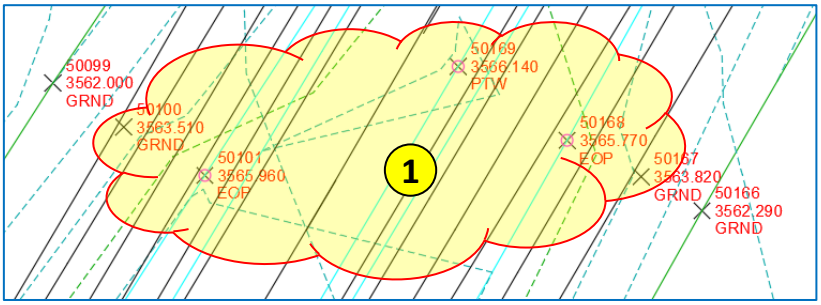
Surface Breaklines

Breaklines are a critical component for building an accurate surface model. Breaklines are added to a surface to control surface triangulation and to better define shapes on the ground of the surface. When working with point-based surfaces, breaklines are important to ensure that the terrain is triangulating correctly along linear features of the surface.

Breakline Type	Breakline Behavior
Standard	3D lines, 3D polylines, survey figures, and feature lines containing valid elevations.
Proximity	Does not require elevations. Elevations are assigned from nearest TIN point.
Wall	Used for representing vertical faces with defined a top and bottom elevation.
Survey Figures	Can be used if available and connection to Survey Database is known.

- For detailed descriptions of each Breakline type, please see: Autodesk Knowledge Network – **Add Breaklines Dialog Box**.

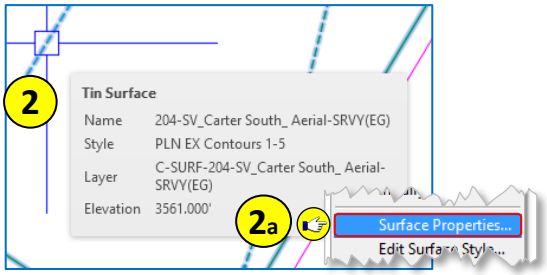
Adding Breaklines – Survey Figures

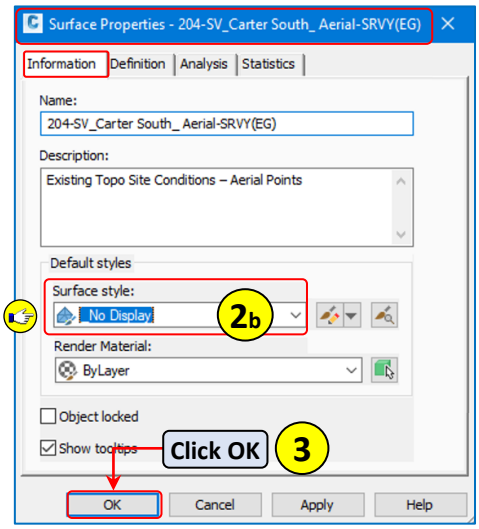


Step 1: **Review** the roads **linear features** running north and south.

- Both surfaces contain anomalies with the surface triangulation along the centerline and edge of road features that can be corrected with breaklines.

When working with multiple surfaces, it is often easier to identify surface features for the active surface if the other surfaces are set to "**No Display**".



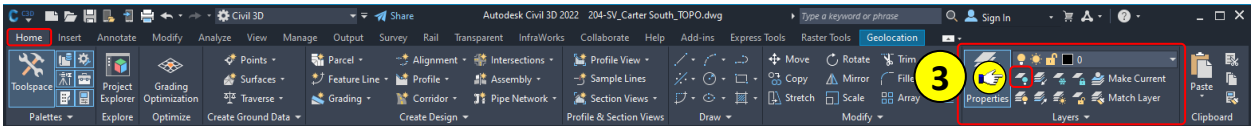


Step 2: From **Model** space > **Select** the **205-SV_Carter South_Aerial-SRVY(EG)** surface.

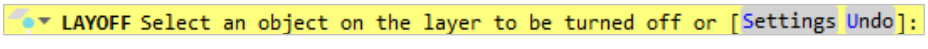
a. **Right-click** > **Select Surface Properties**...

b. From the **Surface Properties** dialog box > Information tab > **Set Surface style** to:

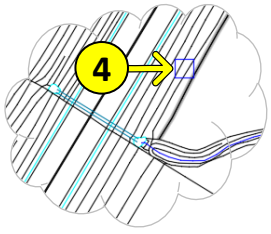
- **_No Display**

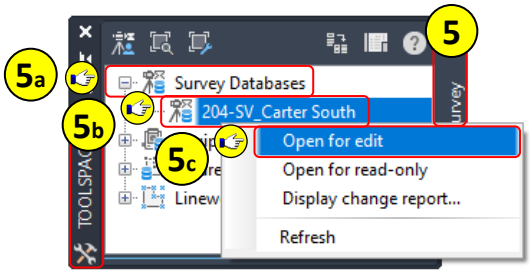


Step 3: **Navigate** to the **Home** tab > Layers panel > **Click Off** .



Step 4: From **Model** space > **Select** all **linework** and **objects** from the **204-SV_Carter South_Aerial-SRVY.dxf**





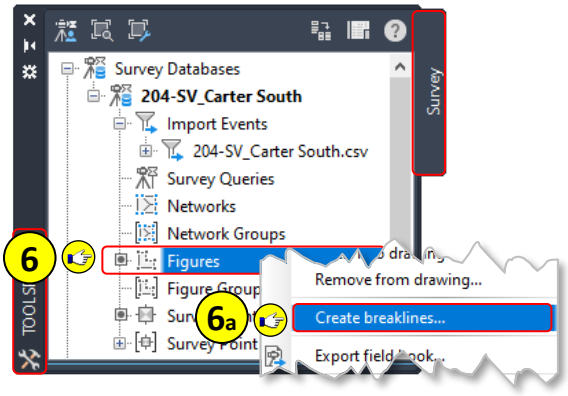
Double-clicking on a Survey Database will open the database in a read-only state.

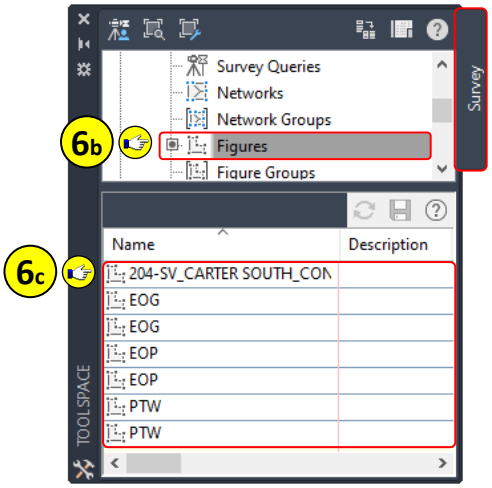
Step 5: **Navigate** to TOOLSPACE > **Survey** tab.

a. **Expand Survey Databases**.

b. If not open already > **Right-Click** on **204-SV_Carter South**

c. **Select Open for Edit**.



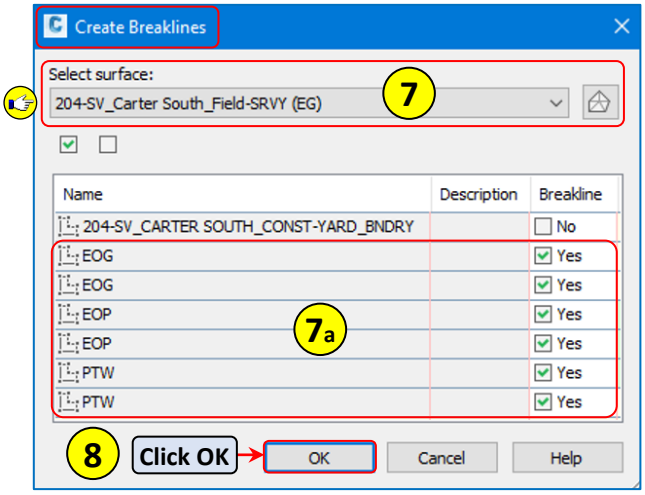


Step 6: **Right-click** on **Figures**.

a. **Select Create Breaklines**…

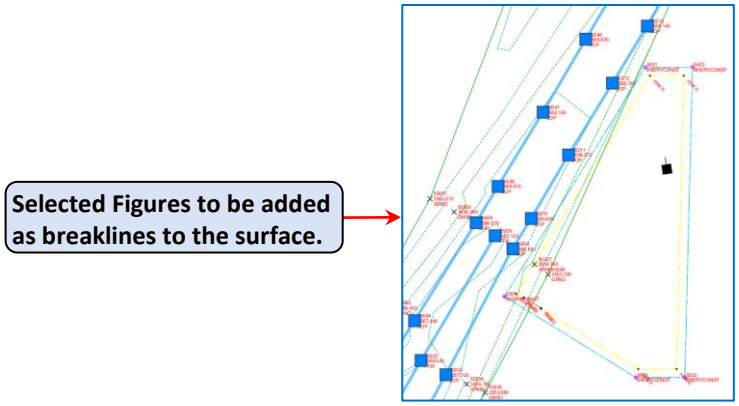
b. Alternatively > **Select Figures** > All figures are displayed in the TOOLSPACE **list view**.

c. **Select any figure** from list > **Right-click** > **Select Create breaklines**…



Step 7: From the **Create Breaklines** dialog box > **Select** the …**_Field-SRVY(EG)** surface.

a. **Verify** or **select** the **Figures** to be added > Figures with ☑ a will be added as breaklines.



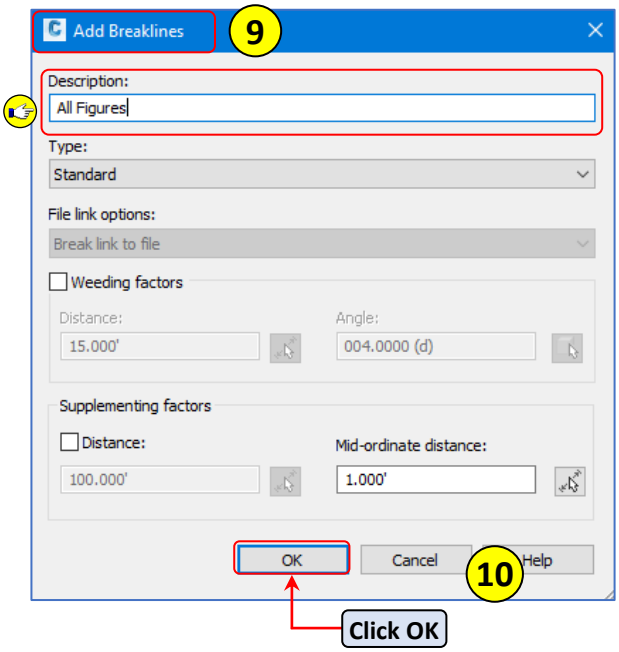
Step 8: **Click** **OK**.

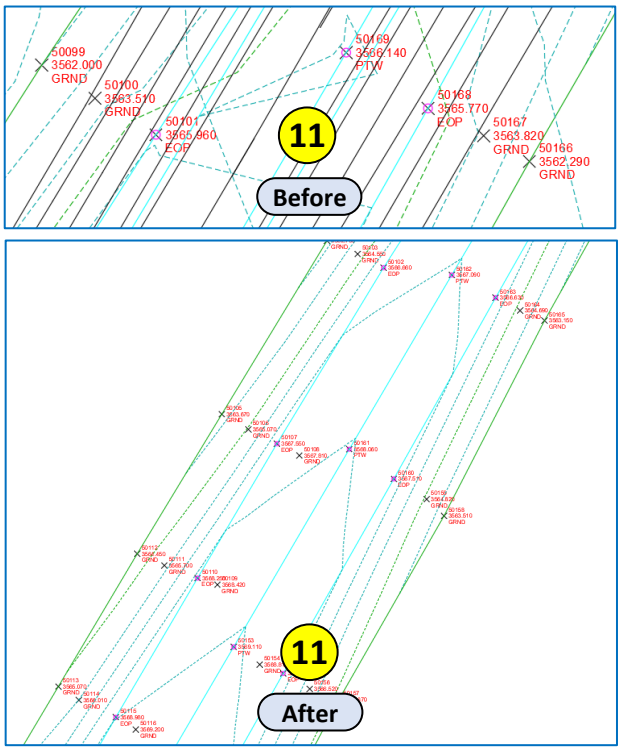
- The figures selected to be added are highlighted and selected in the drawing area.

Step 9: From the **Add Breaklines** dialog box, **verify** and **set** the following parameters:

- **Description** = **All Figures**
- **Accept** **ALL** other defaults

Step 10: **Click** **OK**.

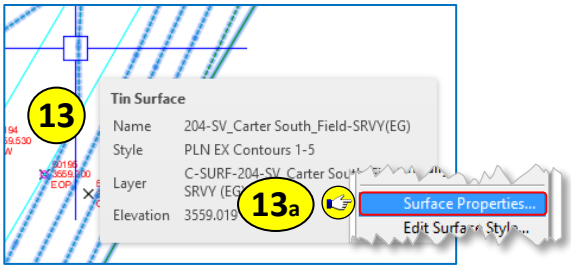


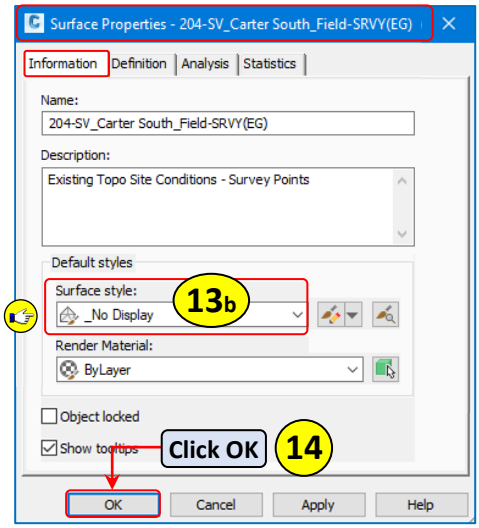


Step 11: **Review** the roads **linear features** running north and south. The anomalies with the surface contours previously identified no longer exist along the centerline and edge of road features.

Step 12: **Navigate** to TOOLSPACE > **Prospector** tab.

- **Check** for any **Out-of-Date** **collections** and **objects** in TOOLSPACE. Any collections or objects with the icon will need to be updated.
- **Right-click** on **collection** or **object** > **Select** **Update**.





Step 13: From **Model** space > **Select** the **204-SV_Carter South_Field-SRVY(EG)** surface.

a. **Right-click** > **Select Surface Properties**...

b. From the **Surface Properties** dialog box > Information tab > **Set Surface style** to:

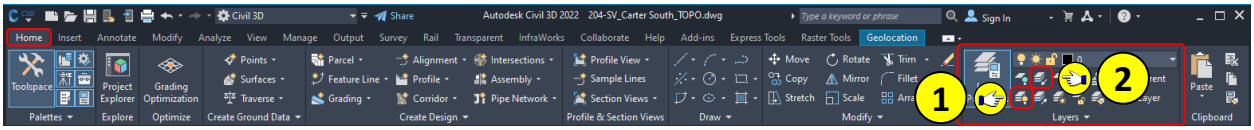
- **_No Display**

Step 14: **Click OK**.

Step 15: **Save** the **drawing** .

	After adding breaklines lines to the surface, some manual surface editing may still be needed that wasn't completely resolved by adding the breaklines.

Adding Breaklines – 3D Polylines



Step 1: **Navigate** to the **Home** tab > Layers panel > **Click On**.

All linework from the **204-SV_Carter South_Aerial-SRVY.dxf** should now be visible in the drawing area.

Step 2: **Navigate** to the **Home** tab > Layers panel > **Click Isolate**.

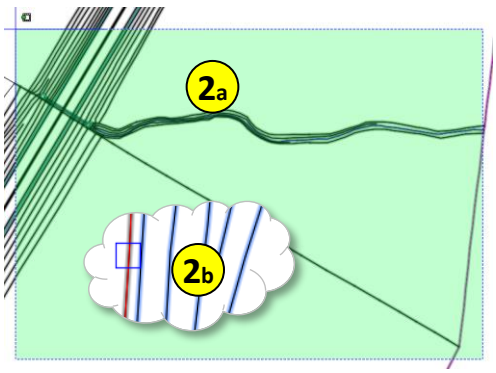
a. From **Model** space > Using a **crossing window** > **Select** all linework from the **204-SV_Carter South_Aerial-SRVY.dxf**

```
LAYISO Select objects on the layer(s) to be isolated or [Settings]:
```

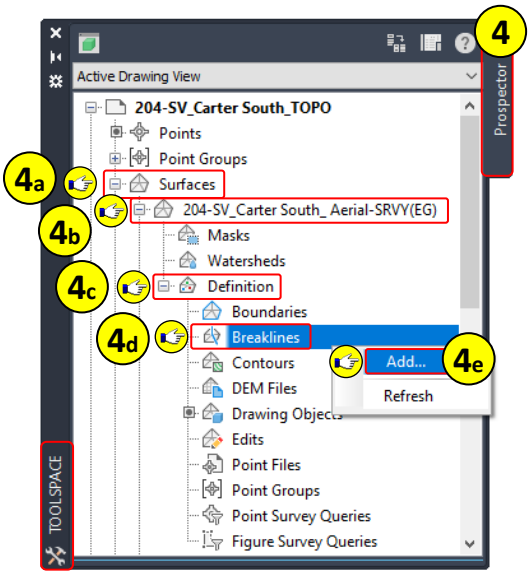
- Pay close attention when making the selection to only select the 3D polylines from the **204-SV_Carter South_Aerial-SRVY.dxf**

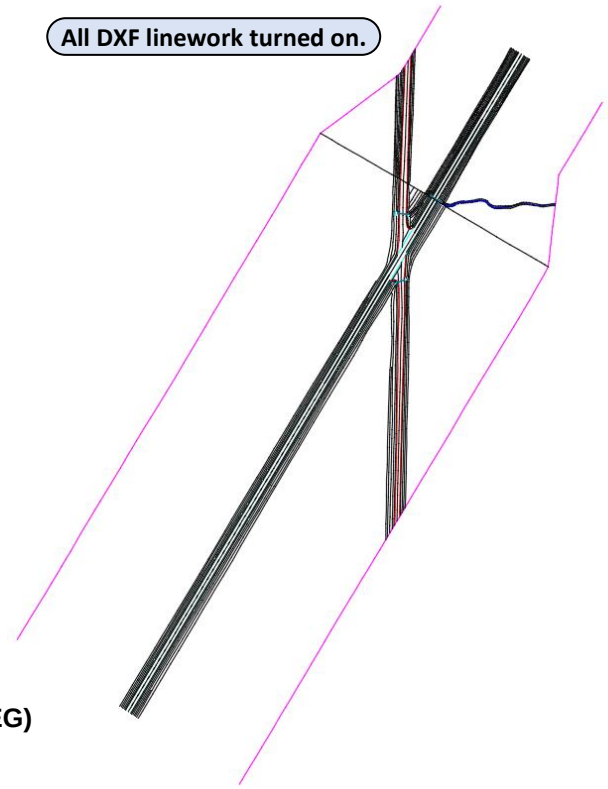
b. **Select** any additional **linework** that could not be selected with the crossing window selection.

c. **Press Enter** to end the selection and exit the command.



All linework from the **204-SV_Carter South_Aerial-SRVY.dxf** should now be visible and the only objects the drawing area.





Step 4: **Navigate** to TOOLSPACE > **Prospector** tab.

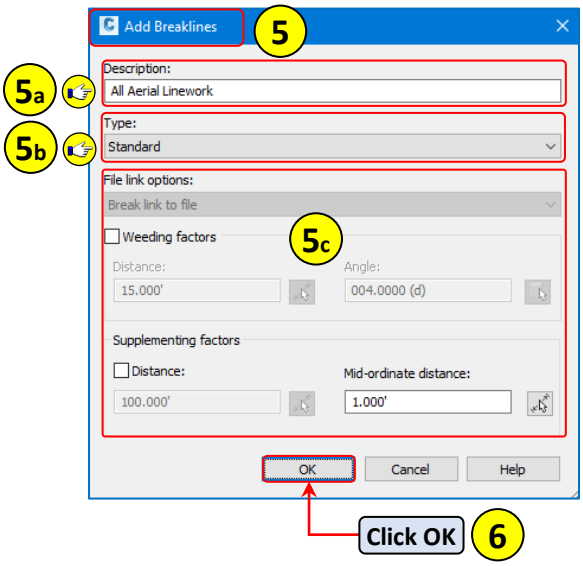
a. **Expand Surfaces** collection.

b. **Expand 204-SV_Carter South_Aerial-SRVY(EG)**

c. **Expand Definition**.

d. **Right-Click** on Breaklines

e. **Select Add**…



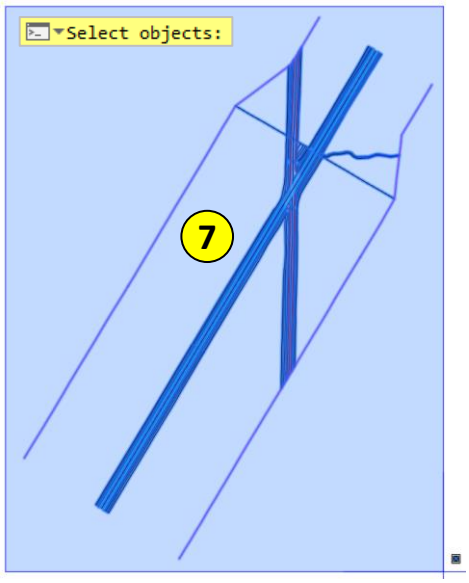
Step 5: From the **Add Breaklines** dialog box > **Set** and **verify** the following **parameters**:

a. **Description** = **All Aerial Linework**

b. **Type** = **Standard**

c. **Except** all other **defaults**.

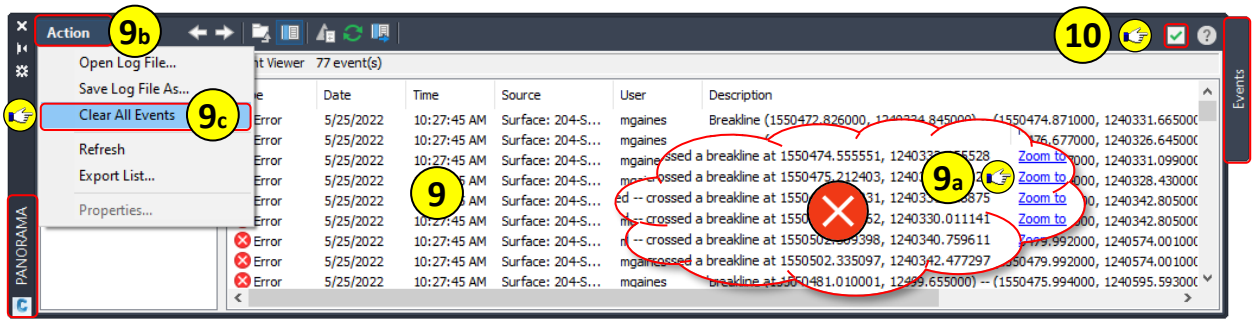
Step 6: **Click** **OK**.



Step 7: From **Model** space > **Select** all **DXF** objects using the AutoCAD window. C3D reports back how many objects were found in the selection.

```
Select objects: Specify opposite corner: 291 found
```

Step 8: **Press** **Enter** to end the selection and exit the command.



Step 9: From the **PANORAMA** – **Events** vista > **Review** the **Error** messages.

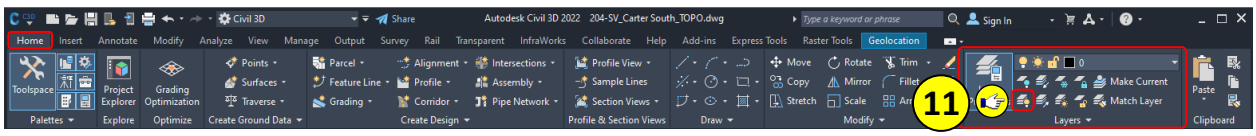
- Several errors are reported back for crossing breaklines. The errors are a direct result from building a surface from objects. C3D sees each line as a breakline and by default, C3D does not allow crossing breaklines. This will be addressed in the next steps.

a. **Clicking** on **Zoom to** will automatically pan and zoom to each location.

b. **Click** **Action**.

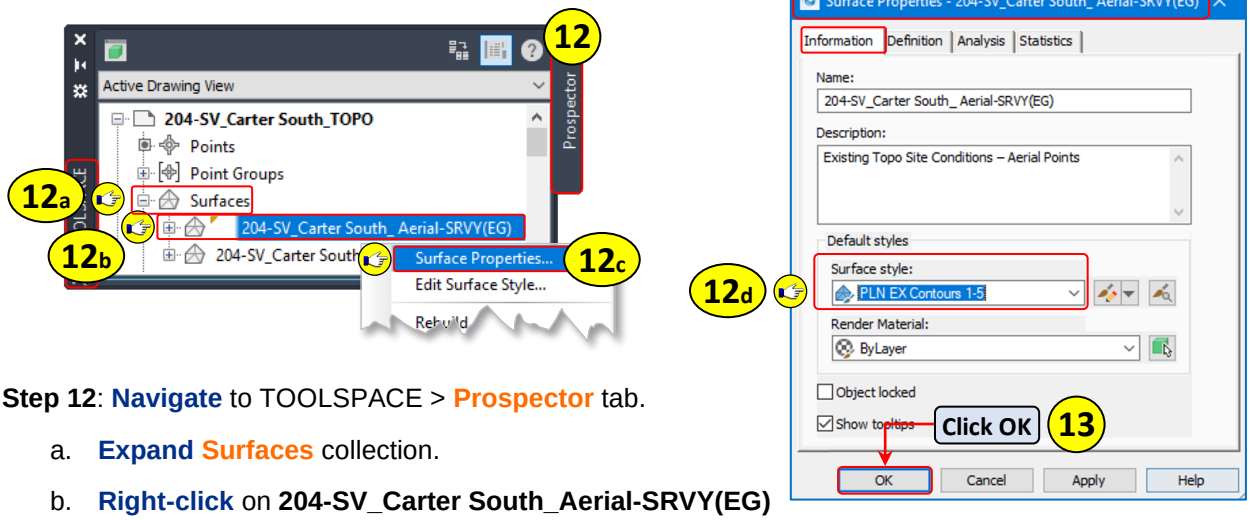
c. **Select** **Clear All Events**.

Step 10: **Dismiss** the **PANORAMA** – **Events** vista ☑.



Step 11: **Navigate** to the **Home** tab > Layers panel > **Click** **On**.

All previously isolated objects should now be visible in the drawing area.



Step 12: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Expand Surfaces** collection.

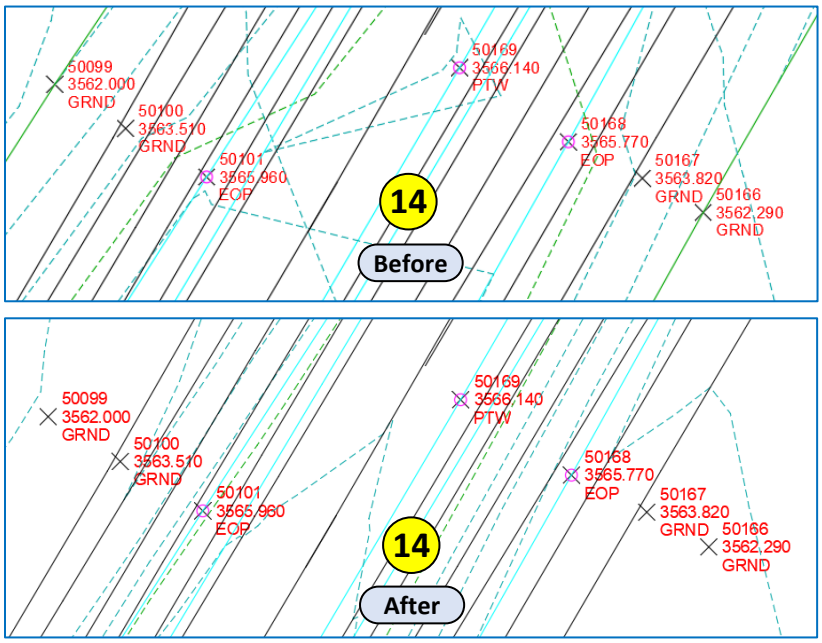
b. **Right-click** on **204-SV_Carter South_Aerial-SRVY(EG)**

c. **Select Surface Properties**...

d. From the **Surface Properties** dialog box > Information tab > **Set Surface style** to:

- **PLN EX Contours 1-5**

Step 13: **Click OK**.



Step 14: **Review** the roads **linear features** running north and south. The anomalies with the surface contours previously identified no longer exist along the centerline and edge of road features.

Step 15: **Navigate** to TOOLSPACE > **Prospector** tab.

- **Check** for any **Out-of-Date** **collections** and **objects** in TOOLSPACE. Any collections or objects with the icon will need to be updated.
- **Right-click** on **collection** or **object** > **Select Update**.

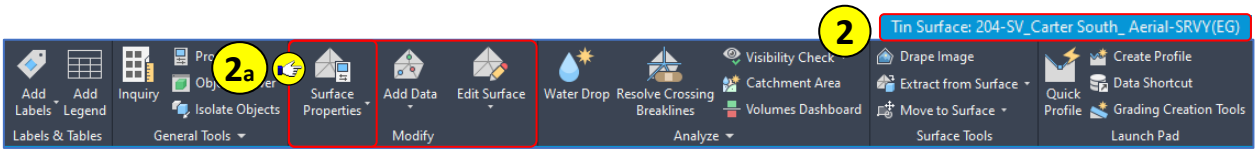
Step 16: **Save** the **drawing** .

Resolve Crossing Surface Breaklines

C3D provides a couple methods in which crossing surface breaklines can be reviewed and resolved. The first method, being the simplest method, is to allow crossing breaklines through Surface Properties. Method one can produce unexpected results though. Method two takes a bit more time and requires users to review each breakline location and choose a solution from the available options using the Breakline Tool.

Method 1 – Surface Properties

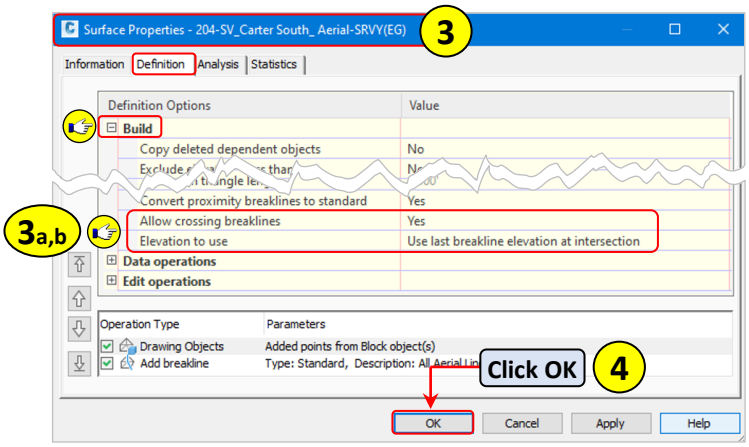
Step 1: From **Model** space > **Select** the **204-SV_Carter South_Aerial-SRVY(EG)** surface.



Step 2: **Navigate** to the **204-SV_Carter South_Aerial-SRVY(EG)** contextual tab > **Modify** panel.

a. **Select Surface Properties**.

- Alternatively, **select** the surface object > **Right-click** > **Select Surface Properties**...



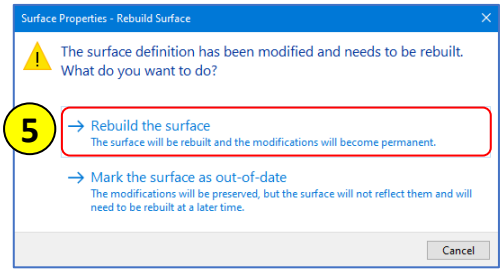
Use caution when using this option. This option can produce **unexpected** results when used on surface data other than contours.

Step 3: From the **Surface Properties** dialog box > Definition tab > **Expand Build**.

a. **Set Allow crossing breaklines** = **Yes**

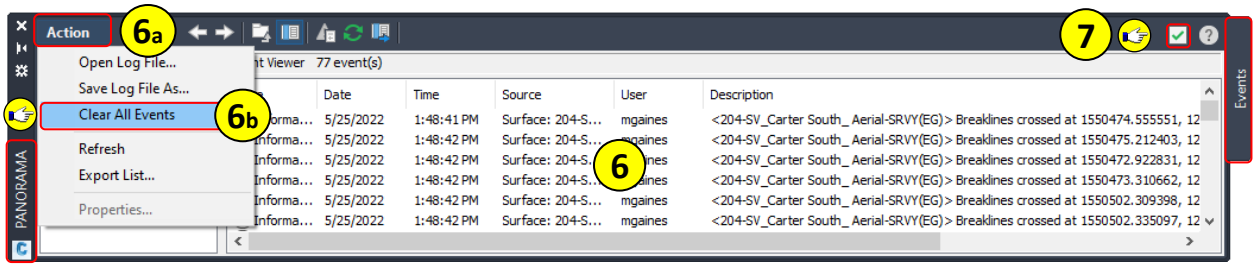
b. **Set Elevation to use** = **Use last breakline elevation at intersection**.

Step 4: **Click OK**.



Step 5: When prompted to Rebuild the Surface or Mark the Surface as out-of-date > **Select Rebuild**.

Step 6: **Save** the **drawing** .



Step 6: From the **PANORAMA** – **Events** vista > **Review** the **Information** messages.

- The errors have been replaced as information line items identifying the locations where breaklines are crossing but have been added to the surface.

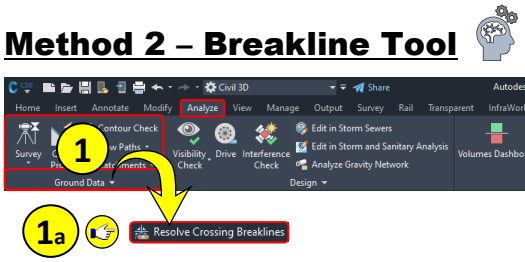
a. **Click Action**.

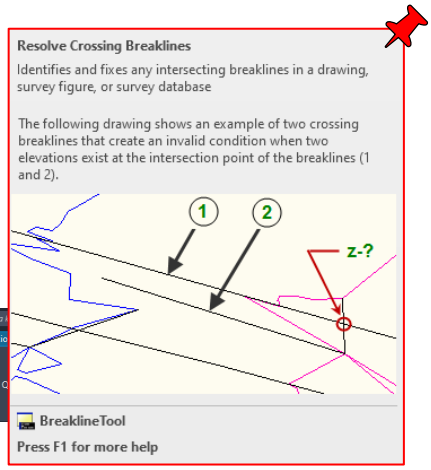
b. **Select Clear All Events**.

Step 7: **Dismiss** the **PANORAMA – Events vista** .

Step 8: **Save** the **drawing** .

Method 2 – Breakline Tool





Step 1: **Navigate** to the **Analyze** tab > Ground Data panel > **Click** the **Ground Data drop-down**.

a. From the **Ground Data drop-down** list > **Select Resolve Crossing Breaklines**.

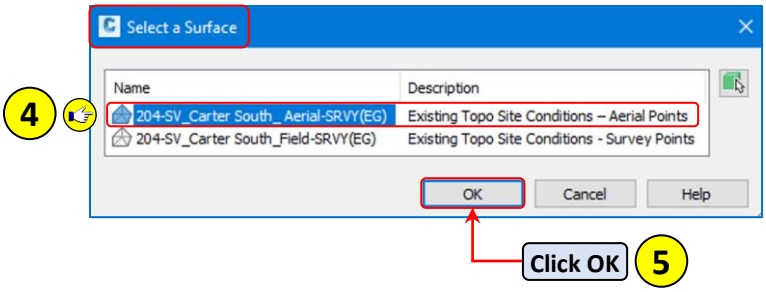
Step 2: When prompted > **Select Surface** from the command line.

```
BREAKLINETOOL Please specify the types of breakline you want to find or [surveyDatabase Figure Surface]:
```

Step 3: When prompted to select surface > **Press Enter** to select from list.

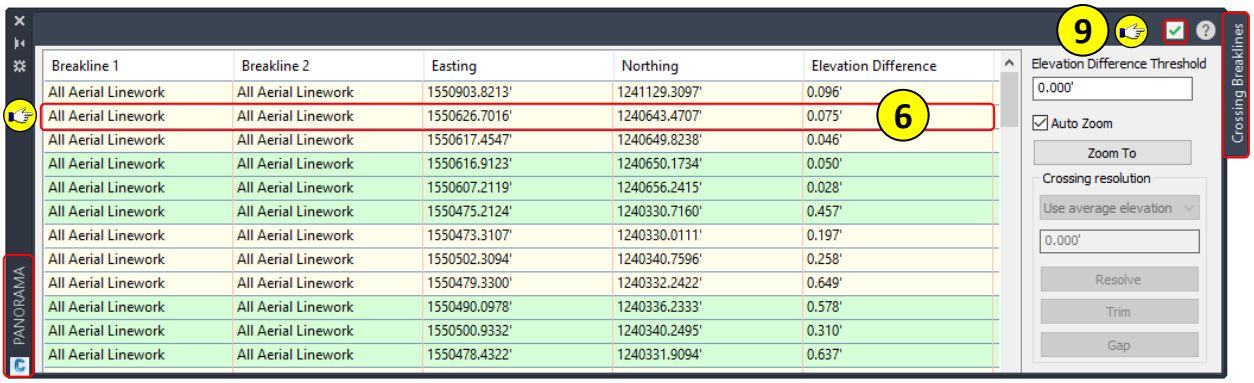
```
BREAKLINETOOL Select a surface <or press enter key to select from list>:
```

- Alternatively > Select surface from Model space.



Step 4: From the **Select a Surface** dialog box > **Select 204-SV_Carter South_Aerial-SRVY(EG)**.

Step 5: **Click OK**.



Breakline 1	Breakline 2	Easting	Northing	Elevation Difference
All Aerial Linework	All Aerial Linework	1550903.8213'	1241129.3097'	0.096'
All Aerial Linework	All Aerial Linework	1550626.7016'	1240643.4707'	0.075'
All Aerial Linework	All Aerial Linework	1550617.4547'	1240649.8238'	0.046'
All Aerial Linework	All Aerial Linework	1550616.9123'	1240650.1734'	0.050'
All Aerial Linework	All Aerial Linework	1550607.2119'	1240656.2415'	0.028'
All Aerial Linework	All Aerial Linework	1550475.2124'	1240330.7160'	0.457'
All Aerial Linework	All Aerial Linework	1550473.3107'	1240330.0111'	0.197'
All Aerial Linework	All Aerial Linework	1550502.3094'	1240340.7596'	0.258'
All Aerial Linework	All Aerial Linework	1550479.3300'	1240332.2422'	0.649'
All Aerial Linework	All Aerial Linework	1550490.0978'	1240336.2333'	0.578'
All Aerial Linework	All Aerial Linework	1550500.9332'	1240340.2495'	0.310'
All Aerial Linework	All Aerial Linework	1550478.4322'	1240331.9094'	0.637'

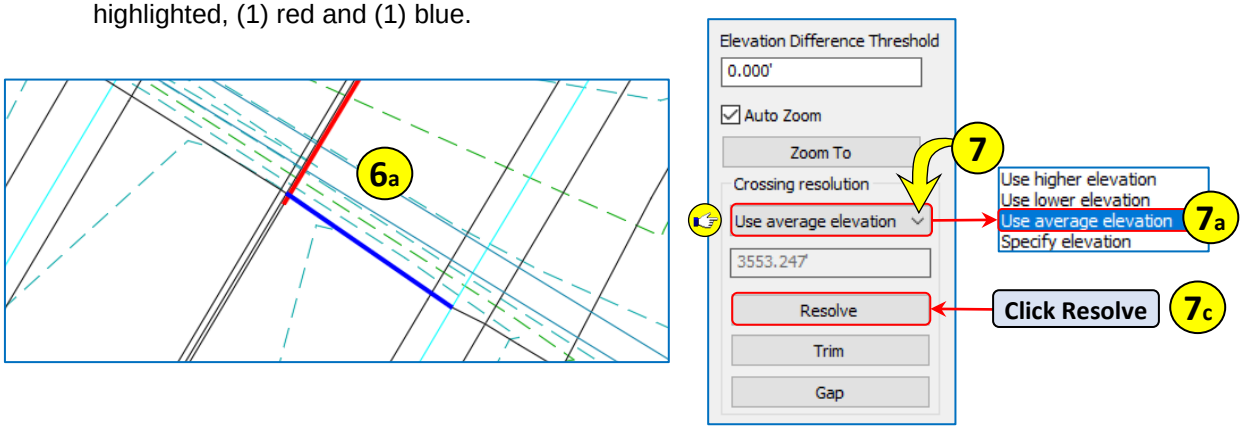
All identified crossing breaklines are listed in the **Crossing Breaklines** PANORAMA vista. The various available elevations options can be used to resolve the Crossing Breaklines.

The Crossing Breakline vista identifies intersecting breaklines as Breakline 1 and Breakline 2. When a line is selected from the list, the drawing is zoomed to the location and both intersecting breaklines will be highlighted in blue and red.

	Breakline with **lower elevation** appear in **RED**. Breakline with **higher elevation** appear in **BLUE**.

Step 6: From the **Crossing Breaklines** vista > **Select** any **line** from the list.

a. The drawing area view is automatically zoomed to the location and the crossing breaklines are highlighted, (1) red and (1) blue.



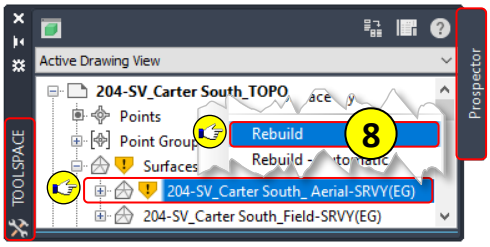
Step 7: From the **Crossing Breaklines** vista > **Click** the **Crossing resolution** drop-down list.

a. **See** the **various options** > Select Use average elevation.

b. **Click Resolve**.

Step 8: **Navigate** to TOOLSPACE > **Prospector** tab.

- **Check** for any **Out-of-Date** **collections** and **objects** in TOOLSPACE. Any collections or objects with the ⚠ icon will need to be updated.
- **Right-click** on **collection** or **object** > **Select Update**.



Step 9: **Dismiss** the **PANORAMA** – **Crossing Breaklines** vista .

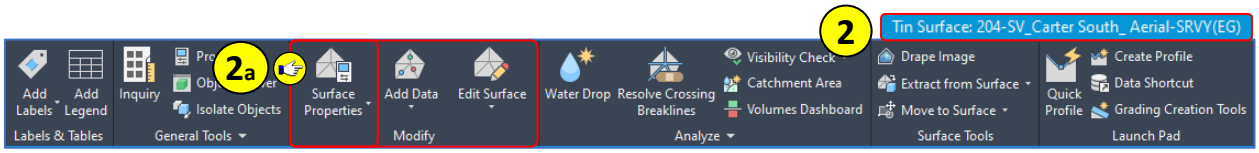
Step 10: **Save** the **drawing** .

Surface Refinement and Editing – Part 2

Deleting Surface Dependent Objects

When data objects are used for surface creation, such as in the case of inserting 3D polylines, the drawing file size can increase over time. To avoid file bloating, the dependent objects can be deleted after surface creation to help control file size and performance.

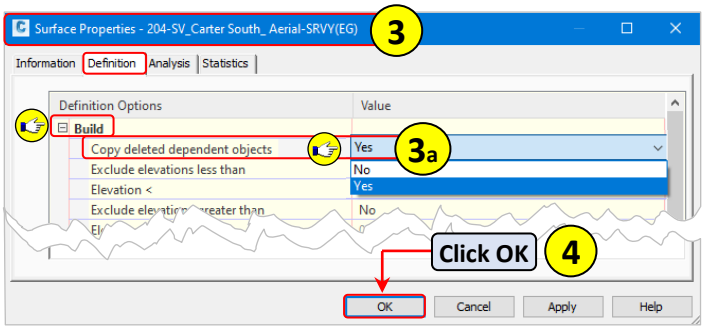
Step 1: From **Model** space > **Select** the **204-SV_Carter South_Aerial-SRVY(EG)** surface.

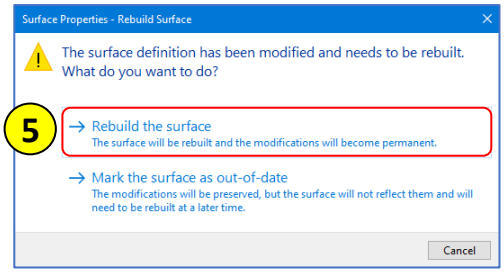


Step 2: **Navigate** to the **204-SV_Carter South_Aerial-SRVY(EG)** contextual tab > **Modify** panel.

a. **Select Surface Properties**.

- Alternatively, **select** the surface object > **Right-click** > **Select Surface Properties**...



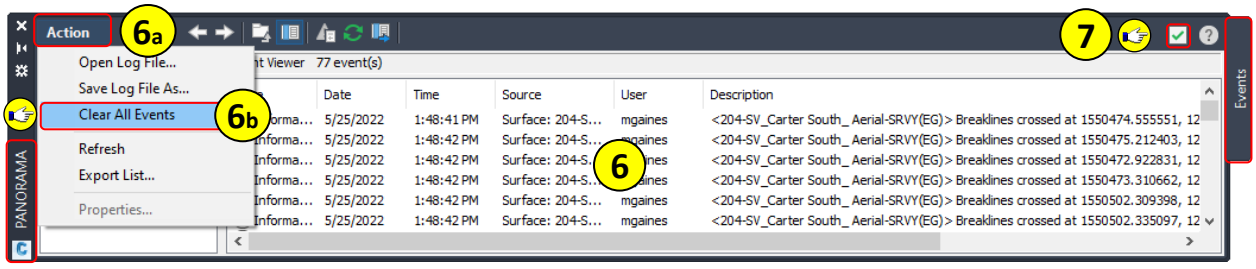


Step 3: From the **Surface Properties** dialog box > Definition tab > **Expand Build**.

a. **Set Copy deleted dependent objects** = **Yes**

Step 4: **Click OK**.

Step 5: When prompted to Rebuild the Surface or Mark the Surface as out-of-date > **Select Rebuild**.



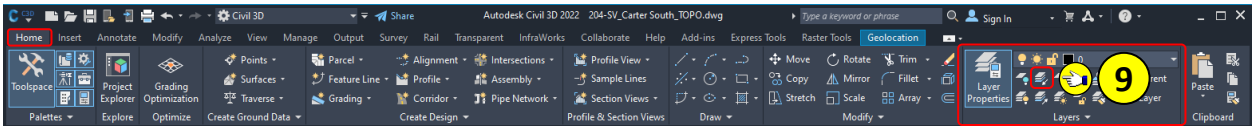
Step 6: From the **PANORAMA** – **Events** vista > **Review** the **Information** messages.

a. **Click Action**.

b. **Select Clear All Events**.

Step 7: **Dismiss** the **PANORAMA – Events vista** .

Step 8: **Save** the **drawing** .



Step 9: **Navigate** to the **Home** tab > Layers panel > **Click Isolate**.

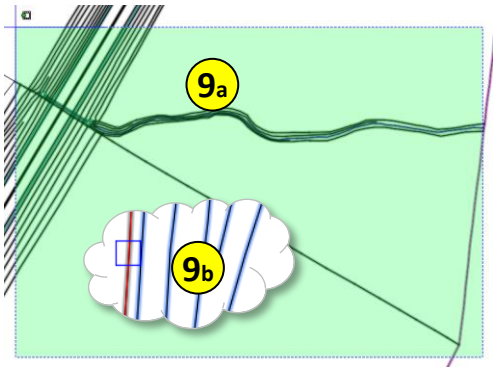
a. From **Model** space > Using a **crossing window** > **Select** all linework from the **204-SV_Carter South_Aerial-SRVY.dxf**

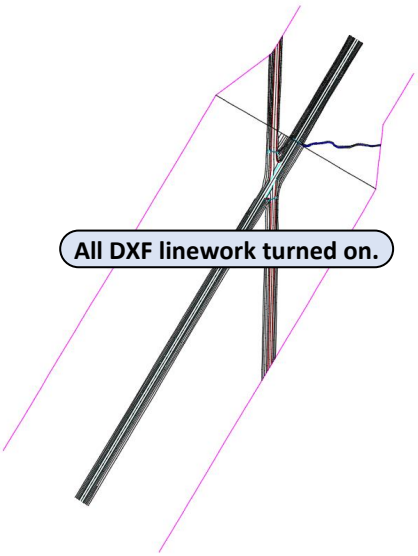
```
LAYISO Select objects on the layer(s) to be isolated or [Settings]:
```

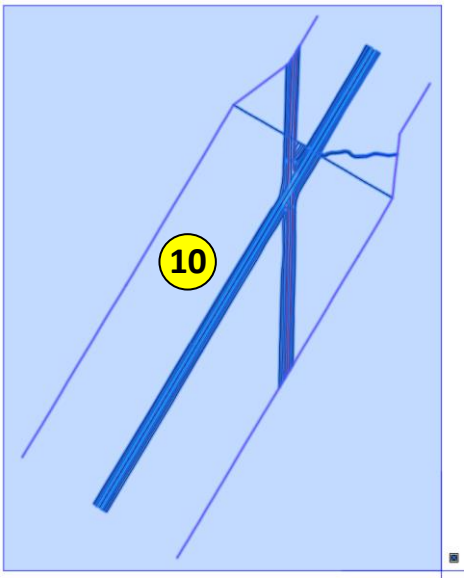
- Pay close attention when making the selection to only select the 3D polylines from the **204-SV_Carter South_Aerial-SRVY.dxf**

b. **Select** any additional **linework** that could not be selected with the crossing window selection.

c. **Press Enter** to end the selection and exit the command.





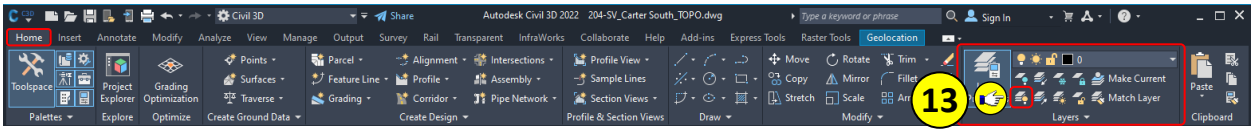


All linework from the **204-SV_Carter South_Aerial-SRVY.dxf** should now be visible and the only objects the drawing area.

Step 10: From **Model** space > **Select** all **DXF** objects using the AutoCAD window. C3D reports back how many objects were found in the selection.

Step 11: From the **Properties** palette > **Verify** the **selection** > 3D Polyline (291) 11

Step 12: **Press Delete**.



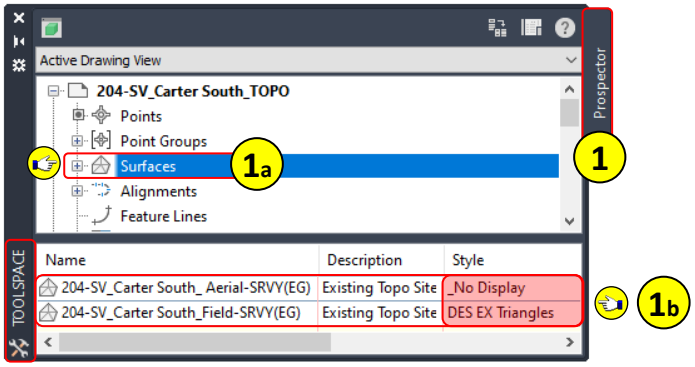
Step 13: **Navigate** to the **Home** tab > Layers panel > **Click On**.

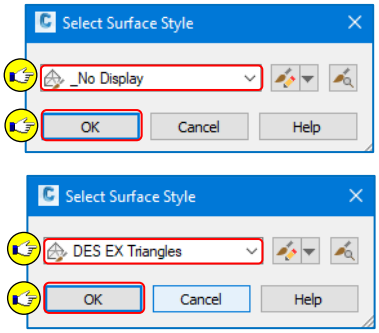
All previously isolated objects should now be visible in the drawing area.

Step 14: **Save** the **drawing** .

Deleting TIN Surface Lines

Once a surface has been defined, it's not uncommon having to edit the TIN lines. Editing the TIN lines is just one more step to better defining the surface to represent the true existing conditions. In the same way that adding breaklines helps to better define the surface.





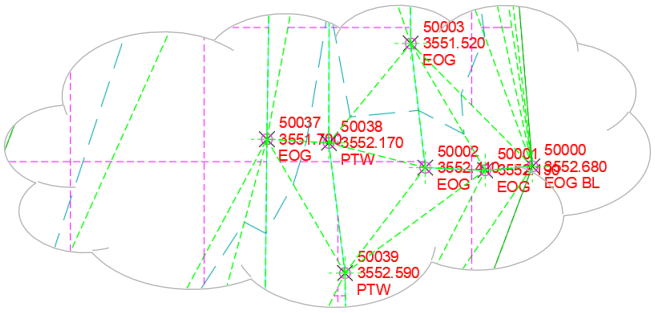
Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

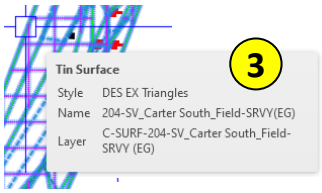
a. **Select Surfaces** collection.

- From the **Prospector** list view > **Set** the **surface styles** for both **surfaces**.

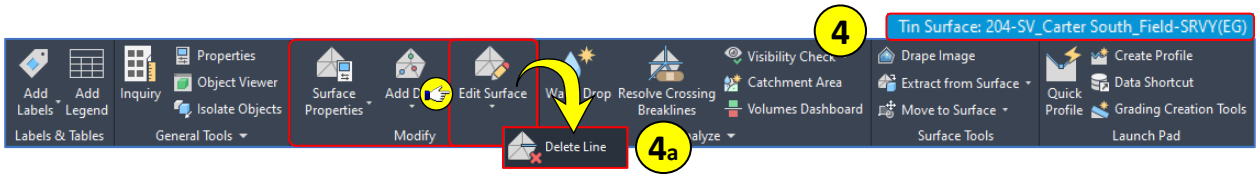
b. **Click** on the surface in the **Style** column > **Click** once more to **select** the **style** > **Click OK**.

- 204-SV_Carter South_ Aerial-SRVY(EG) = **_No Display**
- 204-SV_Carter South_ Field-SRVY(EG) = **DES EX Triangles**



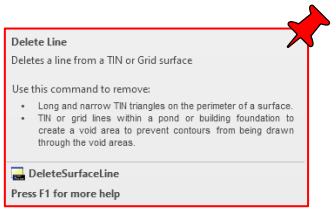


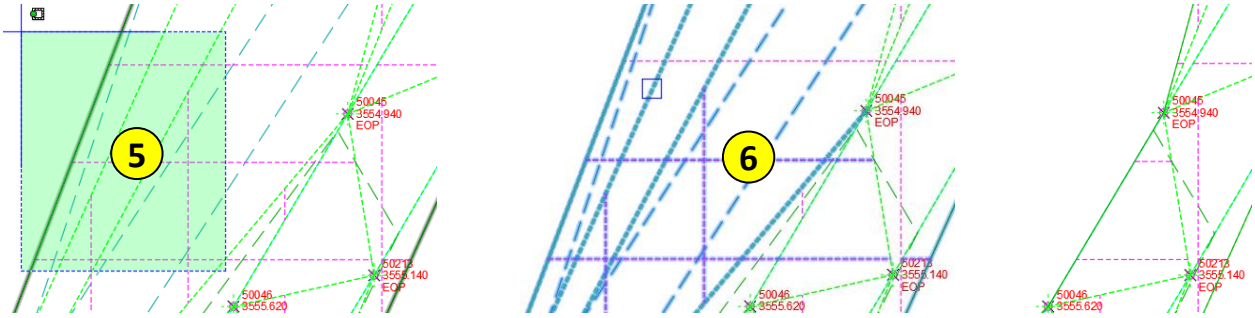
Step 3: From **Model** space > **Select** the **204-SV_Carter South_Field-SRVY(EG)** surface.



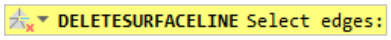
Step 4: **Navigate** to the **204-SV_Carter South_Field-SRVY(EG)** contextual tab > Modify panel > **Edit Surface** drop-down.

a. **Select Delete Line**.





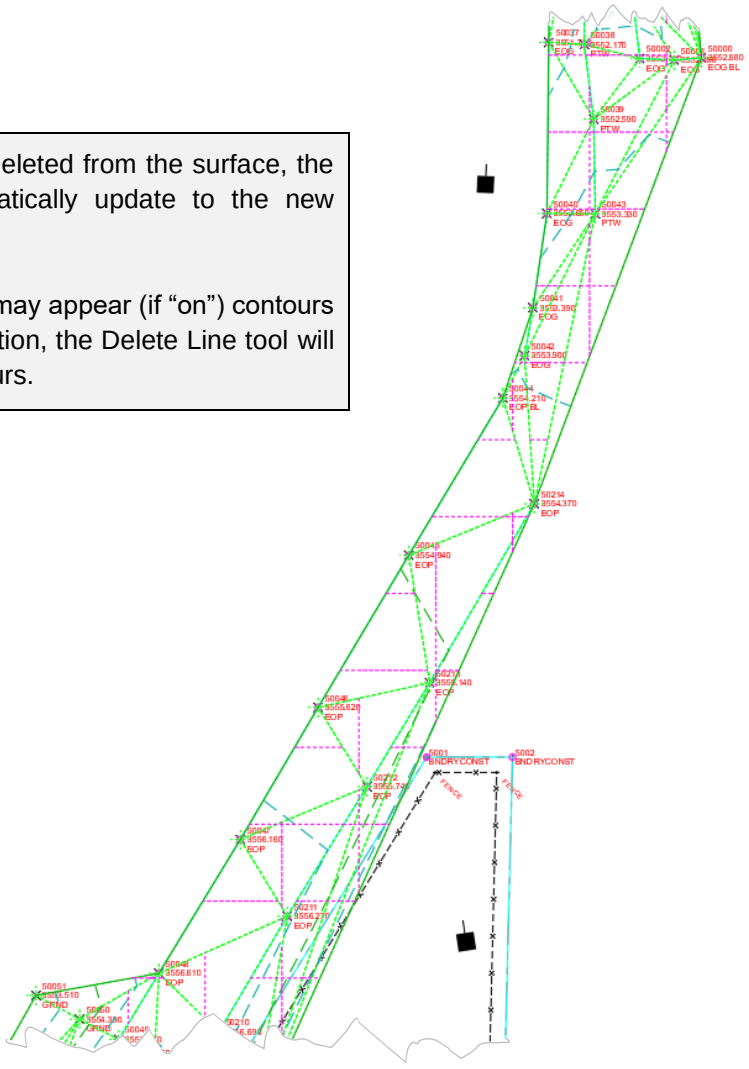
Step 5: When prompted, **select** the **TIN lines** to be **removed**.



- TIN lines can be selected one at a time or multiple lines using the AutoCAD selection method (green window).

Step 6: **Press Enter** to end the selection and **delete** the selected **TIN lines**.

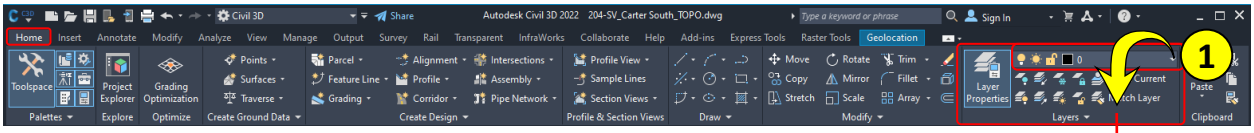
Step 7: **Press Enter** or **Esc** to end the command (**repeat** the command as needed).



	As TIN lines are selected and deleted from the surface, the **surface boundary** will automatically update to the new extents of the data. During the selection process, it may appear (if “on”) contours have been included in the selection, the Delete Line tool will only delete TIN lines. Not contours.

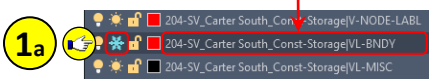
Adding Surface Boundaries

When reviewing the **204-SV_Carter South_Aerial-SRVY(EG)** surface, there are some areas of triangulation that need to be addressed. The Delete Lines surface editing tool could be used to clean up the erroneous areas. Rather than deleting lines, a project boundary in the form of a polyline has been provided that will be used to identify the AOI for the surface and overall project.



Step 1: **Navigate** to the **Home** tab > Layers panel > **Click** the **Layers** drop-down.

a. From the **Layers** drop-down list > **Locate** and **unfreeze** the **204-SV_Carter South_Const-Storage|VL-BNDY** layer.



b. The object on the …**VL-BNDY** layer will be used for the surface boundary.

Step 2: From the **Command** line > **Enter** the command **NCOPY**.

```
NCOPY Select nested objects to copy or [Settings]:
```

a. From the **Command** line > **Select Settings** > **Select** <**Insert**>.

```
NCOPY Enter setting for copying nested objects [Insert Bind] <Insert>:
```

b. When prompted > **Select** the …**VL-BNDY RED polyline**.

```
NCOPY Select nested objects to copy or [Settings]:
```

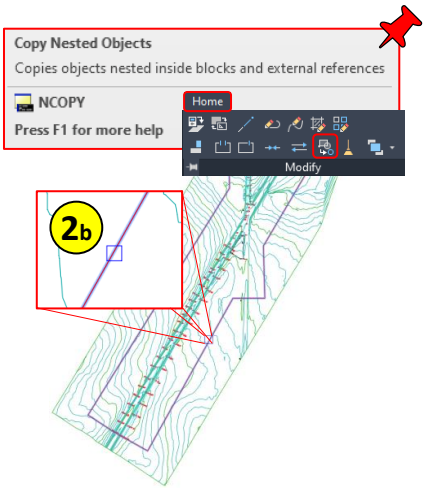
c. **Press Enter**.

d. When prompted for **base point** > **Select Displacement**.

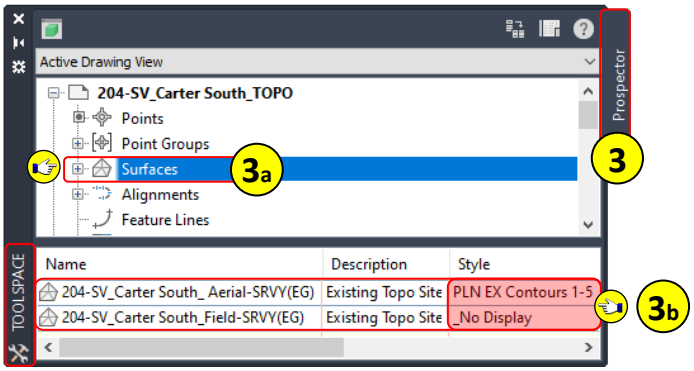
```
NCOPY Specify base point or [Displacement Multiple] <Displacement>:
```

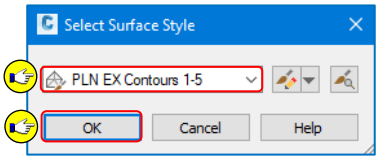
e. When prompted to specify **displacement** > **Press Enter**.

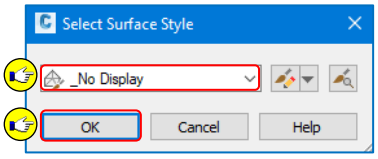
```
NCOPY Specify displacement <0.0000, 0.0000, 0.0000>:
```



The …**VL-BNDY** layer has been copied from the Xref and is live in the current drawing.







Step 3: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Select Surfaces** collection.

- From the **Prospector** list view > **Set** the **surface styles** for both **surfaces**.

b. **Click** on the surface in the **Style** column > **Click** once more to **select** the **style** > **Click OK**.

- 204-SV_Carter South_ Aerial-SRVY(EG) = **PLN EX Contours 1-5**
- 204-SV_Carter South_ Field-SRVY(EG) = **_No Display**

Step 4: **Navigate** to TOOLSPACE > **Prospector** tab.

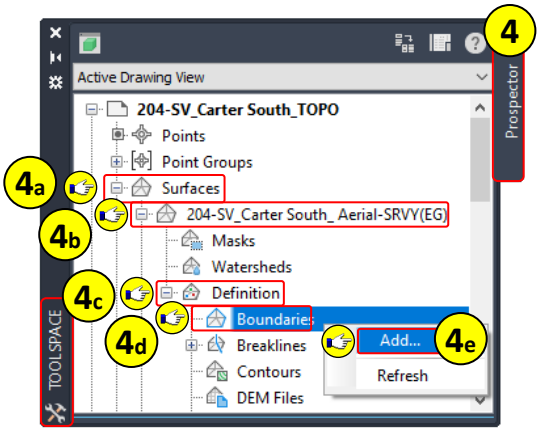
a. **Expand Surfaces** collection.

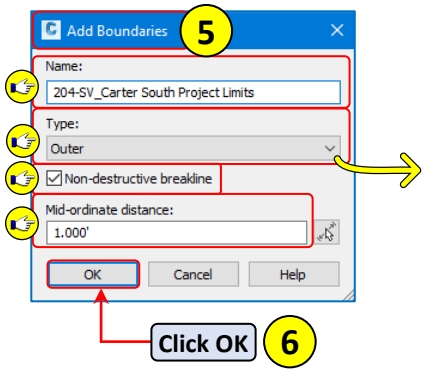
b. **Expand 204-SV_Carter South_Aerial-SRVY(EG)**

c. **Expand Definition**.

d. **Right-Click** on **Boundaries**.

e. **Select Add**…





Boundary Type	Boundary Behavior
Outer	Extents of surface data to defined boundary perimeter.
Show	Used for displaying surface area within a hide boundary.
Hide	Used hiding specific surface areas.
Data Clip	Surface extents limited to boundary object selected. Any data added after the data clip is clipped to the boundary.

Step 5: From the **Add Boundaries** dialog box, **verify** and **set** the following parameters:

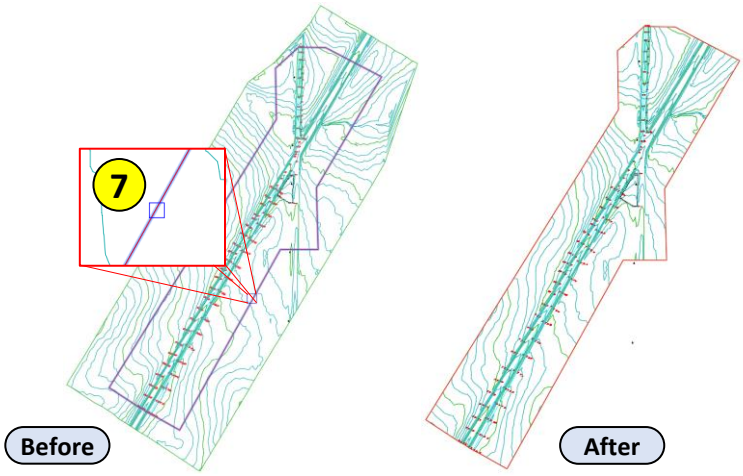
- **Name** = **204-SV_Carter South Project Limits**
- **Type** = **Outer**
- **Non-destructive breakline** = ☑
  - When checked, surface triangulation **will extend** to the limits of the defined boundary.
  - When left unchecked, surface triangulation with **will not extend** to the defined boundary.
- **Mid-ordinate distance** = 1.00 (default)

Step 6: **Click OK**.

Step 7: From **Model** space > **Select** the …**VL-BNDY RED polyline**.

The surface has is now confined to the extents of the shape selected for the boundary.

Step 8: Save the **drawing** .



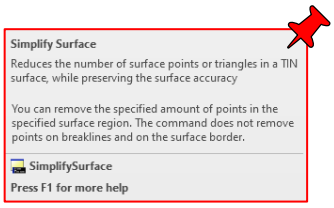
Reducing Surface Size

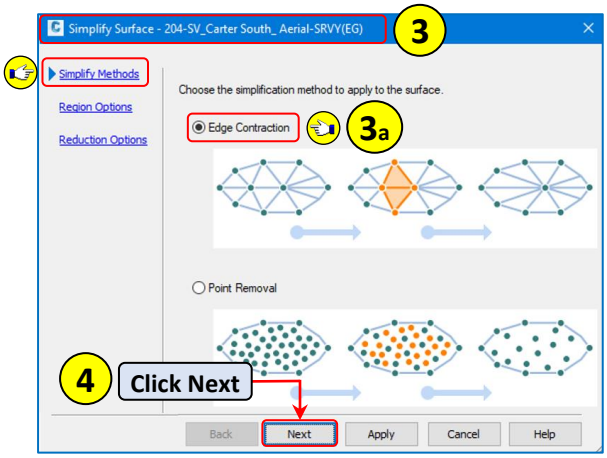
As survey data continues to be added or additional surfaces created in a drawing file, the drawing performance may be negatively impacted. To prevent drawing performance degradation, C3D provides a few tools that can be used to **simplify** surface data. When a surface is simplified, the number of points or triangles in the TIN surface is reduced. The reduction process does not remove points on breaklines or on the surface border. Therefor preserving the accuracy of the surface.

Step 1: From **Model** space > **Select** the **204-SV_Carter South(EG)** surface.

Step 2: **Navigate** to the **204-SV_Carter South_Aerial-SRVY(EG)** contextual tab > Modify panel > **Edit Surface** drop-down.

a. **Select Simplify Surface**.





Step 3: From the **Simplify Surface** wizard dialog box > **Simplify Methods** page >

a. **Select Edge Contraction**.

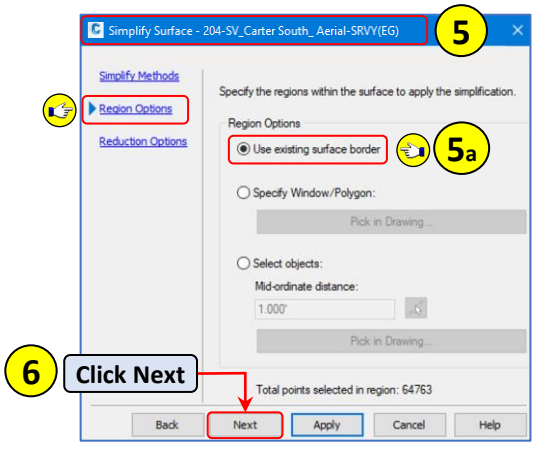
- For detailed descriptions of each simplification method, please see: Autodesk Knowledge Network – **Simplify Methods** (Click Help).

Step 4: **Click Next**.

Step 5: From the **Simplify Surface** wizard dialog box > **Region Options** page >

a. **Select Use existing surface border**.

Step 6: **Click Next**.



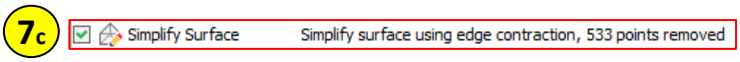
Step 7: From the **Simplify Surface** wizard dialog box > **Reduction Options** page >

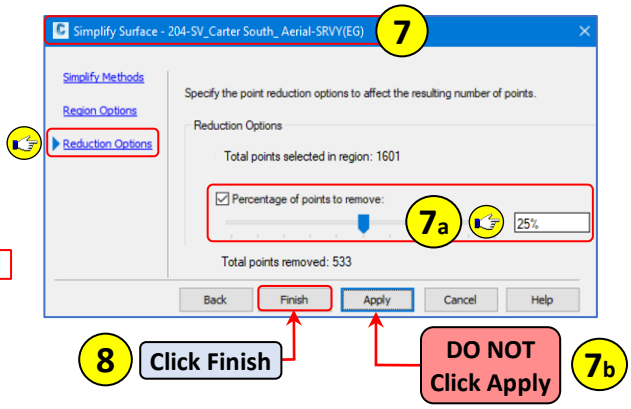
a. **Using** the slider > **adjust** the **Percentage of points to remove** = **25%**

b. **DO NOT Click Apply**

- The simplification process will be applied twice if Apply is clicked and then Finish is clicked.

c. **Reviewing Surface Properties** > Definition tab > **See Total points removed**: **533**





Step 8: **Click Finish**.

Step 9: **Review** the file size **before** and **after** saving:

- File size before simplification = **3,412** KB
- File size after simplification = **3,388** KB

Step 10: From **Model** space > **Select** the **204-SV_Carter South_Aerial-SRVY(EG)** surface.

a. **Right-click** > **Select Surface Properties**...

b. From the **Surface Properties** dialog box > Information tab > **Set Surface** style to:

- **_No Display**

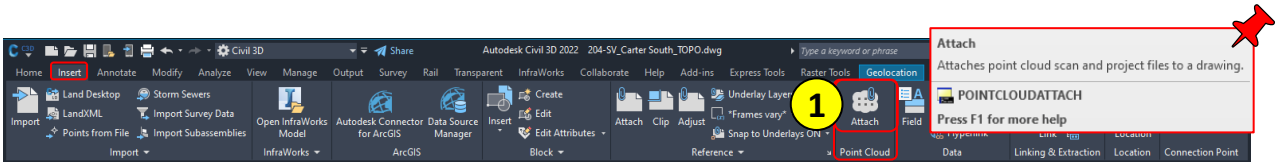
Step 11: **Save** the **drawing** .

Point Clouds

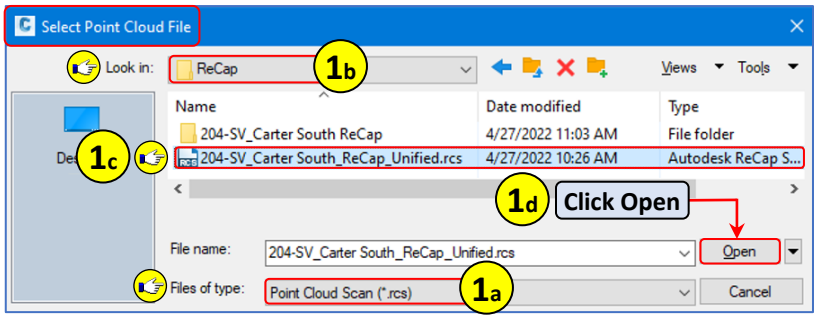
Point clouds are a dense collection of points normally collected using 3D scanners, Lidar, or Photogrammetry equipment. Due to the size of point cloud files, project size, drawing size, and drawing performance, all these items need to be reviewed and considered when working with point clouds. Understanding and reviewing project needs up front will allow for appropriate workflows to be identified to efficiently work with the available point cloud data.

Attach Point Cloud

CAUTION	Prior to attaching a point cloud, it is important to make certain the **drawing units** and **coordinates** match the point cloud data. If there are discrepancies between the two, the data will be shifted.



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



a. **Verify File of type** = **Point Cloud Scan (*.rcs)**.

b. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**ReCap**

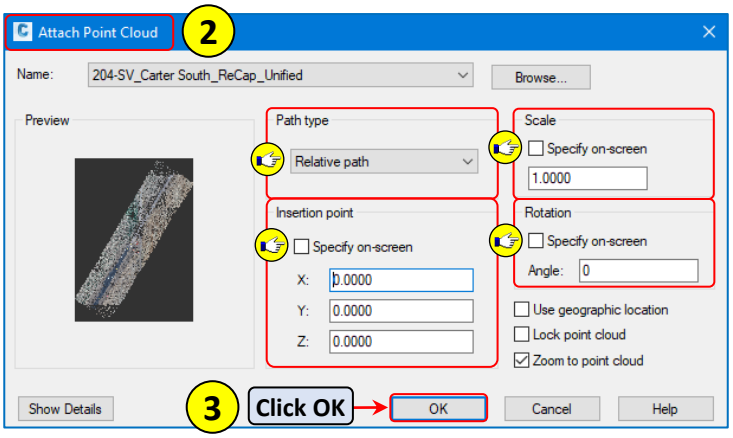
c. **Select** > **204-SV_Carter South_ReCap_Unified.rcs**

d. **Click Open**.

	C3D can read and attach ***.rcs** and ***.rcp** ReCap scan files.

Step 2: From the **Attach Point Cloud** dialog box, **verify** the following parameters:

- **Path Type** = **Relative Path**
- **Scale** = **Unchecked**
- **Insertion point** = **Unchecked**
- **Rotation** = **Unchecked**

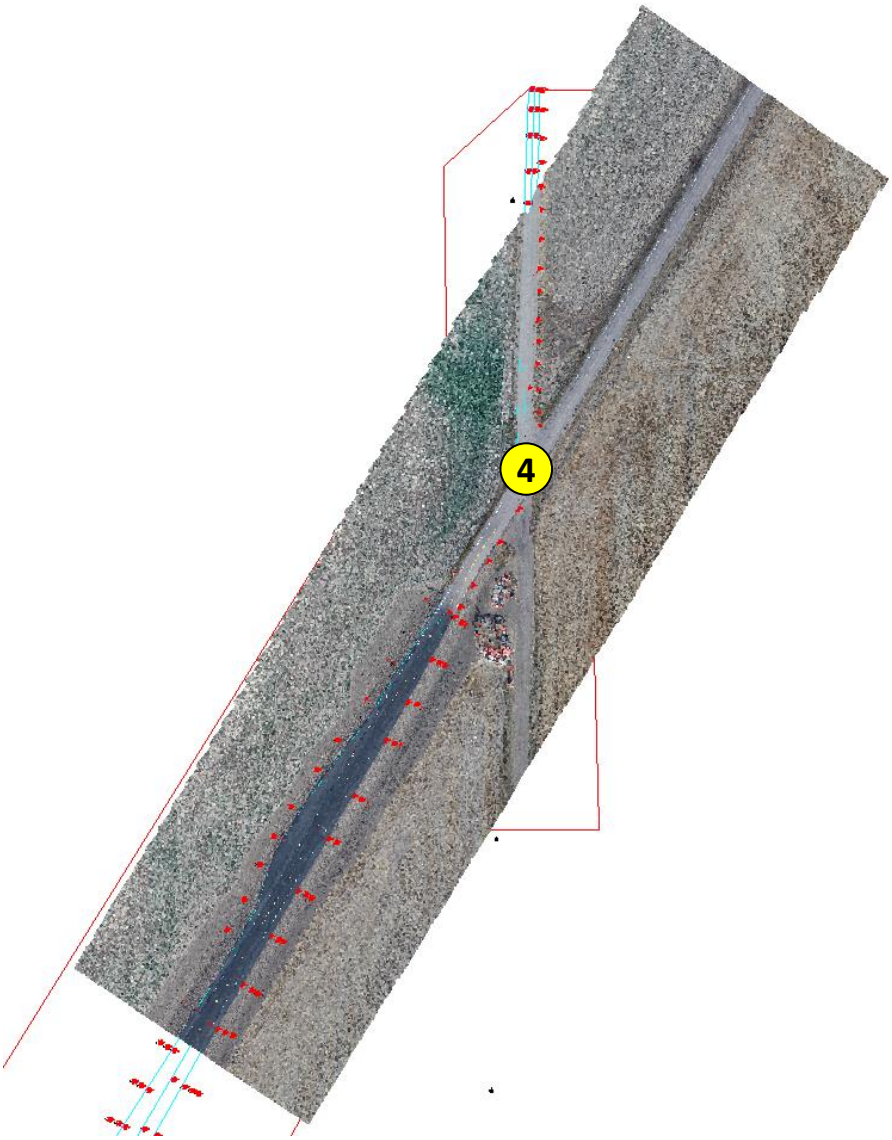


Step 3: **Click OK**.

	When attaching point cloud data to a drawing, be patient after clicking OK. After clicking OK, C3D will be begin the attach process and depending on the size of the point cloud, the process could take several minutes.

Step 4: From **Model** space > **Point Cloud** is **visible** in the drawing area.

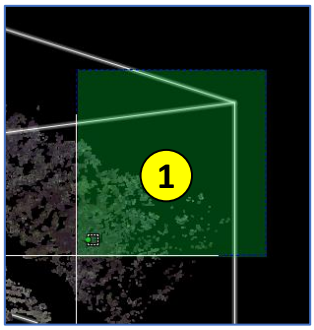
	Point Cloud Model Space **Visual Styles**: • When first attaching a point cloud, the model space visual style is changed from 2D Wireframe to **WIREFRAME**. • Point clouds are **not visible** in the default 2D Wireframe visual style.



Step 5: **Save** the **drawing** .

Point Cloud Display Settings in Civil 3D

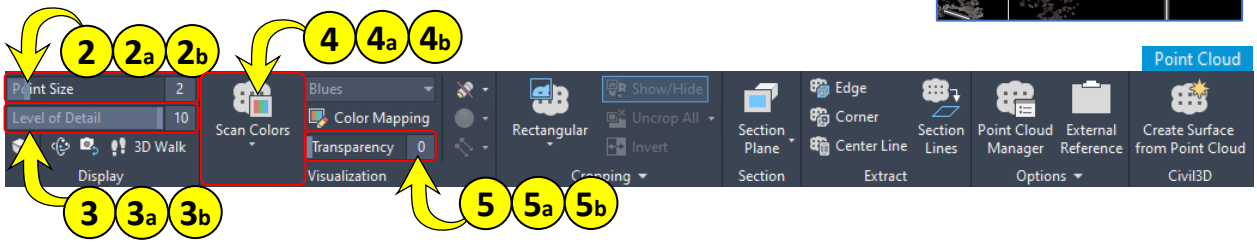
The display of the point cloud points can increase the point size, color, level of detail, and point cloud object transparency.



Point Cloud Display

Step 1: **Select** the **point cloud** (it may be necessary to use a crossing window).

	A bounding box will appear when hovering over the extents of the point cloud.



Step 2: From the **Point Cloud** contextual ribbon > Display panel > **Point Size**:

a. **Adjust** the slider from the default value to **4** (values can also be entered in the field).

   a. **Observe** the **change** to the point cloud as the **Point Size** value is increased / decreased.

b. **Adjust** the **point size** back to **2**.

Step 3: From the **Point Cloud** contextual ribbon > Display panel > **Level of Detail**:

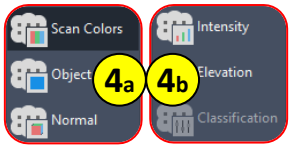
a. **Adjust** the slider from the default value to **8** (values can also be entered in the field).

   b. **Observe** the **change** to the point cloud as the **Level of Detail** value is increased / decreased.

b. **Adjust** the **Level of Detail** back to **10**.

Step 4: From the **Point Cloud** contextual ribbon > Visualization panel > **Click Stylization** drop-down.

a. From the **Stylization** drop-down list > **Select Object** color.



   - **Observe** the **change** to the point cloud as <u>each</u> **Stylization** is applied to the point cloud.

b. **Set** the point cloud **Stylization** back to **Scan Colors**.

Step 5: From the **Point Cloud** contextual ribbon > Visualization panel > **Transparency**:

a. **Adjust** the slider from the default value to **25** (values can also be entered in the field).

   - **Observe** the **change** to the point cloud as the **Transparency** value is increased / decreased.

b. **Set** the point cloud **Transparency** back to **0**.

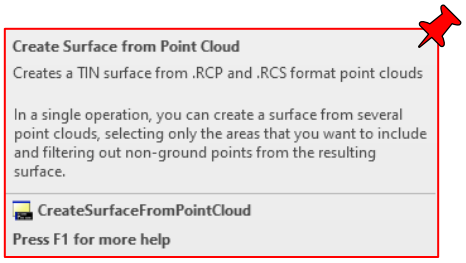
	The **Point Cloud Transparency** control is useful when viewing drawing objects, such as polylines or alignments, etc. Decreasing the transparency value will allow you to see the drafted elements more easily through the point cloud.

Surface Creation from Point Cloud

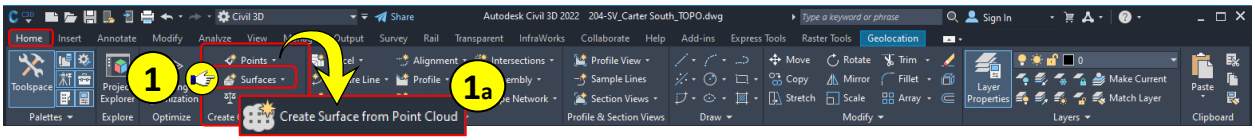
After attaching a point cloud to a drawing, C3D has specific tools for creating a surface using the point cloud data. There are many ways to manage point cloud data to help with overall drawing performance. Before creating the surface, it will be important to know what the end use for the surface will be.

A few examples:

- Used for design purposes.
- Used for displaying site contours.
- Does the entire project site require a high level of detail?
- Can some areas of the point cloud density be decreased?

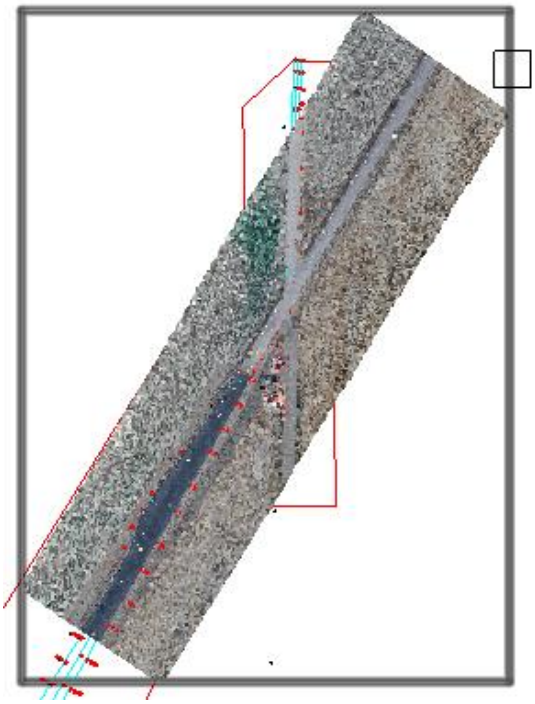


These are just a few examples that will help to determine how the surface is created and how the overall drawing size and performance could potentially be impacted. Positively or negatively.



Step 1: **Navigate** to the **Home** tab > Create Ground Data panel > **Click** **Surfaces** drop-down.

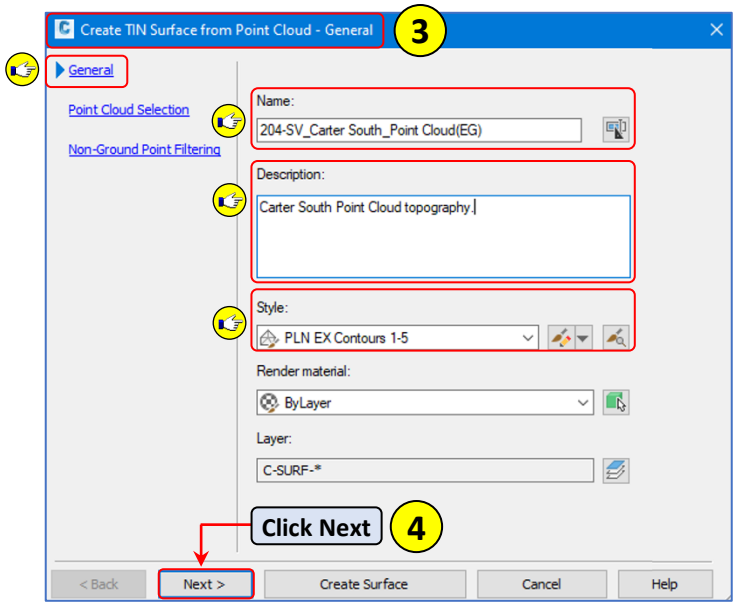
a. From the **Surfaces** drop-down list > **Select** **Create Surface from Point Cloud**.



Step 2: When prompted, from **Model** space > **Select** the **point cloud**.

```
CREATESURFACEFROMPOINTCLOUD Select a point cloud or [Window polyGon polyLIne]:
```

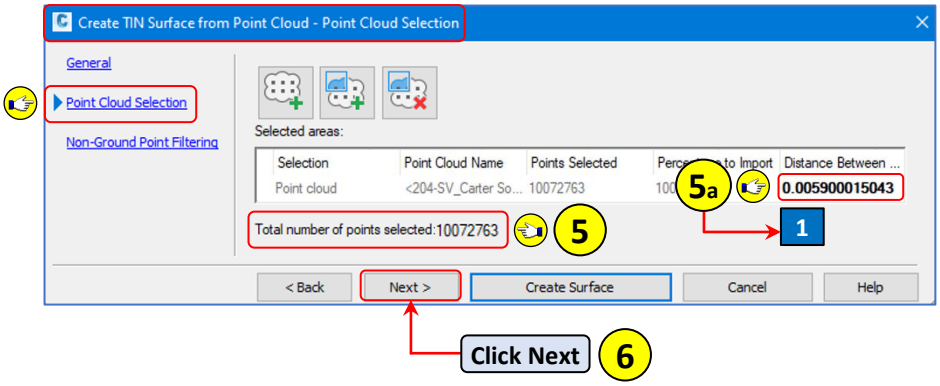
	A bounding box will appear when hovering over the extents of the point cloud.



Step 3: From the **Create TIN Surface from Point Cloud** dialog box > **General** page > **Set** the following properties:

- **Name** = **204-SV_Carter South_Point Cloud(EG)**
- **Description** = **Surface from Point Cloud**
- **Style** = **PLN EX Contours 1-5**

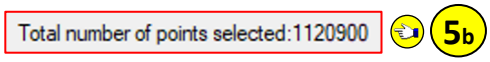
Step 4: **Click Next**.



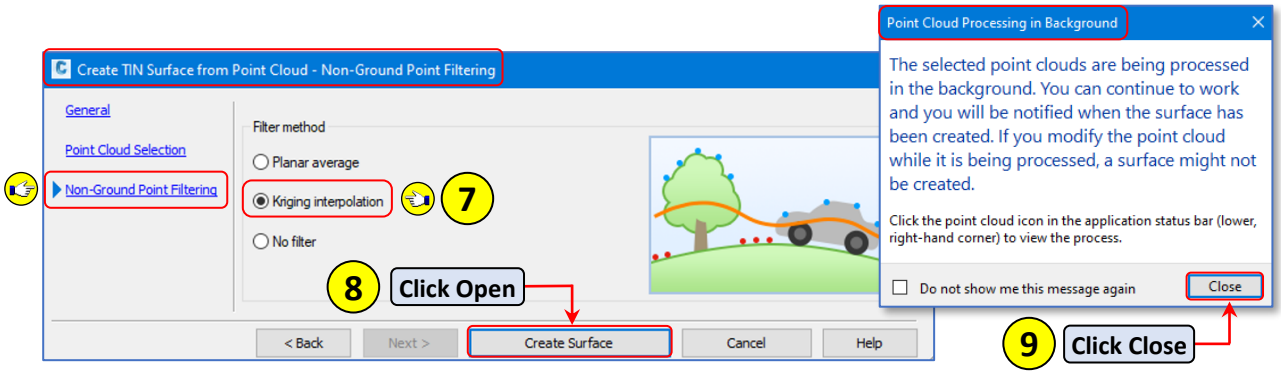
Step 5: From the **Point Cloud Selection** page: **See** Total number of points selected: **10,072,763**

a. From the Selected areas window > **Adjust Distance Between Points** = **1**

b. Adjusting the Distance Between Points has brought the total number of points down to: **1,120,900**



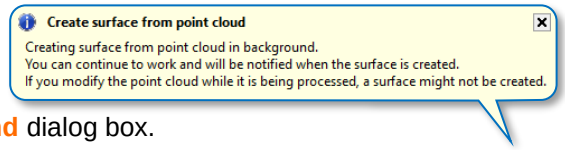
Step 6: **Click Next**.



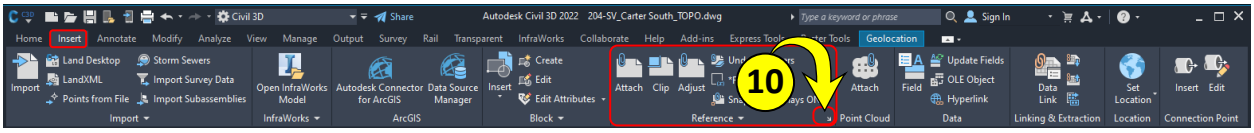
Step 7: From the **Non-Ground Point Filtering** page > **Select Kriging interpolation**.

- The Kriging Interpolation method should be used when non-ground points are present and need to be filtered out. This method takes longer to process than the Planar Average method, the results are more accurate though.

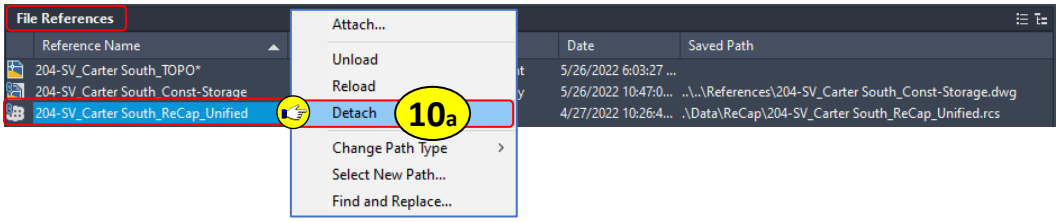
Step 8: **Click Create Surface**.



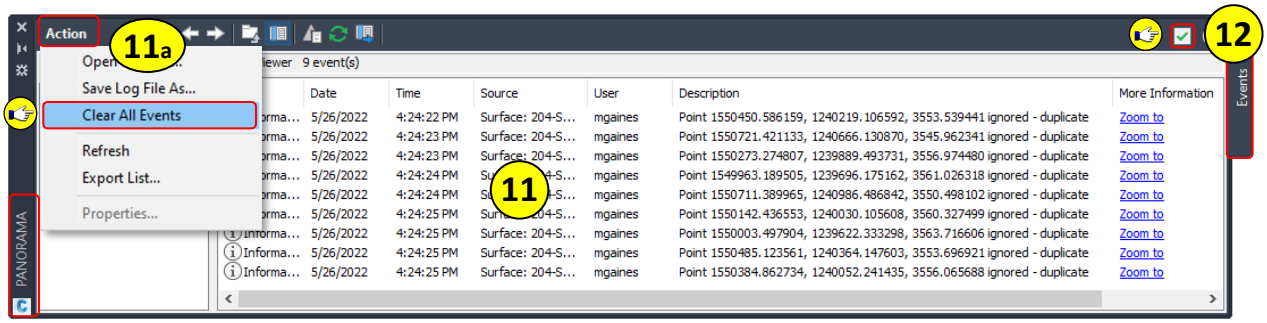
Step 9: **Close** the **Point Cloud Processing in Background** dialog box.



Step 10: **Navigate** to the **Insert** tab > Reference panel > **Select External References**.



a. From the **External References Manager** > **Right-click** on **204-SV_Carter South_ReCap_Unified** > **Select Detach**.

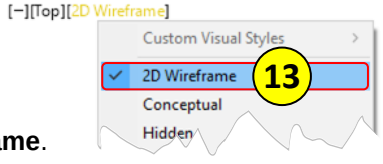


Step 11: From the **PANORAMA** – **Events** vista > **Review** the **Information** messages.

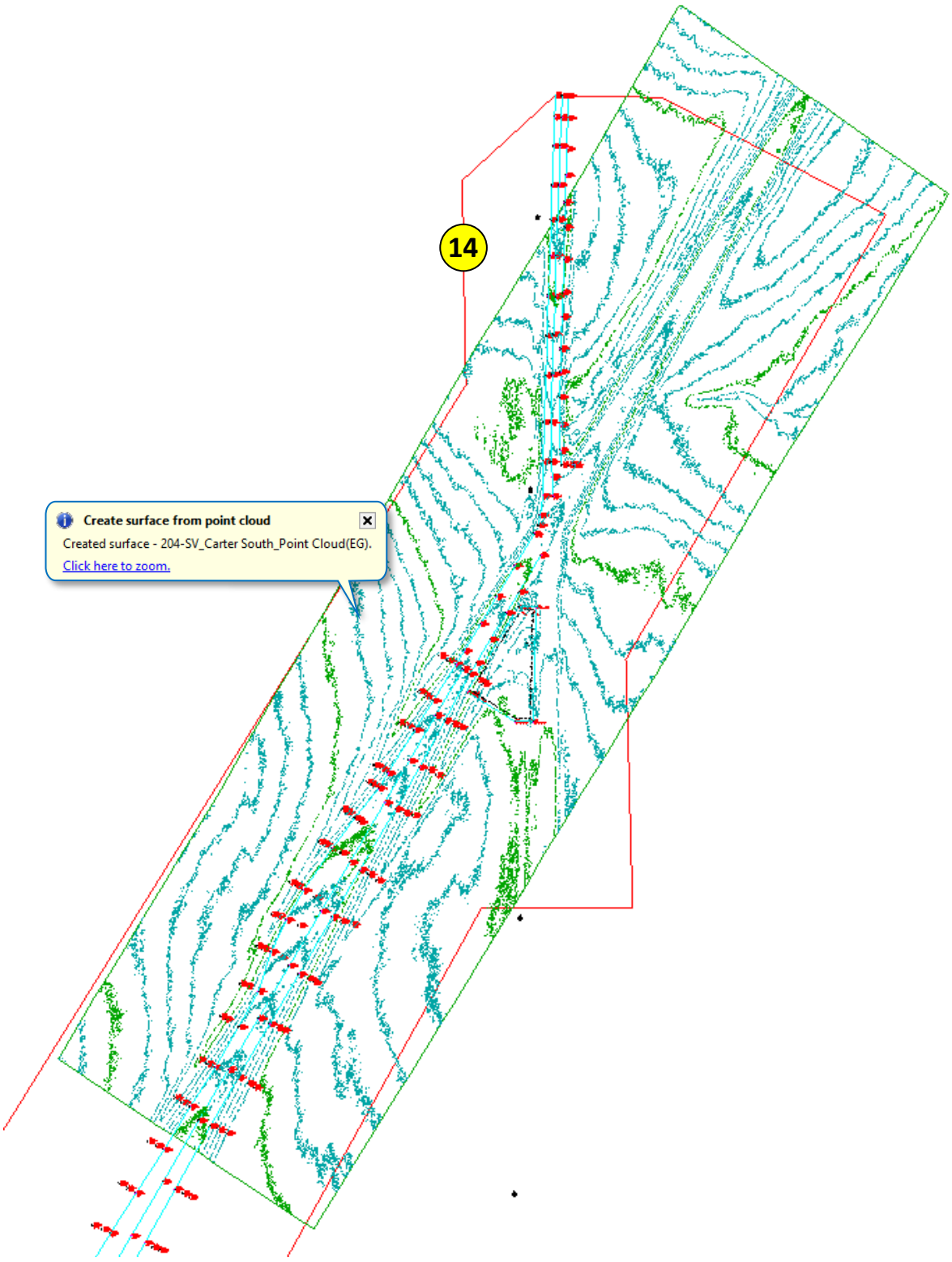
a. **Click Action** > **Select Clear All Events**.

Step 12: **Dismiss** the **PANORAMA** – **Events** vista ☑.

Step 13: From **Model** Space > **Set** the **Visual Style** back to **2D Wireframe**.



Step 14: From **Model** space > **Zoom** to the **surface** area (surface is visible per style selected).

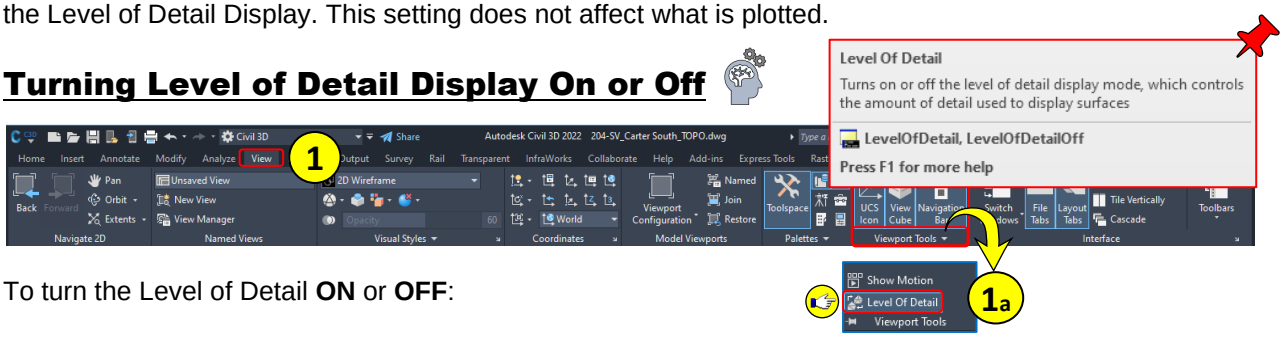


Step 15: **Save** the **drawing** .

Simplify Surface Display

When working with surfaces that contain large amounts of data, Civil 3D provides a display option, **Level of Detail Display**, that reduces the level of detail based on the current zoom level. This in turn improves the performance of Civil 3D. As the zoom level is increased (zoomed in), surface data increases. As the zoom level is decreased (zoomed out) surface data decreases. Surfaces are the only objects affected by the Level of Detail Display. This setting does not affect what is plotted.

Turning Level of Detail Display On or Off

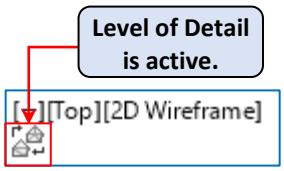


To turn the Level of Detail **ON** or **OFF**:

Step 1: **Navigate** to the **View** tab > **Viewport Tools** panel drop-down list.

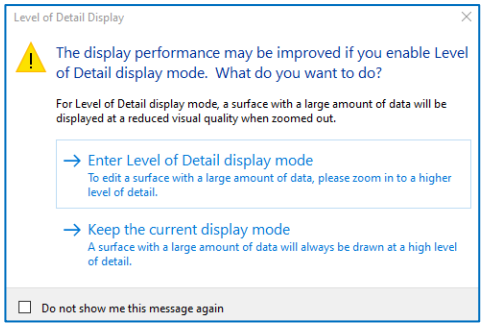
a. From the **Viewport Tools** drop down-list > **Select Level of Detail**.

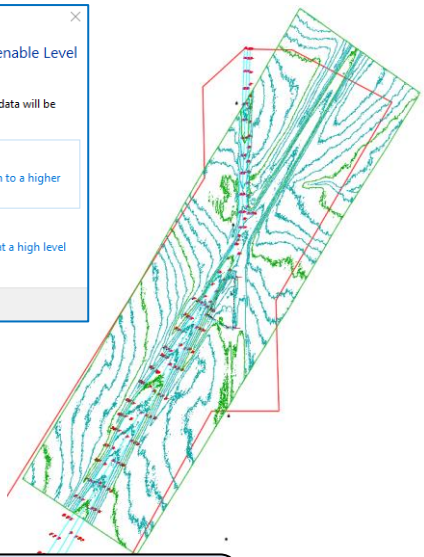
b. Alternatively, the commands **LevelOfDetail** / **LevelOfDetailOff** can be **entered** in the **command line**.



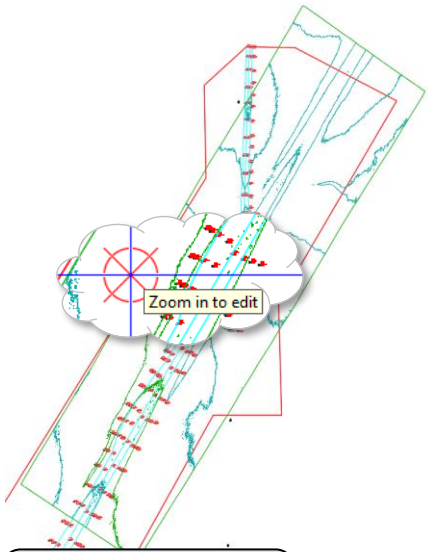
When **Level of Detail** is **active** > the **Level of Detail** icon will be **visible** in upper left corner of the viewport.

When working with surfaces that contain large amounts of data, the **Level of Detail Display** **pop-up** dialog may automatically be launched to **Enter Level of Detail display mode** or **Keep the current display mode**.





Normal Display Mode.

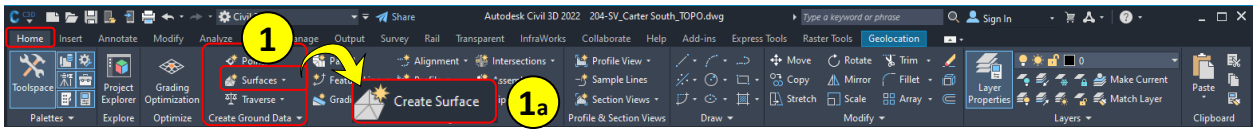


Level of Detail is active.

	Not all surface editing options are available when the **Level of Detail** view is **active**, and the drawing display is zoomed out. The cursor will have a **red** icon if an editing command is activated, and the drawing display is zoomed out to a lower level of detail. The drawing display will need to be zoomed in to the actual true level of detail for the area being edited.

Composite Surfaces

Quite often, a project may end up having two or more surfaces that need to be combined into one overall surface. The process for combining surfaces consists of pasting surfaces together to create a composite surface. There is no limit to how many surfaces can be pasted together.

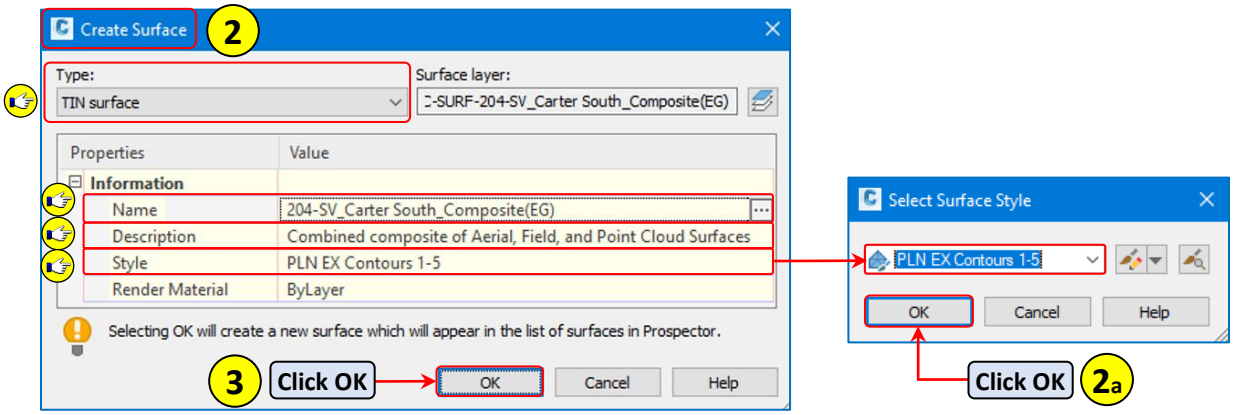


Composite Surface Creation

Step 1 : **Navigate** to the **Home** tab > Create Ground Data panel > **Click Surfaces** drop-down.

a. From the **Surfaces** drop-down list > **Select Create Surface**.

- Alternatively, you can use the Prospector > Surfaces > **right-click** > **Select Create Surface**…



Step 2: From the **Create Surface** dialog box, **set** the following **properties**:

- **Type** = **TIN surface**
- **Name** = **204-SV_Carter South_Composite(EG)**
- **Description** = **Combined composite of Aerial, Field, and Point Cloud Surfaces**
  (It's always best practice to describe the surface)
- **Style** = **PLN EX Contours 1-5**

Step 2a: **Click OK**.

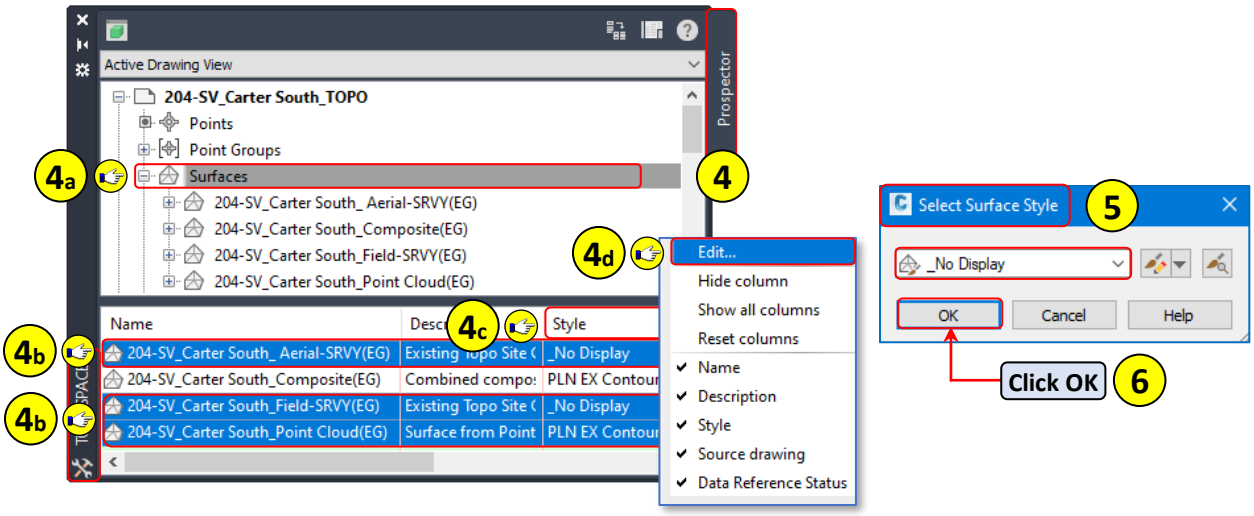
Step 3: **Click OK**.

Step 4: **Navigate** to TOOLSPACE > **Prospector** tab.

a. **Select** the **Surfaces** object collection.

b. From the TOOLSPACE preview list > **Select** the **204-SV_2-Carter South_Aerial-SRVY(EG)**, **204-SV_Carter South_Field-SRVY(EG)**, and **204-SV_2-Carter South_Point Cloud(EG** surfaces.

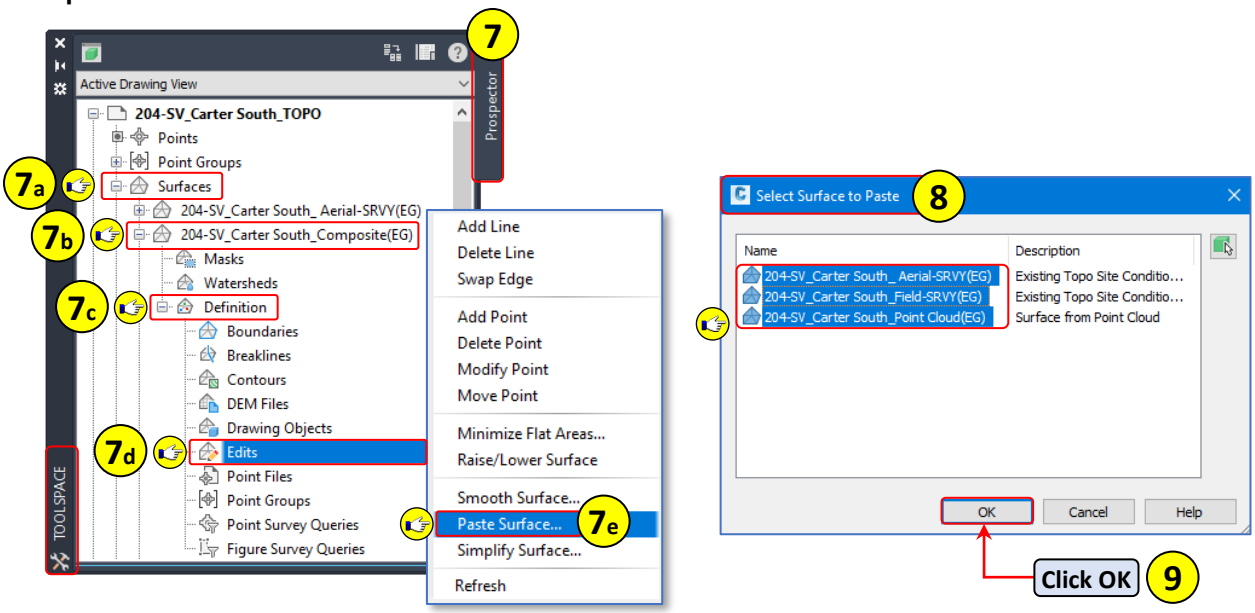
c. **Right-click** on the **Style** column.



d. **Select Edit**…

Step 5: From the **Select Surface Style** dialog box > **Select** _ **No Display**.

Step 6: **Click OK**.



Step 7: **Navigate** to TOOLSPACE > **Prospector** tab.

a. If not already, **Expand** the **Surfaces** collection.

b. **Expand 204-SV_Carter South_Composite(EG)**

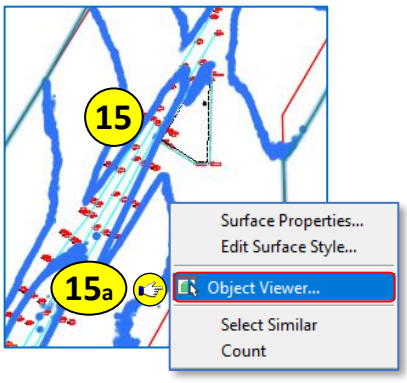
c. **Expand Definition**.

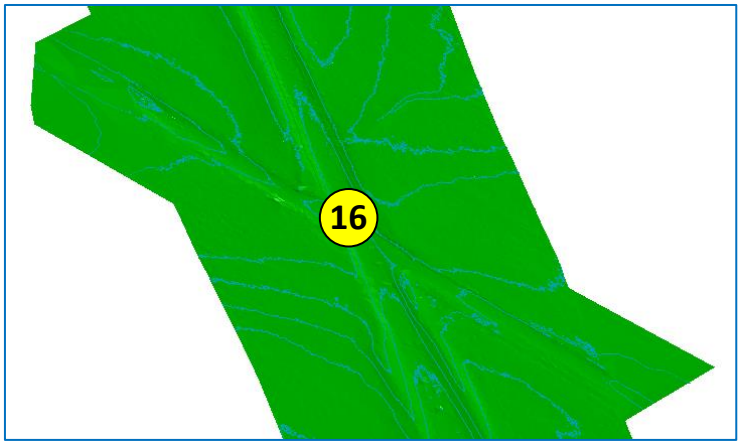
d. **Right-Click** on **Edits**

e. **Select Paste Surface**…

Step 8: From the **Select Surface to Paste** dialog box > **Select** the **204-SV_2-Carter South_Aerial-SRVY(EG)**, **204-SV_Carter South_Field-SRVY(EG)**, and **204-SV_2-Carter South_Point Cloud(EG** surfaces.

Step 9: **Click OK**.





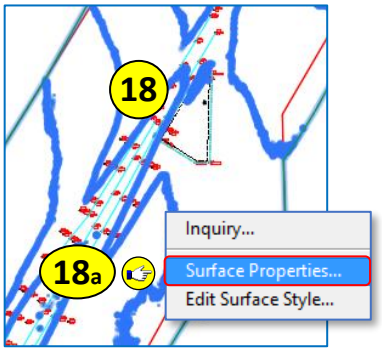
Step 15: From **Model** space > the **Composite** surface is visible > **Select** the **Composite(EG)** surface.

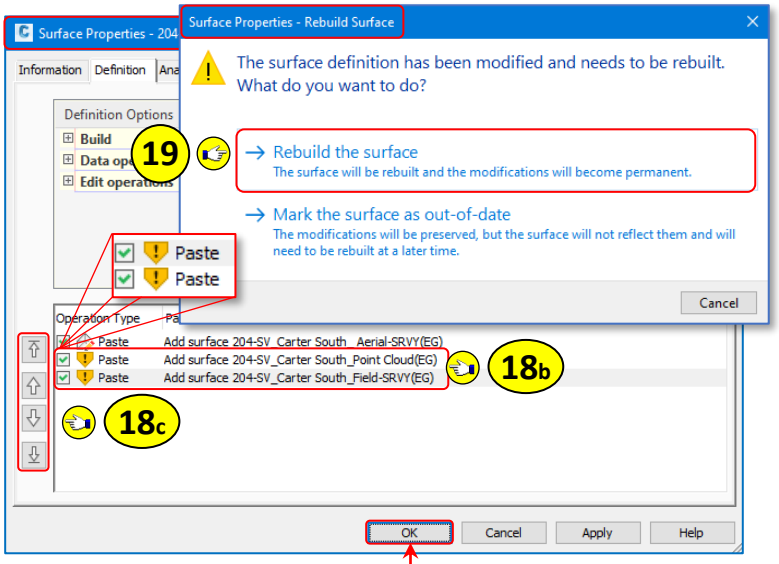
a. **Right-Click** > **Select Object Viewer**.

Step 16: **Review** the **surface** > **See** how the surfaces meshed together where overlapping data existed.

	The order in which the surfaces are selected and pasted will determine which surface data resides on the top.

Step 17: Close the **Object Viewer** by **Pressing Esc** or the .





Step 18: From **Model** space > **Select** the **Composite(EG)** surface.

a. **Right-Click** > **Select Surface Properties**.

b. From the **Definition** tab > **Review** the **Operation Type** and **order**. The last item in the list is the last operation applied to the surface. The **Field-SRVY** should be on top (bottom of list).

c. If needed, using the **Order Control** buttons > **Change** the order of the pasted surfaces.

Step 19: If prompted to rebuild > **Select Rebuild the Surface**.

Step 20: **Click OK**.

Step 21: **Save** the **drawing** .

	Any additional changes to the Aerial-SRVY(EG), Point Cloud(EG), or Field-SRVY(EG) surfaces **will be** reflected in the **Composite(EG)** surface.

Project Data Sharing

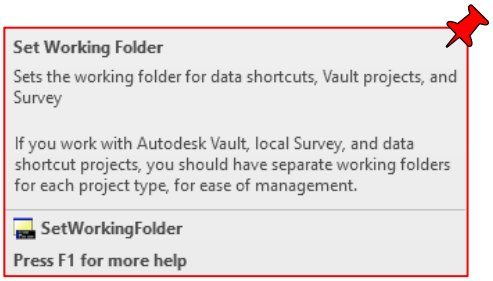
Data Shortcuts provide an efficient workflow for sharing project data between drawings files and work groups. Data Shortcuts are comprised of XML files that are used for storing and connecting the source data to consumer drawings. Data Shortcuts are located and managed from the Prospector tab of TOOLSPACE.

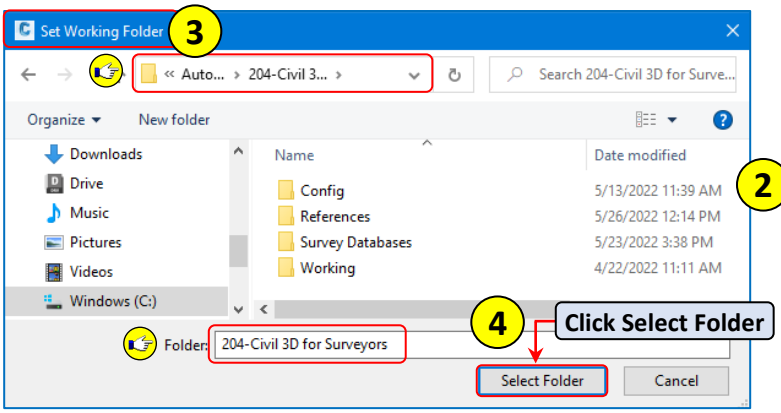
Data Shortcut Creation

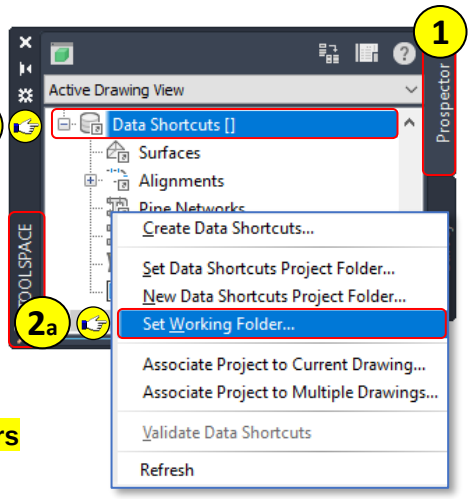
Step 1: **Navigate** to TOOLSPACE > **Prospector** tab.

Step 2: **Right-click** on **Data Shortcuts**.

a. **Select Set Working Folder**…





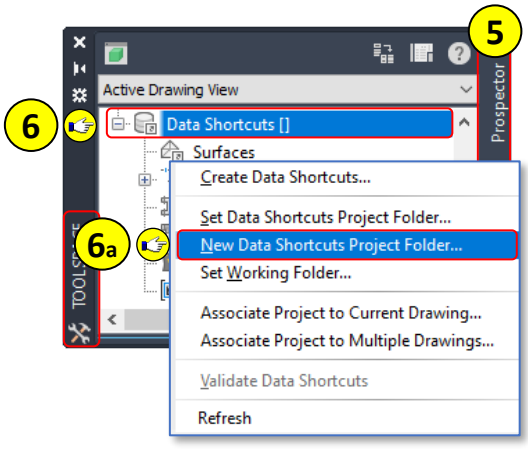


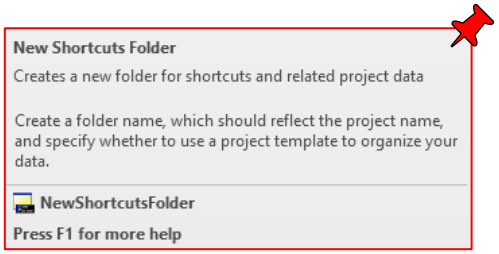
Step 3: From the **Set Working Folder** dialog box > **Navigate** to:

- C:\mdtapps\Autodesk_Training**204-Civil 3D for Surveyors**

Step 4: **Click Select Folder**.

	After setting the **Working Folder** there will **not** be a visual change in TOOLSPACE.

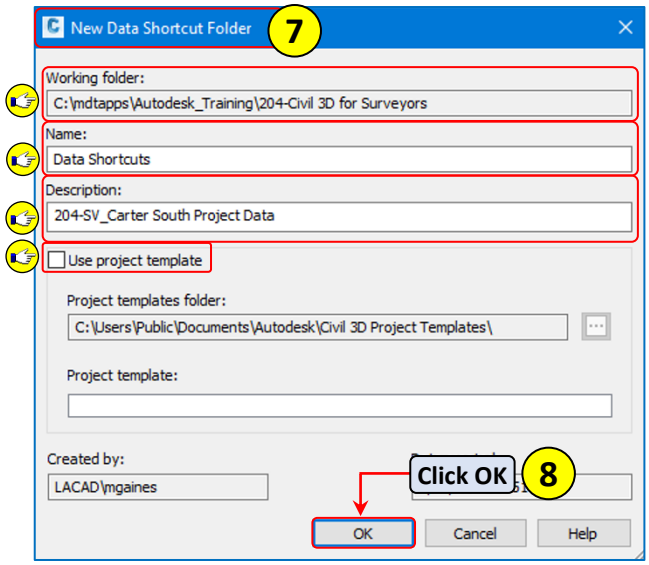




Step 5: **Navigate** to TOOLSPACE > **Prospector** tab.

Step 6: **Right-click** on **Data Shortcuts**.

a. **Select New Data Shortcuts Project Folder**…



Step 7: From the **New Data Shortcut** Folder dialog box > **Verify** and **Set** the following **parameters**:

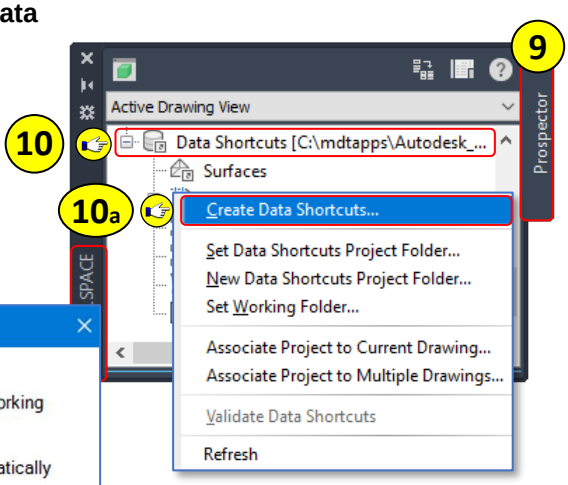
- **Working folder**: **C:\Civil 3D Projects_RCFC\204-Civil 3D for Surveyors** (previously set).
- **Name** = **Data Shortcuts**
- **Description** = **204-SV_Carter South Project Data**
- **Use project template** = **UNCHECKED**

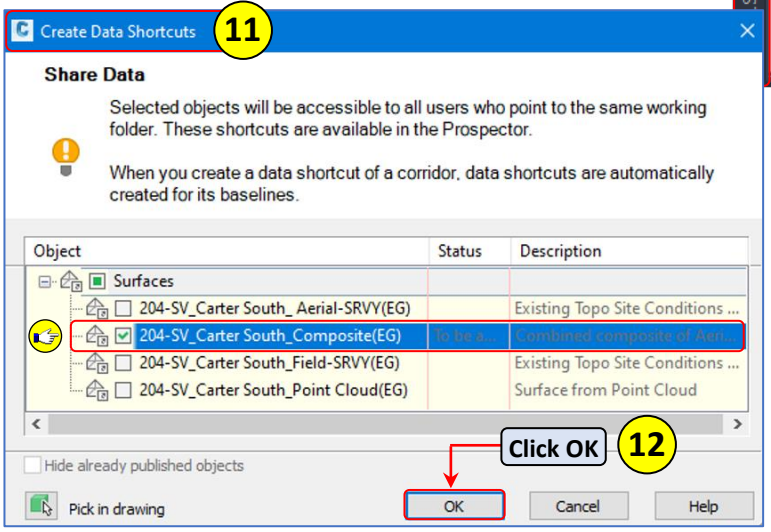
Step 8: **Click OK**.

Step 9: **Navigate** to TOOLSPACE > **Prospector** tab.

Step 10: **Right-click** on **Data Shortcuts**.

a. **Select Create Data Shortcuts**…





Step 11: From the **Create Data Shortcuts** dialog box > **Check** ☑ the **204-SV_Carter South_Composite(EG)** surface.

Step 12: **Click OK**.

Step 13: **Save** and **Close** the **204-SV_Carter South_TOPO-USER INITIALS.dwg** .

Traverse Editor

Most engineering projects include a mapping component of some sort, parcels, right-of-way, easements, etc. The Traverse Editor provides and easy to use interface for replicating existing map features or proposing new map features. The data can be saved and adjusted if needed. When completed, the data can be used for creating C3D parcel objects.

Traverse data can be created using:

- Existing COGO Points
- Manually entering data (EX: record maps / legal exhibits)
- Polylines

Parcel Creation using the Traverse Editor

The data from the Surveyor's Certificate shown below will be used to create the described parcel of land.

Parcel Carter South 02-3257-26-2-01-01-0000

CERTIFICATE OF SURVEY DESCRIPTION

I, Wile E. Coyote 'Genius' Registered Land Surveyor, do hereby certify that I have surveyed, divided, and mapped

---

Parcel numbered 02-3257-26-2-01-01-0000 and have found the monuments depicted on the plat are of the character shown, occupy the positions indicated and are of sufficient number and durability.

Commencing at a point of Northing 1237921.515 and Easting 1550466.487;
thence bearing N 1-5-33.522 E a distance of 2394.333 feet;
thence along a curve to the RIGHT, having a radius of 255.794 feet, a delta angle of 23° 22' 29.79", and whose long chord bears N 12-59-9.702 E a distance of 103.634 feet;
thence bearing N 30-45-8.529 E a distance of 2533.846 feet;
thence bearing S 67-49-36.818 E a distance of 83.082 feet;
thence bearing S 1-14-36.060 W a distance of 4691.501 feet;
thence bearing N 87-53-29.87 W a distance of 1340.619 feet to the point of beginning.

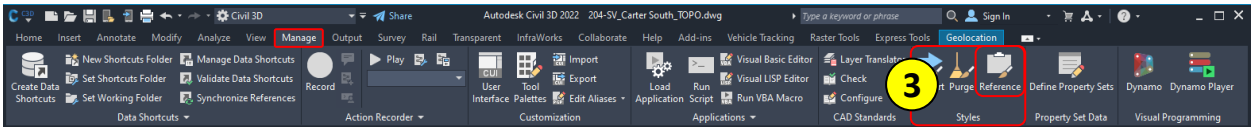
Said described parcel contains 4912625.522 square feet (112.778 acres), more or less, subject to any and all easements, reservations, restrictions and conveyances of record.

Step 1: From the **Start** tab > **Create** a new drawing using the **Standard**: **survey-start.dwt**

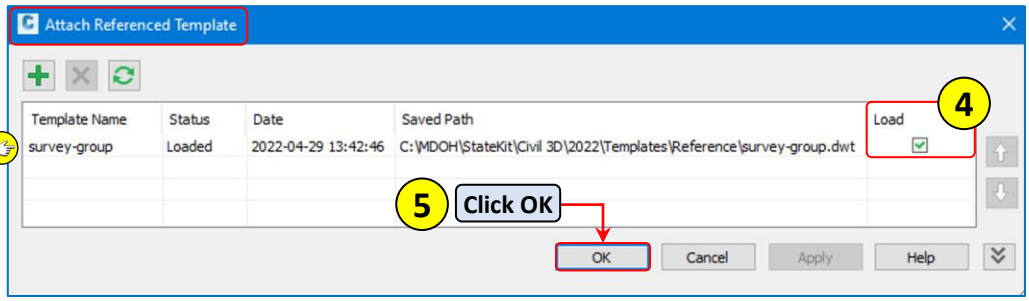
- C:\MDOH\StateKit\Civil 3D\2022\Templates**_Start-Dwg**

Step 2: **Save** and **Name** the drawing: **204-SV_Carter South_PARCEL-USER INITIALS.dwg**

- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working**Survey**

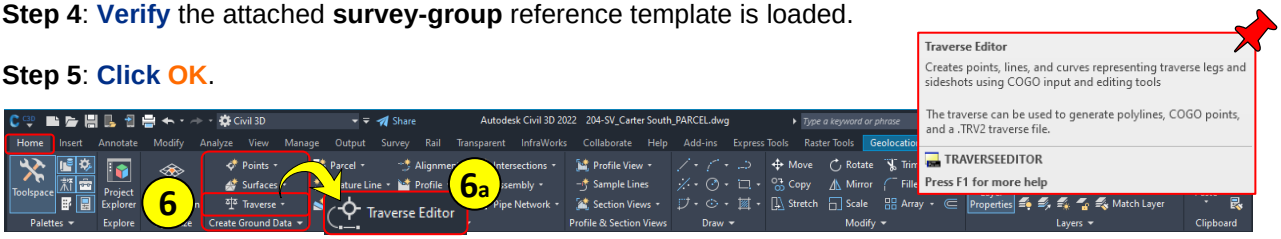


Step 3: **Navigate** to the **Manage** tab > Styles panel > **Select Reference**.



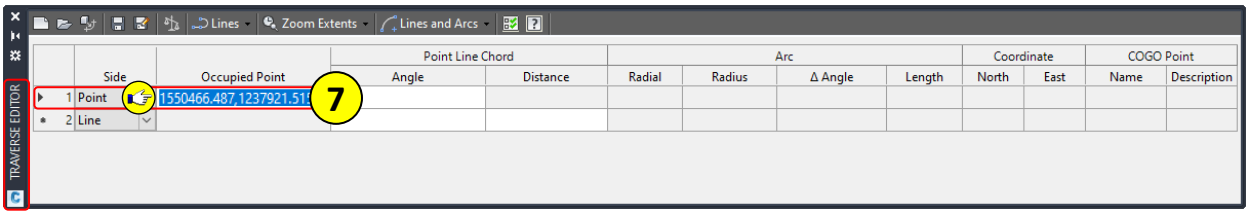
Step 4: **Verify** the attached **survey-group** reference template is loaded.

Step 5: **Click OK**.



Step 6 : **Navigate** to the **Home** tab > Create Ground Data panel > **Click Traverse** drop-down.

a. From the **Traverse** drop-down list > **Select Traverse Editor**.



Step 7: From the **Traverse Editor** palette > **Enter 1550466.487,1237921.515** for the first point.

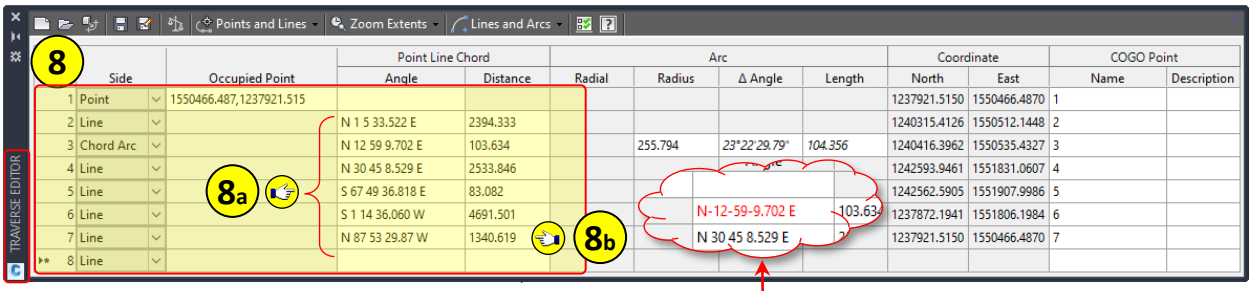
Step 8: From the **Traverse Editor** palette > **Side** column > **Select** the type of **traverse** from the drop-down list for each traverse segment.

a. **Input** the **segment data** listed below in the **Traverse Editor**:

Side		Occupied Point	Point Line Chord		Arc			
			Angle	Distance	Radial	Radius	Angle	Length
1	Point	**1550466.487,1237921.515**						
2	Line		**N 1 5 33.522 E**	**2394.333**				
3	Chord Arc		**N 12 59 9.702 E**	**103.634**		**255.794**	**23°22'29.79"**	**104.356**
4	Line		**N 30 45 8.529 E**	**2533.846**				
5	Line		**S 67 49 36.818 E**	**83.082**				
6	Line		**S 1 14 36.060 W**	**4691.501**				
7	Line		**N 87 53 29.87 W**	**1340.619**				

- The <**Tab**> and <**Arrow**> keys can be used for navigating between cells.

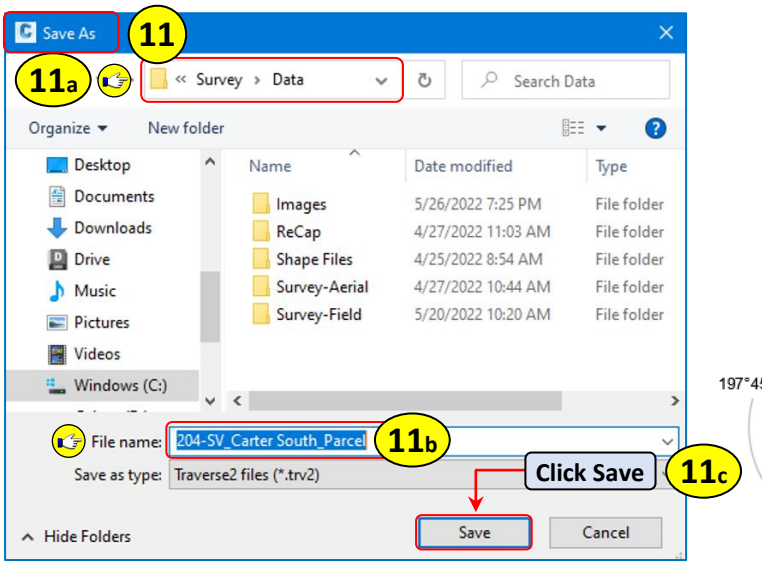
CAUTION	When entering the segment data, take special care to enter the numbers, spaces and letters **exactly** as shown. If data entered shows as RED, there is an issue with the format (N-00.00E).

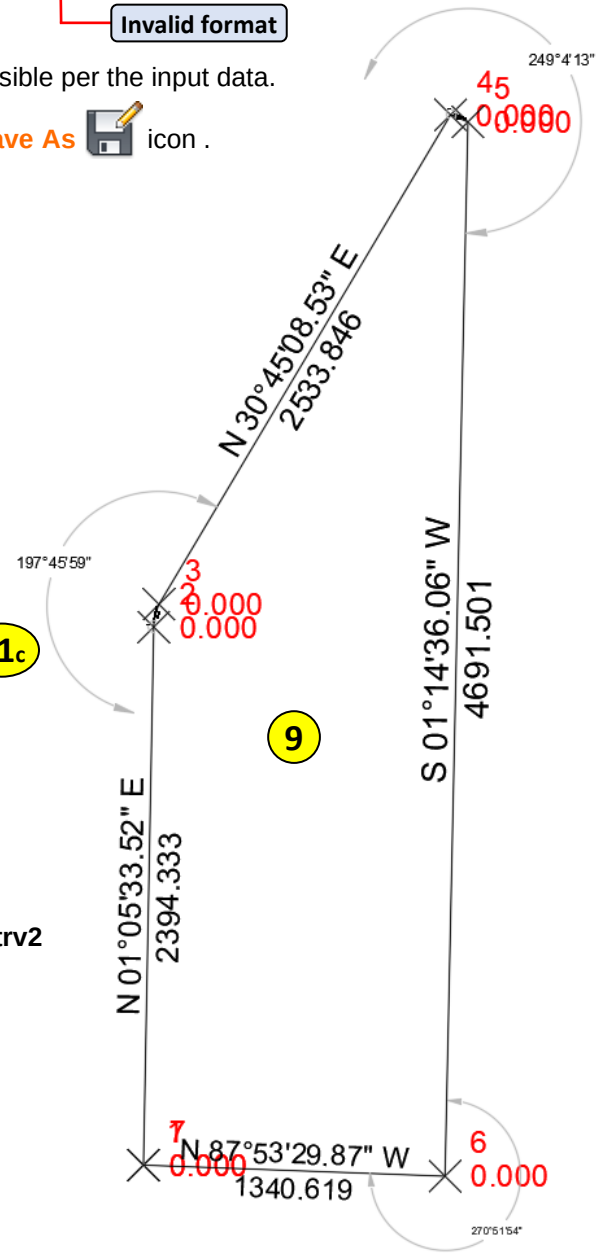


b. **Press Enter** when done entering data in line 7.

Step 9: From **Model** space, the **Traverse Segments** are visible per the input data.

Step 10: From the **Traverser Editor** palette > **Click** the **Save As** icon .





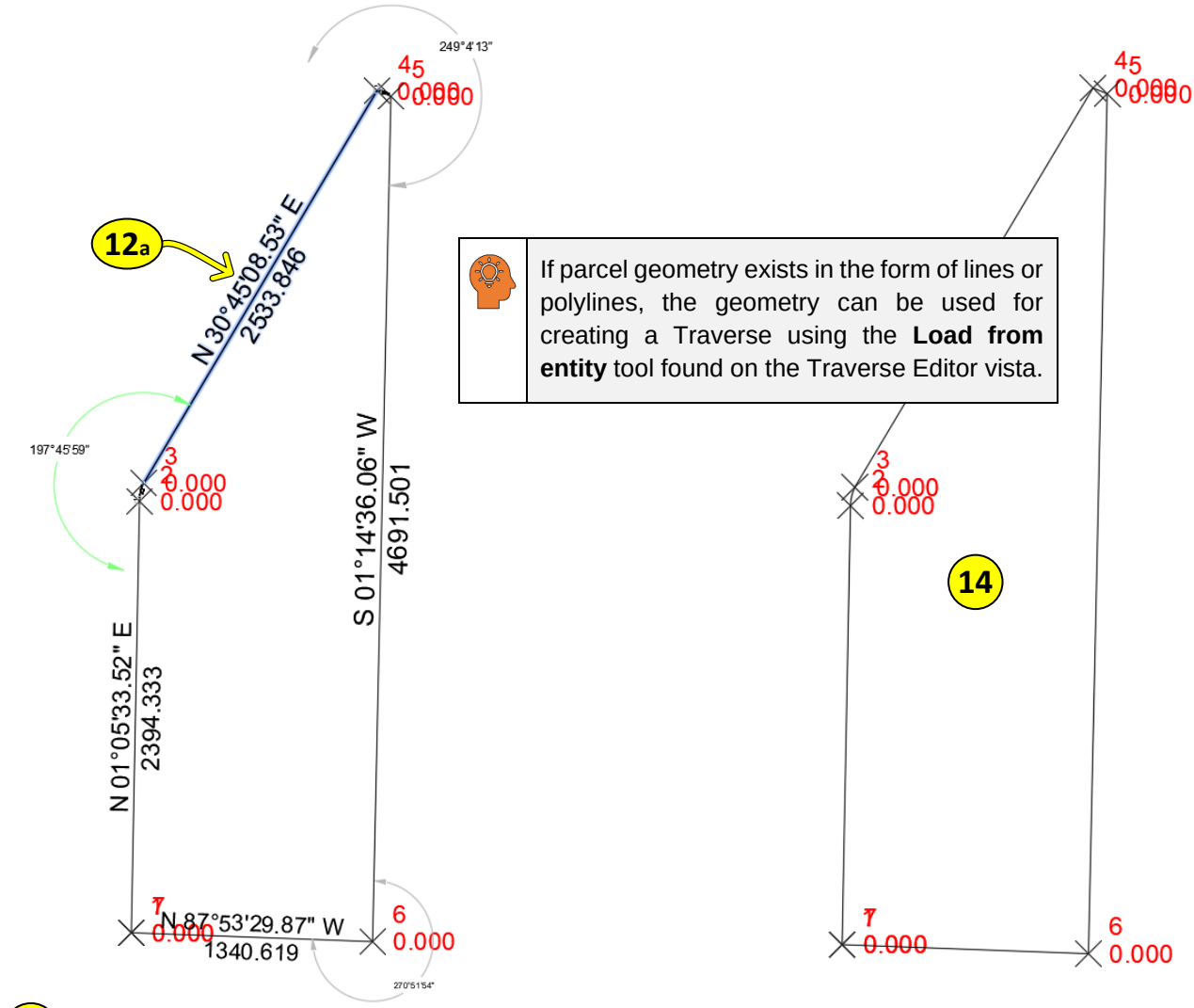
Step 11: From the **Save As** dialog box:

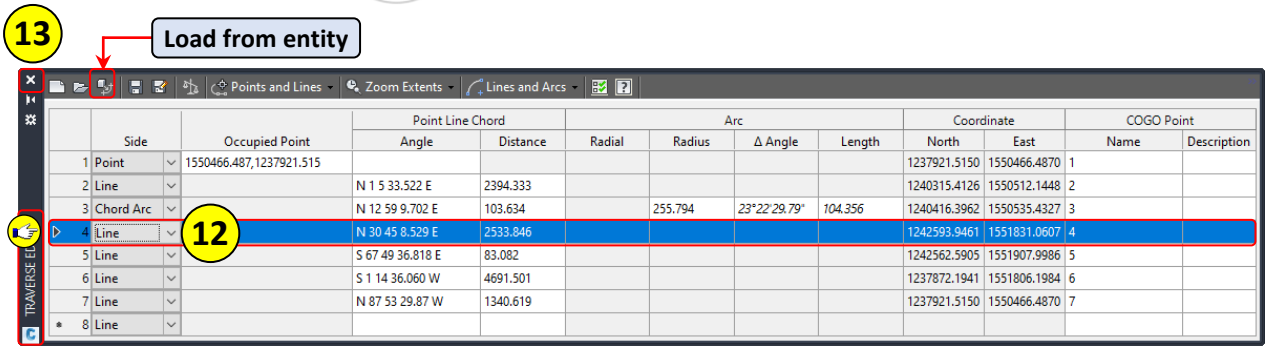
a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey**Data**

b. **Enter File name** = **204-SV_Carter South_Parcel.trv2**

c. **Click Save**.

	Not only does the Traverse Editor provide linework that can be used for dynamic parcel creation, cogo points have been created at each vertex. The points can then be exported to a field ASCII file if needed.





	Side	Occupied Point	Point Line Chord Angle	Point Line Chord Distance	Arc Radial	Arc Radius	Arc Δ Angle	Arc Length	Coordinate North	Coordinate East	COGO Point Name	COGO Point Description
1	Point	1550466.487,1237921.515							1237921.5150	1550466.4870	1	
2	Line		N 1 5 33.522 E	2394.333					1240315.4126	1550512.1448	2	
3	Chord Arc		N 12 59 9.702 E	103.634		255.794	23°22'29.79"	104.356	1240416.3962	1550535.4327	3	
4	Line		N 30 45 8.529 E	2533.846					1242593.9461	1551831.0607	4	
5	Line		S 67 49 36.818 E	83.082					1242562.5905	1551907.9986	5	
6	Line		S 1 14 36.060 W	4691.501					1237872.1941	1551806.1984	6	
7	Line		N 87 53 29.87 W	1340.619					1237921.5150	1550466.4870	7	
8	Line											

Step 12: From the **Traverse Editor** palette > **Select Line 4**.

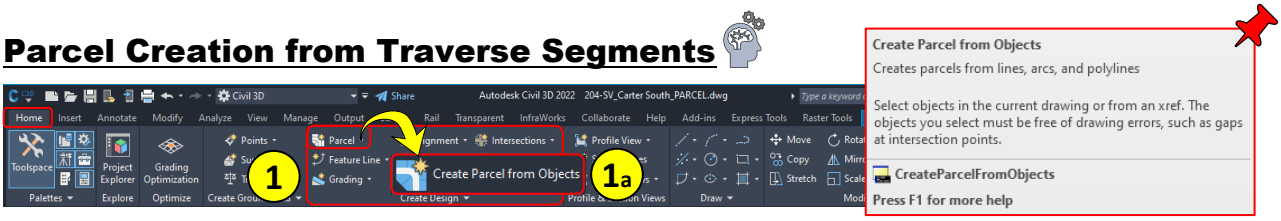
a. **See** the **segment** highlighted in Model space.

The segment annotation created by the Traverse Editor **cannot** be deleted or edited using traditional editing methods. The annotation is automatically removed from Model space when Traverse Editor is closed.

Step 13: **Close** the **Traverse Editor** palette by clicking on the .

Step 14: From **Model** space > **See** the **Polyline** and **points** created using the **Traverse Editor**.

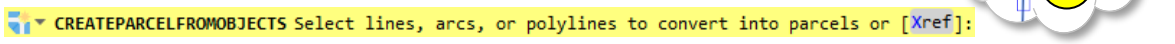
Parcel Creation from Traverse Segments

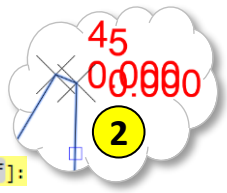


Step 1 : **Navigate** to the **Home** tab > Create Design panel > **Click Parcel** drop-down.

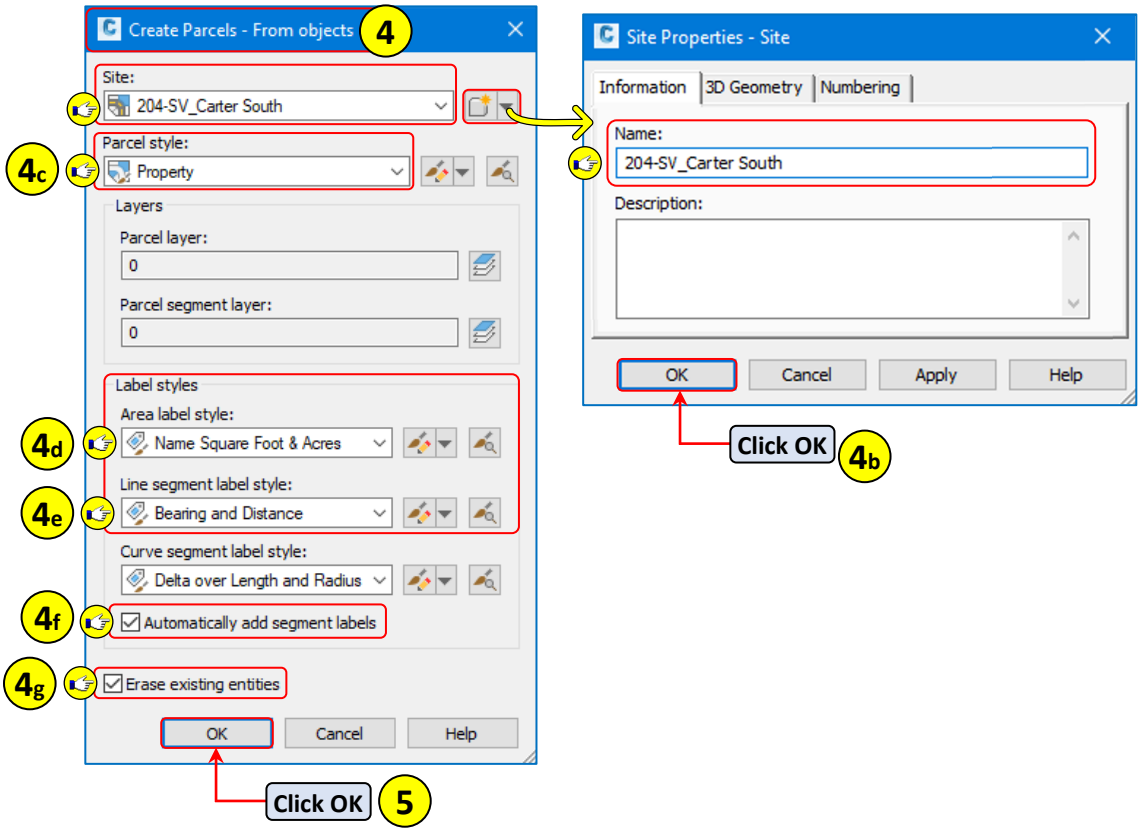
a. From the **Parcel** drop-down list > **Select Create Parcel from Objects**.

Step 2: From **Model** space when prompted > **Select** the **Traverse Polyline** object.





Step 3: **Press Enter**.



Step 4: From the **Create Parcels – From objects** dialog box > **verify** and **set** the following parameters:

a. **Site** > **Create** a **new** site = **204-SV_Carter South**

b. **Click OK.**

c. **Parcel Style** = **Property**

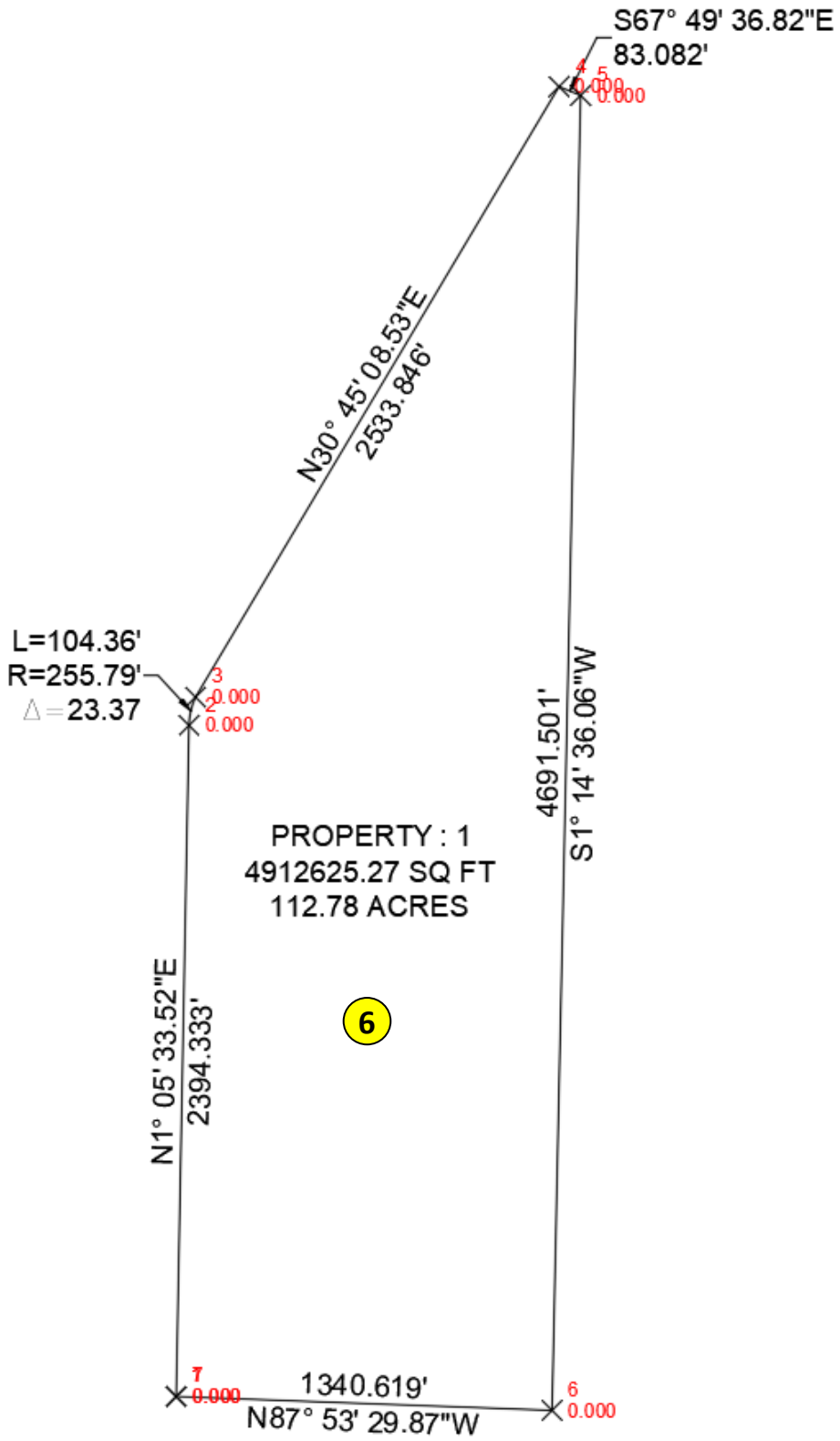
d. **Area label style** = **Name Square Foot & Acres**

e. **Line segment label style** = **Bearing and Distance**

f. **Automatically add segment labels** = **Yes**

g. **Erase existing entities** = **Yes** (if original geometry is to be retained, leave blank)

Step 5: **Click OK**.



Step 6: From **Model** space > **See Parcel** and **automatic segment labels**.

Step 7: **Save** the **drawing** .

Reports Manager

Civil 3D has many out of the box reports that are useful for documenting survey related tasks. Such as Parcel, Point, and Surface reports. The Reports Manager located on the Toolbox tab of TOOLSPACE palette is used for storing and organizing the many report styles. The Toolbox tab must be active to access the reports.

To activate the **Toolbox** tab > **Navigate** to the **Home** tab > Palettes panel > **Click** the **Toolbox** icon.

Toolbox Controls:

Edit the Report Settings – Edit settings for all report types.

Edit Toolbox Content – Edit or add custom reports and other custom tools.

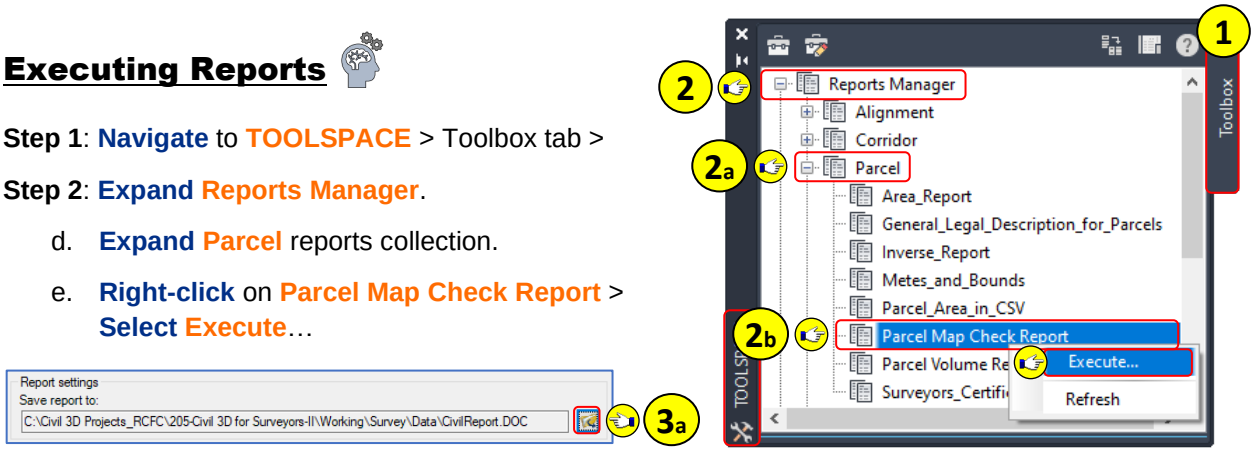
Executing Reports

Step 1: **Navigate** to **TOOLSPACE** > Toolbox tab >

Step 2: **Expand** **Reports Manager**.

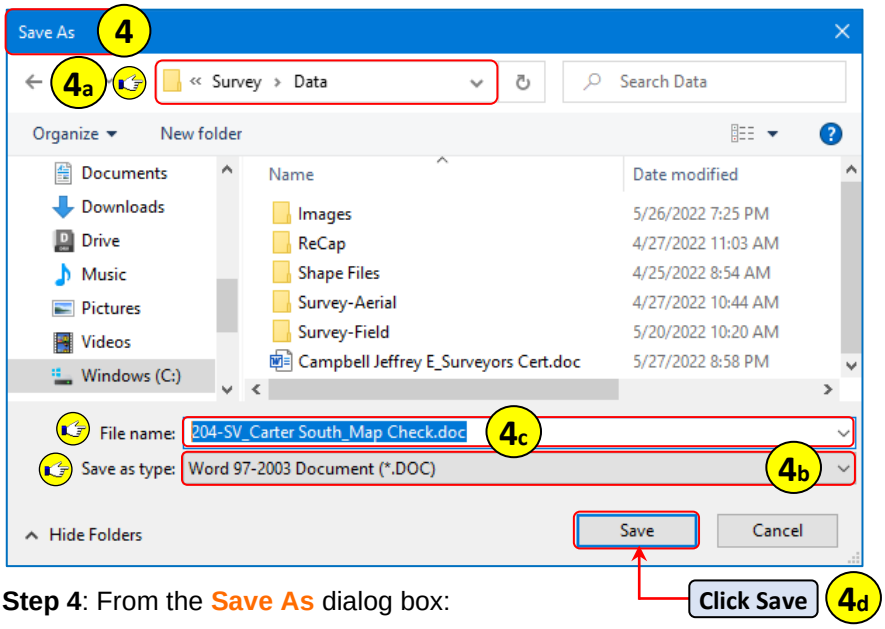
d. **Expand** **Parcel** reports collection.

e. **Right-click** on **Parcel Map Check Report** > **Select** **Execute**…



Step 3: From the **Create Reports – Parcel Mapcheck Report** dialog box:

a. **Click** **Save report** icon



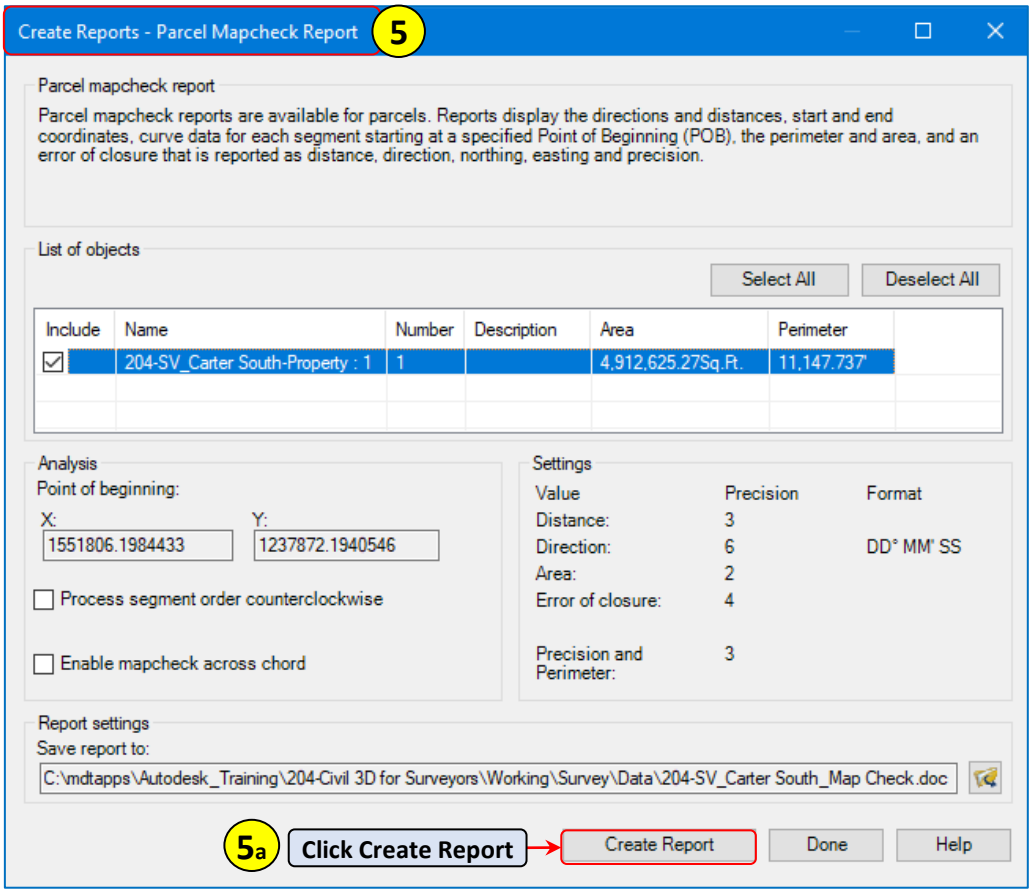
Step 4: From the **Save As** dialog box:

a. Navigate to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey**Data**

b. **Set Save as type** = **(*.DOC)**

c. **Enter File name** = **204-SV_Carter South_Map Check**.doc

d. **Click Save**.



Parcel Point of Beginning:

The **X** and **Y** coordinates for the true parcel POB can be adjusted through parcel properties.

See Appendix A: Setting Parcel POB

Step 5: From the **Create Reports – Parcel Mapcheck Report** dialog box:

a. **Click Create Report**.

Step 6: The **Parcel Mapcheck** will automatically open in **Word**.

a. **Review** the report and **close** the document.

Parcel Map Check Report

Client:
Bob Builder
Can we Build It, Yes we Can!
7532 Shady Ln
Date: 5/27/2022 9:40:09 PM

6a

Prepared by:
Wile E. Coyote 'Genius'
ACME Land Surveyors
123 Red Rock Ridge Ln

Parcel Name: 204-SV_Carter South - Property : 1
Description:
Process segment order counterclockwise: False
Enable mapcheck across chord: False
North:1,237,872.1941' East:1,551,806.1984'

Segment# 1: Line
Course: N87° 53' 29.87"W Length: 1,340.619'
North: 1,237,921.5150' East: 1,550,466.4870'

Segment# 2: Line
Course: N1° 05' 33.52"E Length: 2,394.333'
North: 1,240,315.4126' East: 1,550,512.1447'

Segment# 3: Curve
Length: 104.356' Radius: 255.794'
Delta: 23.3749 (d) Tangent: 52.914'
Chord: 103.634' Course: N12° 59' 09.70"E
Course In: S88° 42' 05.19"E Course Out: N65° 19' 35.40"W
RP North: 1,240,309.6158' East: 1,550,767.8731'
End North: 1,240,416.3962' East: 1,550,535.4327'

Segment# 4: Line
Course: N30° 45' 08.53"E Length: 2,533.846'
North: 1,242,593.9461' East: 1,551,831.0607'

Segment# 5: Line
Course: S67° 49' 36.82"E Length: 83.082'
North: 1,242,562.5904' East: 1,551,907.9986'

Segment# 6: Line
Course: S1° 14' 36.06"W Length: 4,691.501'
North: 1,237,872.1941' East: 1,551,806.1984'

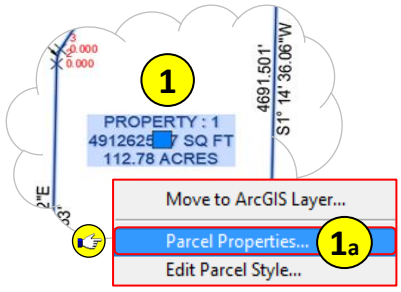
Perimeter: 11,147.737' Area: 4,912,625.27Sq.Ft.
Error Closure: 0.0000 Course: S70° 41' 58.36"W
Error North : 0.00000 East: -0.00001

Precision 1: 11,147,737,000.000

Step 7: **Save** and **close** the **204-SV_Carter South_PARCEL_USER INITIALS**.dwg .

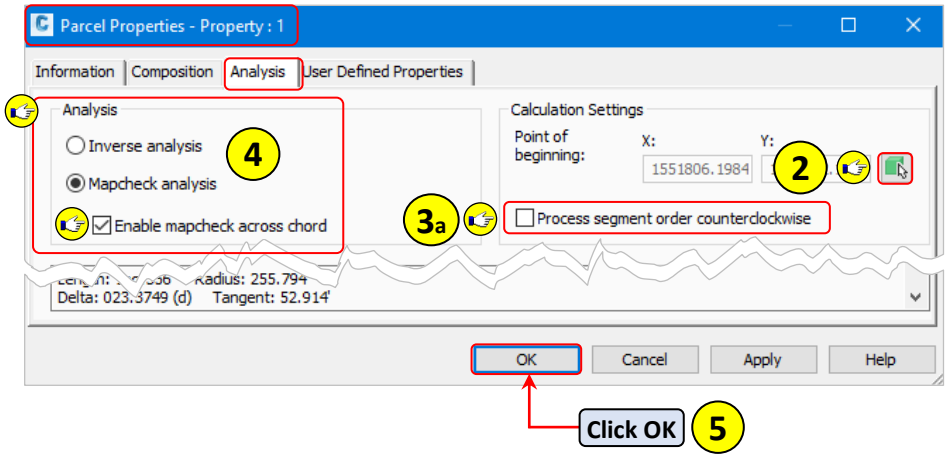
Appendix A

Setting Parcel Point of Beginning



Step 1: From **Model** Space > **Select** the **Parcel Area** label.

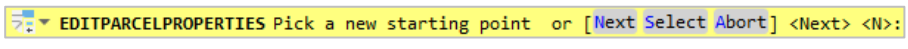
a. **Right-Click** > **Select Parcel Properties**.



Step 2: From the **Parcel Properties** dialog box > Analysis tab > **Click** the **Pick Point** icon .

Step 3: From **Model** space when prompted > **Select** the location **point** for the parcel **POB**.

- **Alternatively**, from the **Command line** prompt > **Select** one of the **3** options:



  - **Next** = Pressing Enter will cycle through the end point vertices of the parcel.
  - **Select** = Clicking select, will select the current location highlighted on the parcel.
  - **Abort** = Cancels the POB command.

a. If needed > **Adjust** the **segment order** from clockwise to counterclockwise.

Step 4: If needed > **Set** the **Analysis** type and **mapcheck** across chord.

Step 5: **Click OK**.

Migrating Legacy Project Data

To work with Bentley legacy drawing files in Civil 3D, there are three options available. The three options outlined in this section work with specific file formats. Each option will produce specific results based on the type of data and file format being migrated.

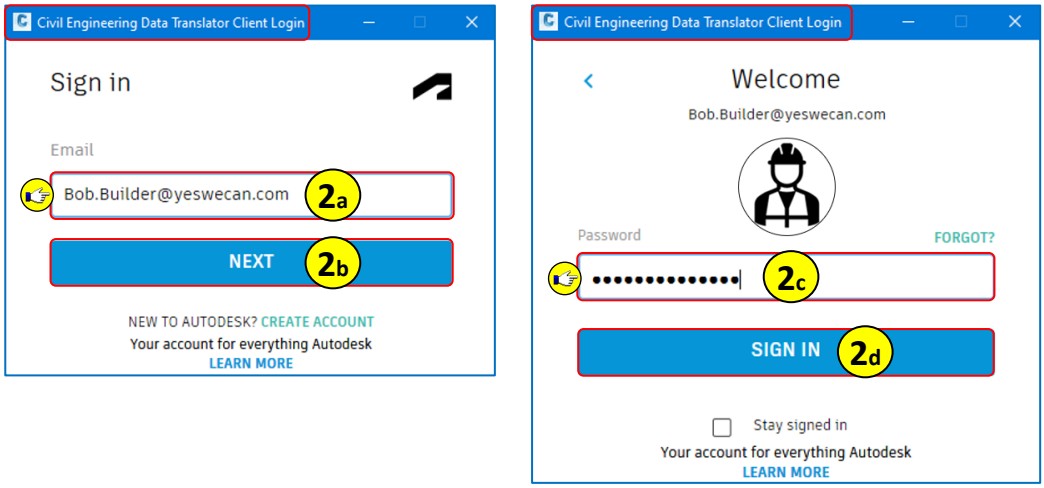
Civil Engineering Data Translator Client

The Civil Engineering Data Translator Client provides an easy-to-use interface to migrate data between Civil 3D and Bentley InRoads and Bentley GEOPAK. The Translator is a cloud-based service that requires a separate installation and requires an active Autodesk Account for access.

The translator client should be used when access to Bentley is not available and dynamic geometry, including alignments and profiles, and surface models needs to be migrated to Civil 3D.

	Before using the Civil Engineering Translator Client, it must first be downloaded and installed. The client is installed separately from Civil 3D. After installation, the client can be launched using either the desktop icon or navigating to the Windows Start menu > Autodesk folder.

Step 1: **Launch** the **Civil Engineering Data Translator Client** using the **desktop icon** or **Start** menu.



Step 2: From the **Civil Engineering Data Translator Client Login** pop-up window:

a. **Enter account email address**.

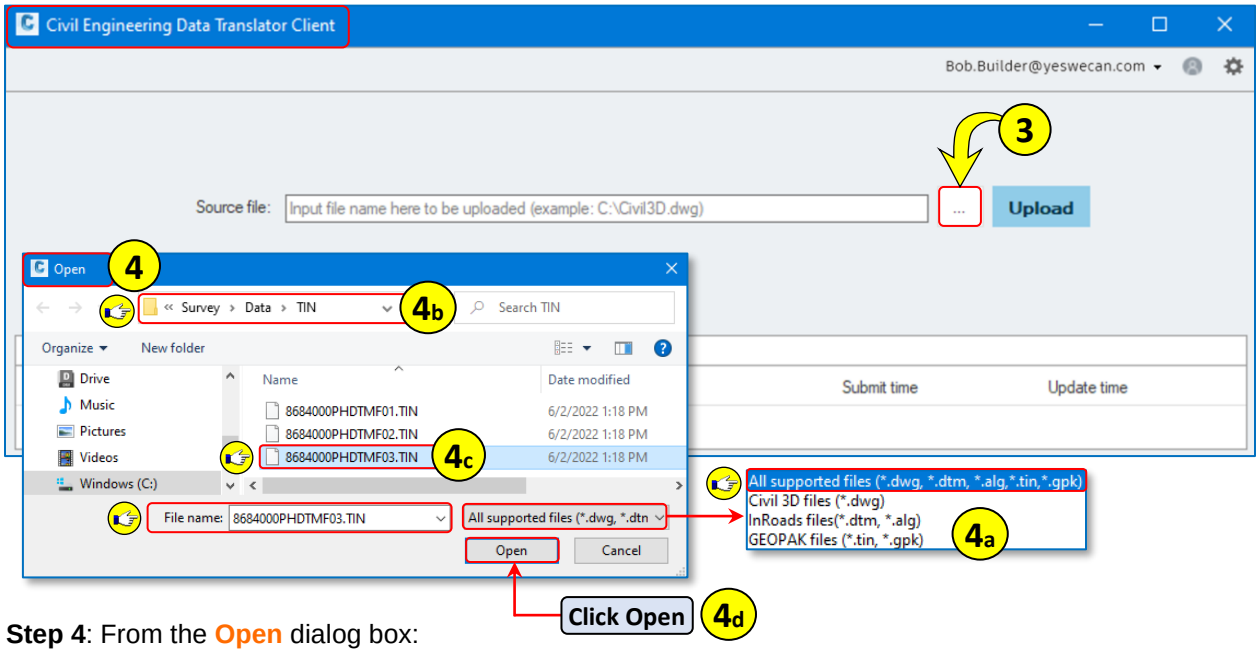
b. **Click Next**.

c. **Enter account password**.

d. **Click SIGN IN**.

- If prompted for **Two Step Verification:**
  Select a **method** > **Click Send Code** > **Click Enter Code**.

Step 3: From the **Civil Engineering Data Translator Client** > **Click** the **ellipsis** button.



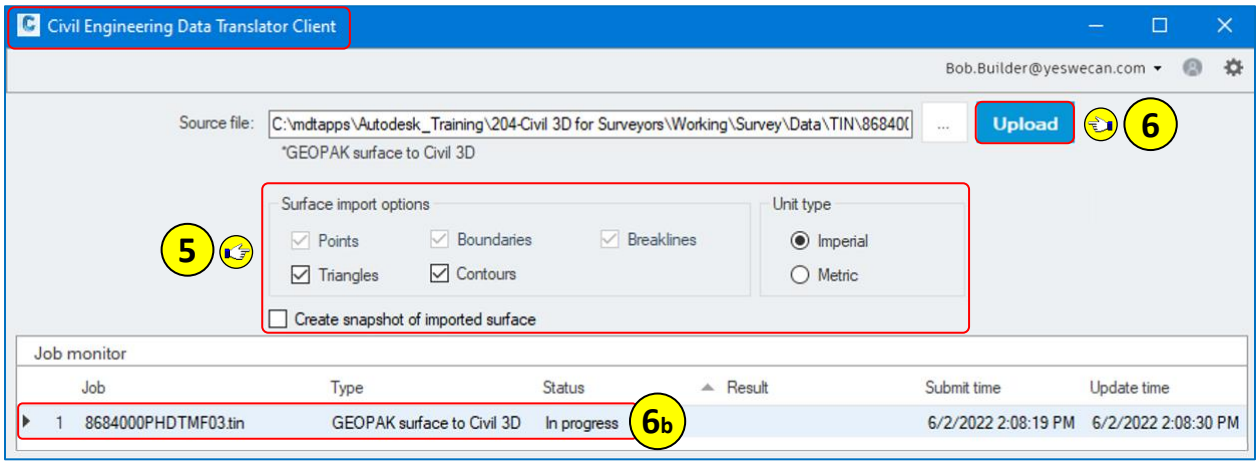
Step 4: From the **Open** dialog box:

a. **Verify** there is a supported **file type** available for the file being translated.

b. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**TIN**

c. **Select** > **8684000PHDTMF03.TIN**

d. **Click Open**.

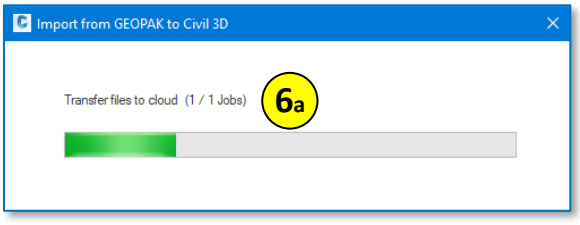


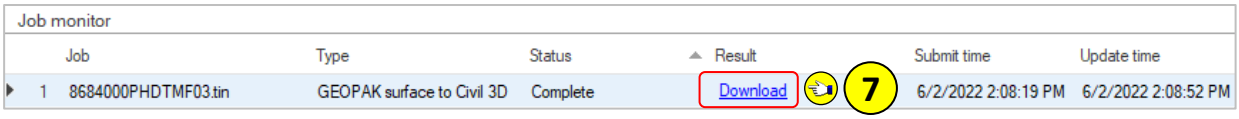
Step 5: From the **Civil Engineering Data Translator Client** > **Set** and **verify** the **import options**.

Step 6: **Click Upload**.

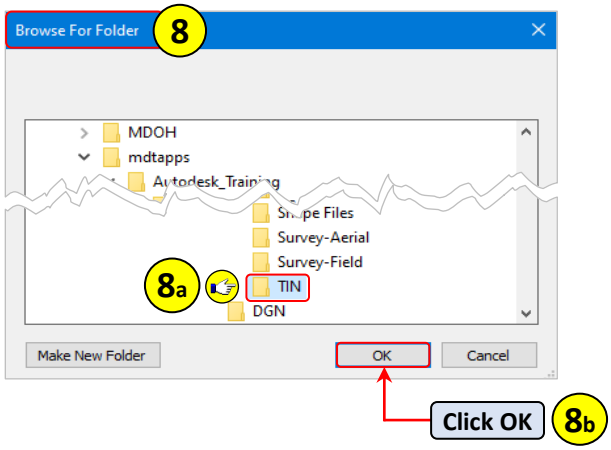
a. **Import from GEOPAK to Civil 3D** pop-up window displays job progress bar.

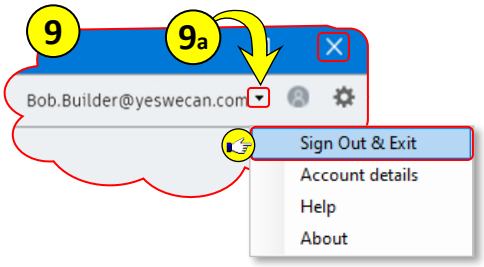
b. **Job monitor** Status = **In Progress**





Step 7: When the job is complete > **Click Download** from the Job monitor.





Step 8: From the **Browse for Folder** dialog box:

a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**TIN**

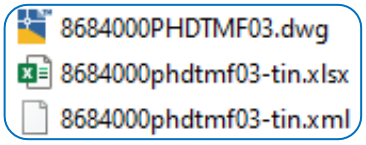
b. **Click OK**.

Step 9: **Close** the **Civil Engineering Data Translator Client**:

a. **Click** the drop-down next to log in name > **Select Sign Out & Exit** or **click** .

	Depending on the type of job performed and the type of data available in the source file, different file types are created during the data translation process.

The translation process has created three files:



The translated drawing file can now be opened and viewed in Civil 3D.

	The drawing created by this process is not based on the MDT standard template. If the data is needed in MDT format, it will either need to be exported as XML or copied directly into a new drawing started from the MDT standard template.

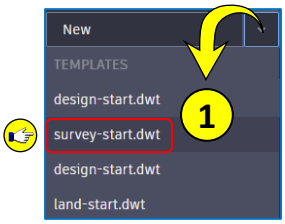
DGN Import

DGN Import is to be used when migrating Bentley.dgn files containing **two-dimensional** linework. DGN Import should not be used for intelligent three-dimensional design objects.

Command: **DGNIMPORT**

System Variable: **DGNIMPORTMODE** (controls default behavior of the DGNIMPORT command)

- MDT template default value = **1**
  (imports the DGN file into the active drawing and ignores duplicate named objects)



Step 1: From the **Start** tab > **Create** a new drawing using the **Standard**: **survey-start.dwt**

- C:\MDOH\StateKit\Civil 3D\2022\Templates**_Start-Dwg**

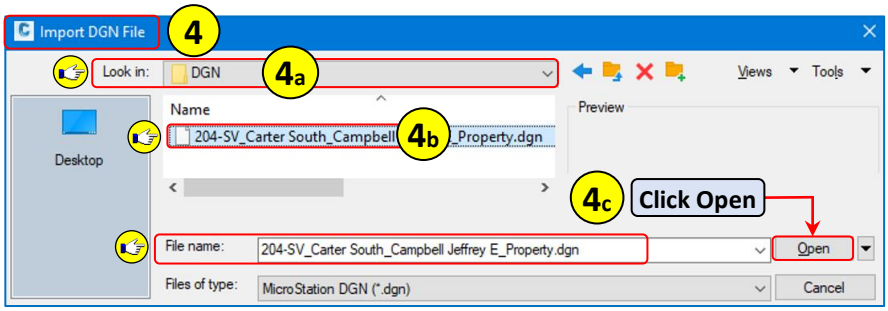
Step 2: **Save** and **Name** the drawing: **204-SV_Carter South_DGNIMPORT-USER INITIALS.dwg**

- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working**Survey**

Step 3: From the **Command** line > **Enter** the command **DGNIMPORT** > **Press Enter**.

DGNIMPORT

- Alternatively > **navigate** to the **Application** menu > Open > **Select DGN**.



Step 4: From the **Import DGN File** dialog box:

c. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey**DGN**

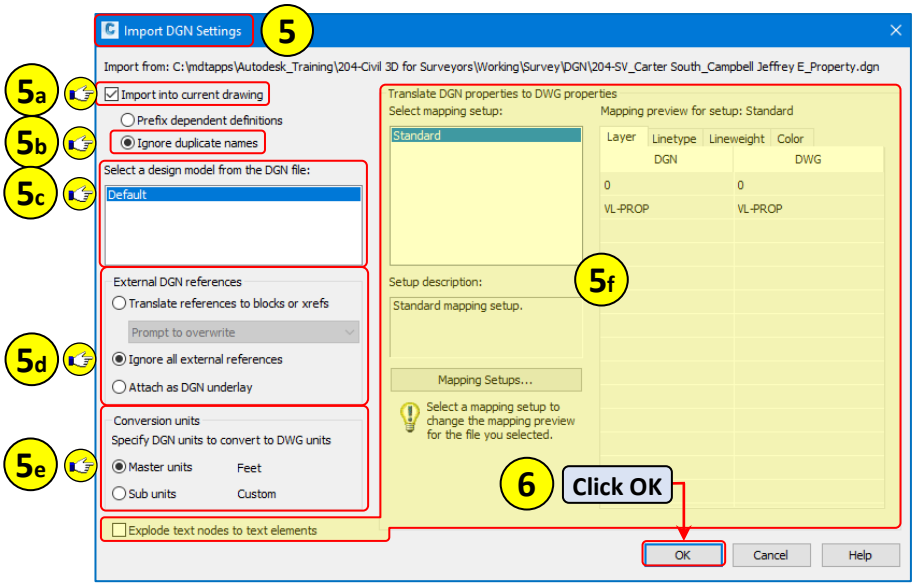
d. **Select** > **204-SV_Carter South_Campbell Jeffrey E_Property.dgn**

e. **Click Open**.

Step 5: From the **Import DGN Settings** dialog box > **Set** and **verify** the following **parameters**:

c. **Check** > **Import into current drawing**

d. **Select** > **Ignore duplicate names**



e. Select a design model from the DGN file = **Default**.

f. External DGN references > **Select Ignore all external references**.

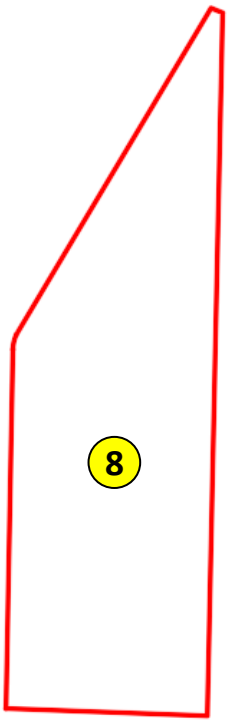
g. Conversion units > **Select Master Units**.

h. **Accept** all other **defaults**.

Step 6: **Click OK**.

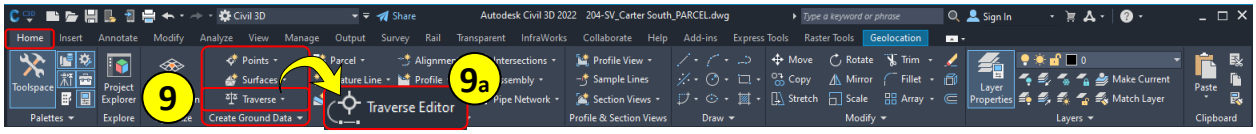
Step 7: **Zoom Extents**.

Step 8: From **Model** space > **See imported** linework.



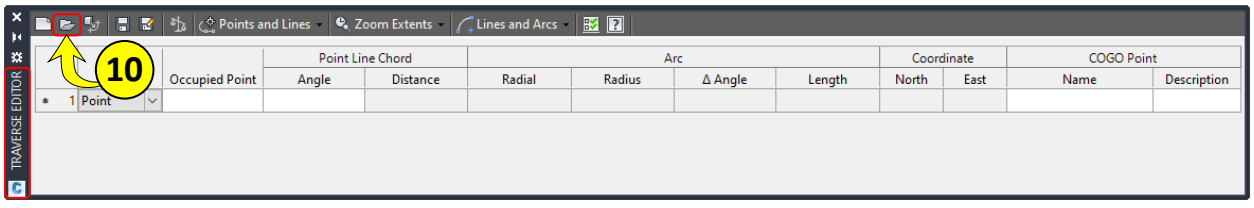
Validating the DGN Import

Use the previously created traverse (see Traverse Editor) to verify the correctness and location of the imported linework.

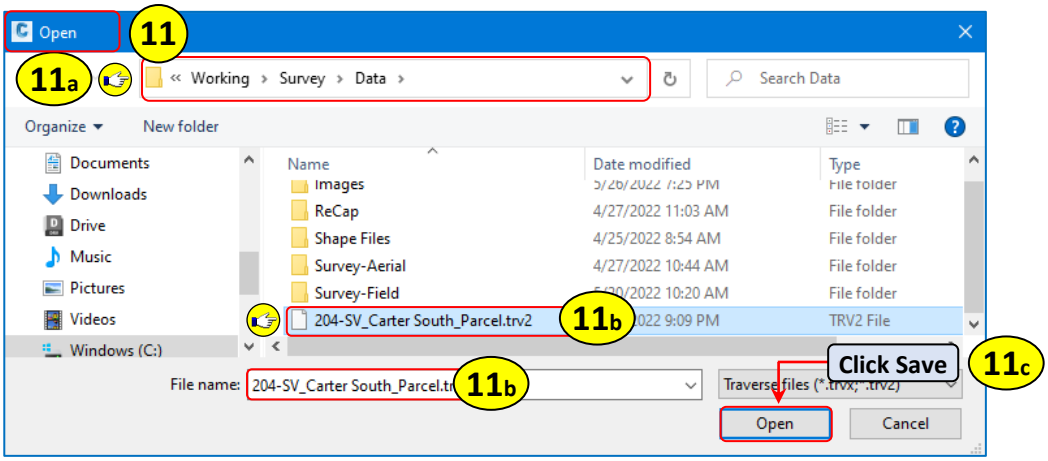


Step 9 : **Navigate** to the **Home** tab > Create Ground Data panel > **Click Traverse** drop-down.

a. From the **Traverse** drop-down list > **Select Traverse Editor**.



Step 10: From the **Traverse Editor** palette > **Click Open**.

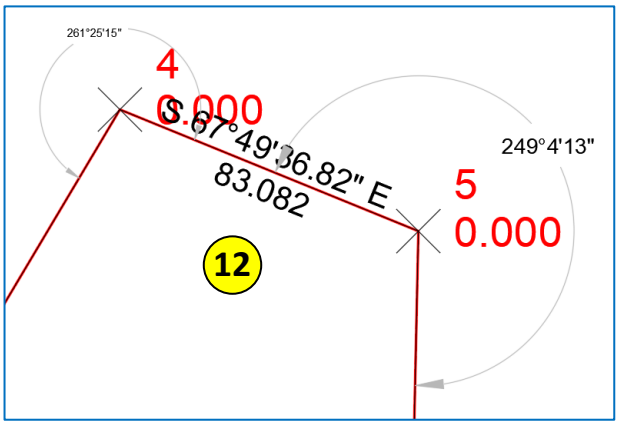


Step 11: From the **Open** dialog box:

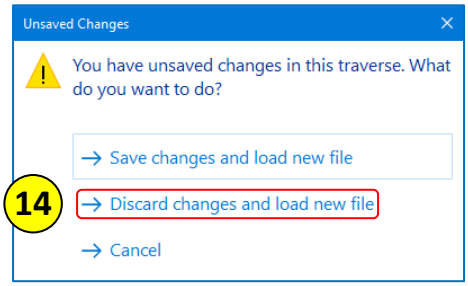
a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey**Data**

b. **Select** > **204-SV_Carter South_Parcel.trv2**

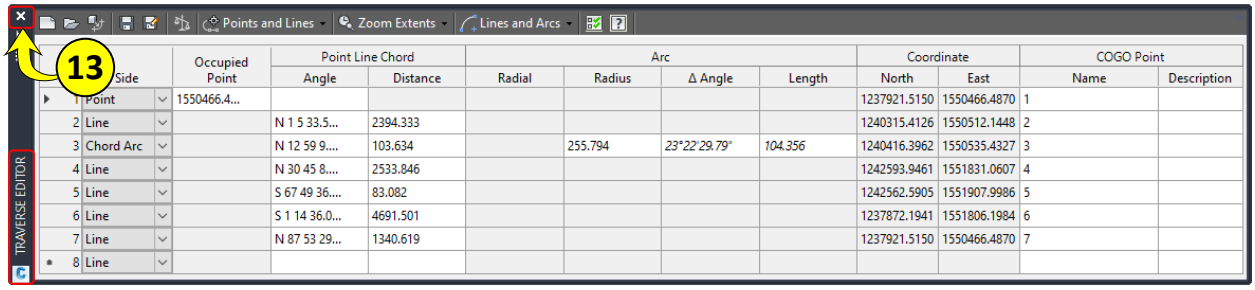
c. **Click Open**.



After validating the linework, the points and linework inserted from the traverse can be deleted.



Step 12: From **Model** space > **See** and **verify** the **traverse data** to the **imported DGN linework**.



	Side	Occupied Point	Point Line Chord Angle	Point Line Chord Distance	Arc Radial	Arc Radius	Arc Δ Angle	Arc Length	Coordinate North	Coordinate East	COGO Point Name	COGO Point Description
1	Point	1550466.4...							1237921.5150	1550466.4870	1	
2	Line		N 1 5 33.5...	2394.333					1240315.4126	1550512.1448	2	
3	Chord Arc		N 12 59 9....	103.634		255.794	23°22'29.79"	104.356	1240416.3962	1550535.4327	3	
4	Line		N 30 45 8....	2533.846					1242593.9461	1551831.0607	4	
5	Line		S 67 49 36....	83.082					1242562.5905	1551907.9986	5	
6	Line		S 1 14 36.0...	4691.501					1237872.1941	1551806.1984	6	
7	Line		N 87 53 29...	1340.619					1237921.5150	1550466.4870	7	
8	Line											

Step 13: **Close** the **Traverse Editor** palette by clicking on the .

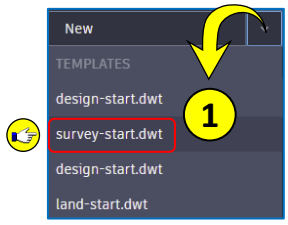
Step 14: If prompted for unsaved changes > **Select Discard changes and load new file**.

Step 15: **Save** and **close** the **204-SV_Carter South_ DGNIMPORT-USER INITIALS**.dwg .

LandXML Import

LandXML data can easily be imported into Civil 3D using the Import LandXML command. the Use this when you do have access to Bentley or the XML file and create XML from Bentley or Autodesk.

CAUTION	**Important**: Not all xml files are the same. The LandXML format is a specialized XML data file format containing civil engineering and survey measurement data. When selecting an XML file to import, Civil 3D will provide an error message if the file is not in **LandXML** data format ("Not a LandXML file. Please select another file"). If this error is encountered, a LandXML file must be obtained. XML files can not be converted to the LandXML format.

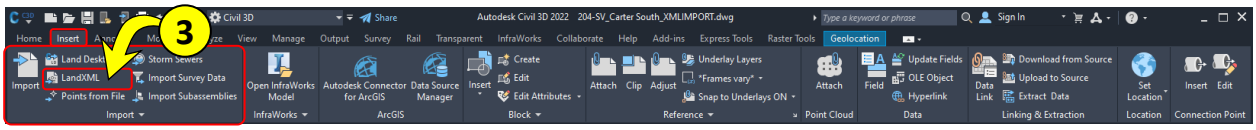


Step 1: From the **Start** tab > **Create** a new drawing using the **Standard**: **survey-start.dwt**

- C:\MDOH\StateKit\Civil 3D\2022\Templates**_Start-Dwg**

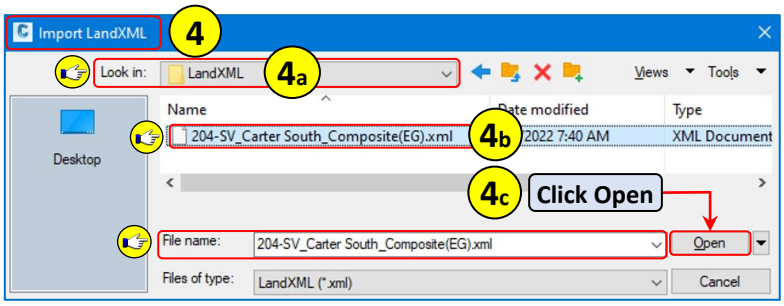
Step 2: **Save** and **Name** the drawing: **204-SV_Carter South_XMLIMPORT-USER INITIALS.dwg**

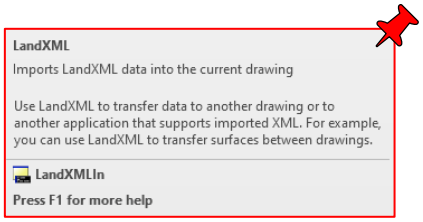
- C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working**Survey**



Step 3: **Navigate** to the **Insert** tab > Import panel > **Select** **LandXML**.

- Alternatively > From the **Command** line > **Enter** the command **LandXMLIn** > **Press** **Enter**.



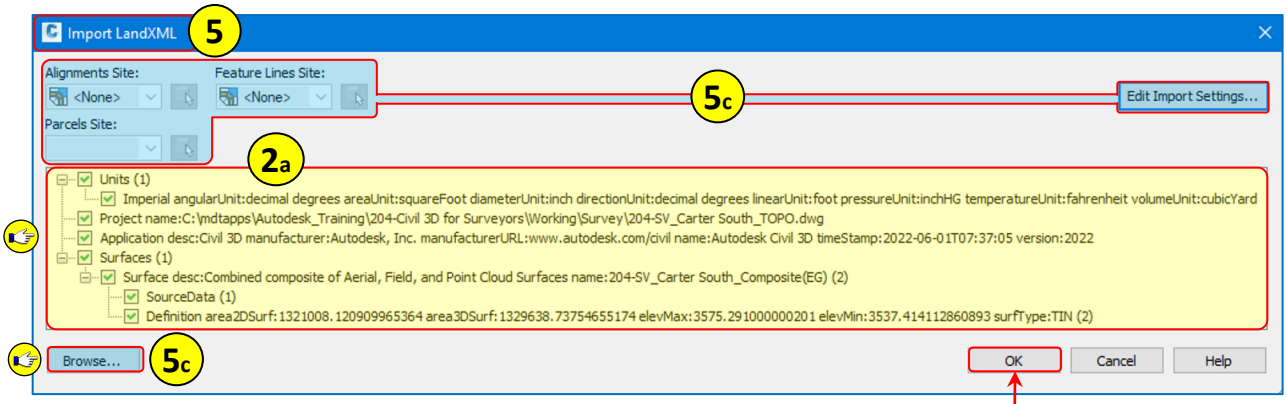


Step 4: From the **Import LandXML** dialog box:

a. **Navigate** to C:\mdtapps\Autodesk_Training\204-Civil 3D for Surveyors\Working\Survey\Data**LandXML**

b. **Select** > **204-SV_Carter South_Composite(EG).xml**

c. **Click** **Open**.



Step 5: From the **Import LandXML** dialog box:

a. **Review** and **select** the xml data to be **imported**.

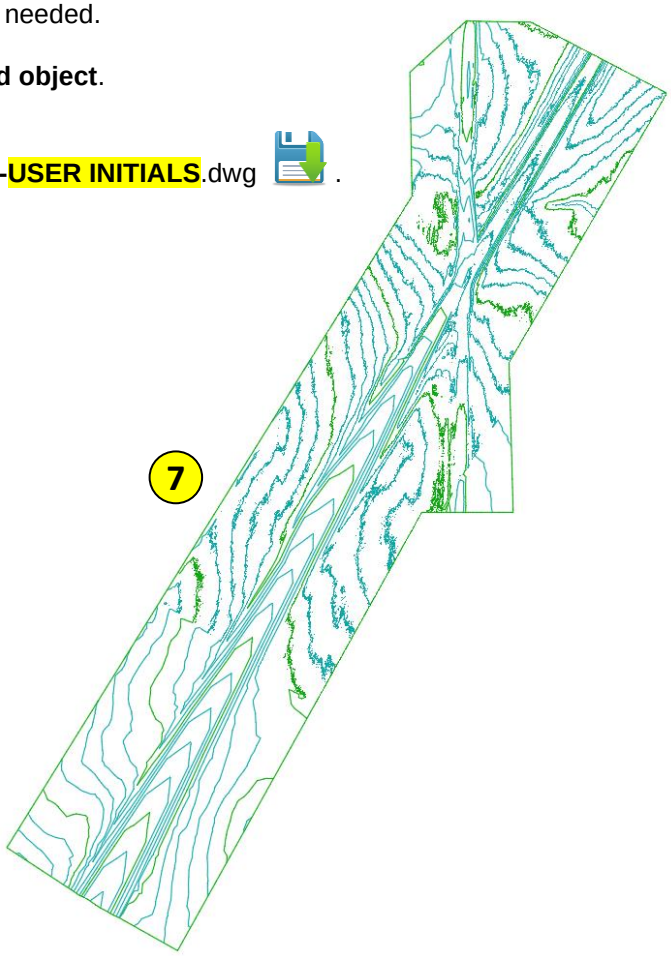
- By default, all collections and available data components are selected for import.

b. Additional parameters and settings can be set if needed.

c. Additional LandXML data can be browsed to and selected if needed.

Step 6: **Click OK**.

- After clicking OK, the selected data object or objects will be imported into the active drawing. The data objects will be added to the applicable data collection collections in the Prospector of Toolspace and can then be stylized as needed.

Step 7: From **Model** space > **See** the **imported object**.

Step 8: **Save** and **close** the **204-SV_Carter South_ XMLIMPORT -USER INITIALS**.dwg .