

USACE Training: User Reference Guide V2



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Project Set Up

Introduction

A project is a collection in the Prospector tree that represents objects in a database (vault). Each project is essentially a folder that contains drawings, databases of points, and reference objects, such as surfaces, alignments, and pipe networks. A project folder can also contain other documents relevant to an engineering project.

Key Concepts

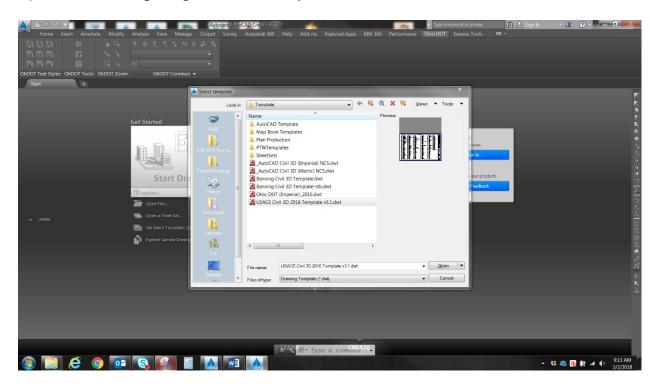
- log in to the project management system
- create a project

Note: you must be in a Civil 3D drawing to set up a project.

Creating a Project

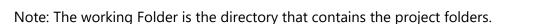
EXERCISE:

1. Open a new drawing using the USACE template.



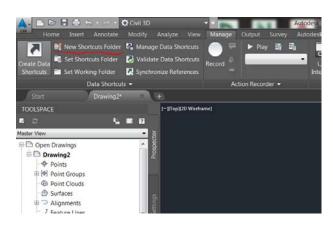


 From the Manage tab>Data Shortcuts pane select "Set Working Folder" and use the "Browse for Folder" dialog to select the Working Folder.



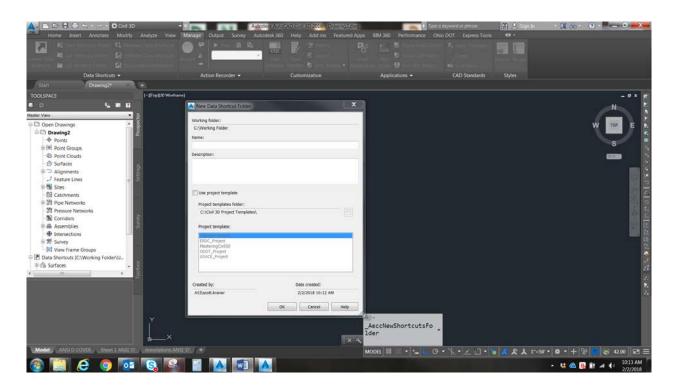
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3. To create a Civil 3D project using a project directory, which has been previously created using Project Wise, from the Manage tab>Data Shortcuts pane select "New Shortcuts Folder" to open the "New Data Shortcut Folder" dialog.

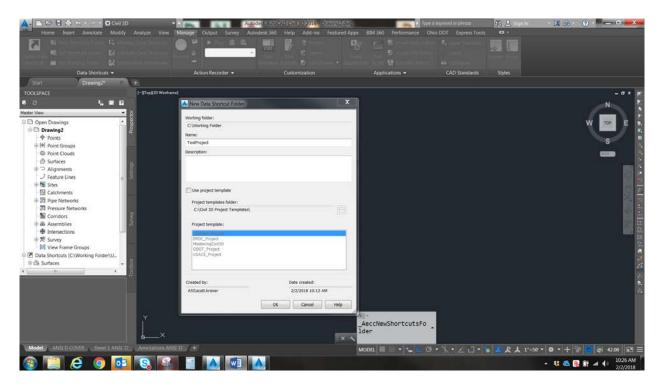








4. Type the name of the project directory in the "Name" portion of the dialog. Note that spelling, capitalization, spacing, etc. must match, exactly. You may add a project description in the "Description" portion of the dialog. Do not select the "Use project template" option, if a directory structure has already been created. Click OK.



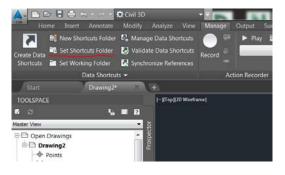




5. A new Civil 3D project is created and associated with the selected project directory. A subdirectory named "_Shortcuts" is added the project directory to manage Data Shortcut XML pointers.

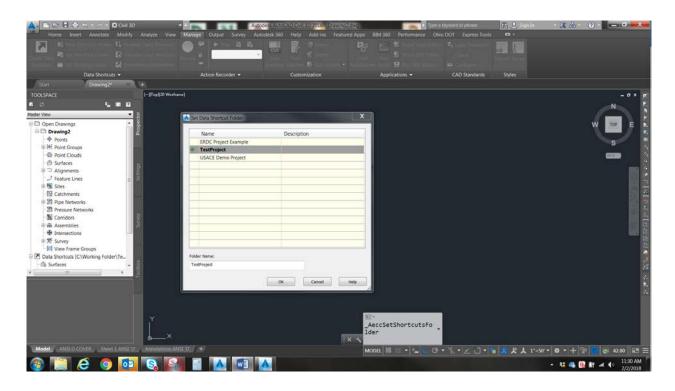
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6. From the Manage tab>Data Shortcuts pane select "Set Shortcuts Folder" to open the "Set Data Shortcuts Folder" dialog and set a current project.









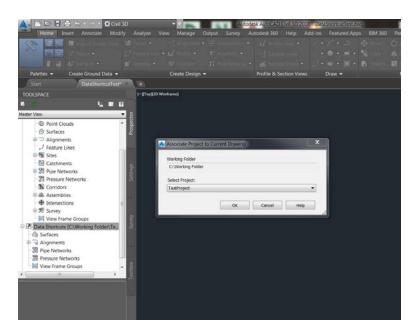
Note: Any project within the Working Folder can be selected.

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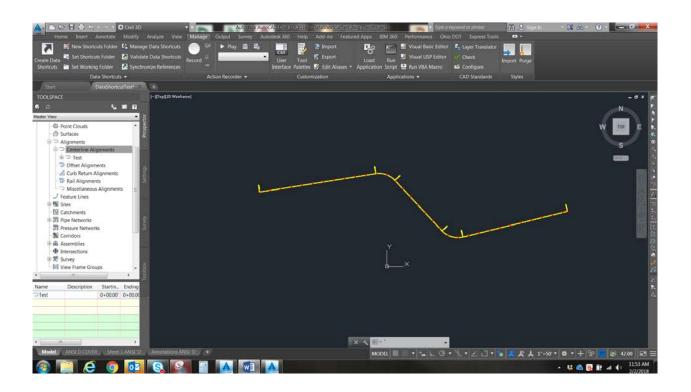
7. New drawings can be created and associated with a project by Right Clicking the "Data Shortcuts" folder in the Prospector tab of Toolspace and selecting "Associate Project to Current Drawing". This



brings up the "Associate Project to Current Drawing" dialog, which allows for the selection of any project within the Working Folder, which is displayed at the top of the dialog.



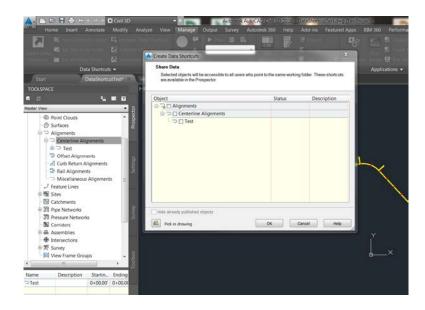
8. Data Shortcuts can be created by selecting the "Create Data Shortcuts" icon in the Data Shortcuts pane of the Manage tab.

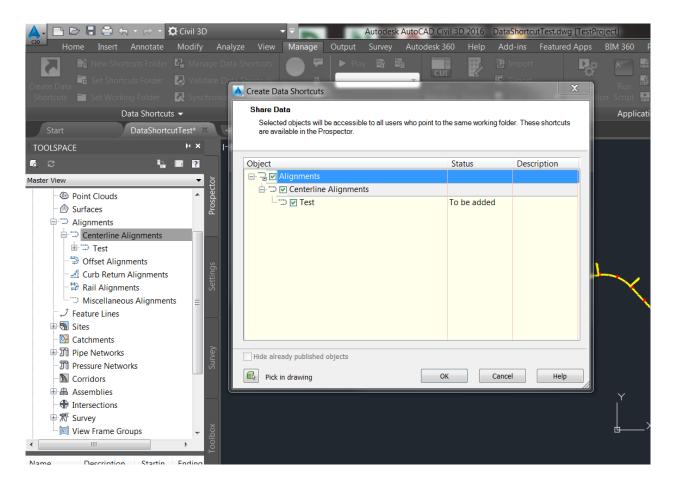






9. This brings up the Create Data Shortcuts dialog, which allows you to select the data you wish to make available.





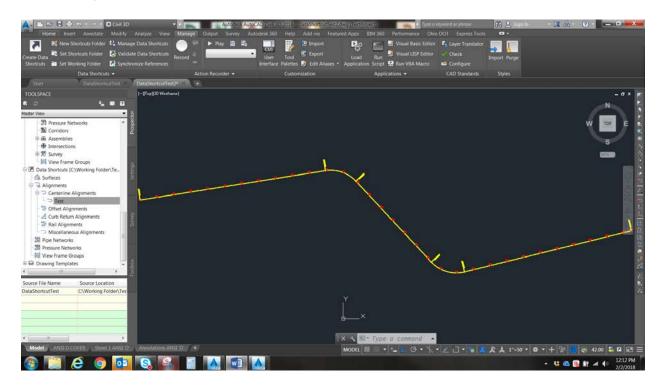




10. Once selected, data appears under the Data Shortcuts area of Prospector.



11. Data can be shared with another drawing, associated with the same project, by Right Clicking the object under the Data Shortcut area of Prospector and Selecting "Create Reference. The Create <selected object> Reference dialog appears allowing adjustment to some of the data referenced objects settings. Selecting OK creates a data reference of the object within the new drawing. You usually need to zoom to the newly created data reference.





GIS Data

Introduction

Autodesk Civil 3D is built on the Autodesk Map 3D platform technology, which allows for combining of CAD and GIS (geographic information system) data. GIS Data is usually downloaded from County, State or Local agencies or can be a locally stored and maintained.

Key Concepts

- Importing GIS Data.
- Connecting GIS Data.
- Control display of connected GIS Data.

Importing GIS Data: ESRI Shape (.shp) Files

The **MAPIMPORT** command converts GIS data into native AutoCAD geometry, removing the need to maintain them in their original format. The command can be compared to importing and exploding a block in AutoCAD, as the drawing becomes the host of the geometry in model space. ESRI GIS databases store information over several files, our focus will be:

- 1. Geometry
- 2. Attributes
- 3. Coordinates

The dialog box that comes up after using the **MAPIMPORT** command, the selected source file data can be extracted, below are some key items to focus on:

- **Spatial filter**: if no filter is assigned ALL the geometry in file will be imported
- **Drawing Layer**: this will be the AutoCAD layer geometry will be on. New layer can be created by simply typing it, will default to white and continuous.
- *Input Coordinates*: coordinate assigned to source file, important to assign if data does not match drawing coordinates.
- **Data**: MUST be manually set if attribute data is needed.
- *Import polygon as closed polylines*: best if checked, otherwise closed polylines will be imported as shaded polygon objects.





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EXERCISE: Importing County Outlines

- 1. Start by creating a **NEW** drawing using default template.
- 2. Switch to Model tab.
- Set coordinate to MS83-WF. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...
- 4. From the command line type, the command **MAPIMPORT**.
- 5. Browse to the *County_Boundaries* data folder and select *stco.shp*
- 6. From the Import Dialog Box:
 - a. Drawing Layer > type in GIS-County
 - b. Data field > select Create object data > drop down should read stco
 - c. Check box for Import polygons as closed polylines.

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(*NOTE: Map and File coordinates are supposed to be different*)

- 7. Pick the OK button. The command line should read that 85 OBJECTS (s) inserted
- 8. From model space > Zoom to drawing extents > view all imported entities.
- Open AutoCAD *PROPERTIES* palette and select any of the county outlines. Notice the objects are recognized as AutoCAD native *polyline* entities. Scroll down to the bottom section of palette and view the "*OD*" (Object Data).





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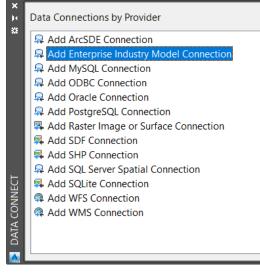




Connecting to GIS Data: ESRI Shape (.shp) Files

The imbedded Autodesk Map 3D technology allows for connections to Feature Data Objects (FDO) to accesses GIS data in its native format. It can be compared to the use of AutoCAD X-refs, in the sense that a link is created and if changes occur they can be easily updated. The Data Connect palette contains several data providers to access typical GIS data formats:

- 1. Relational Database Management Systems (RDBMS):
 - a. ArcSDE
 - b. Enterprise Industry Model Connection (MAPMAION or MAPSYS)
 - c. MySQL
 - d. Oracle
 - e. SQL Serer
 - f. SQL Server Spatial
- 2. File based formats:
 - a. SDF
 - b. SHP
 - c. ODBC Connections (Open Data Base Connectivity)
- 3. Web based Service connections
 - a. WFS (Web Feature Service)
 - b. WMS (Web Mapping Service)

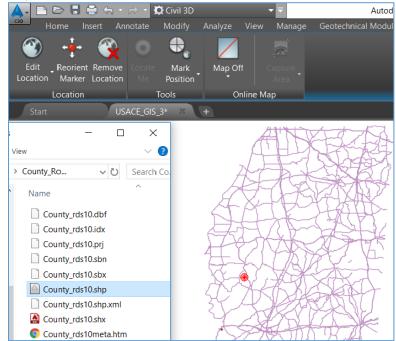




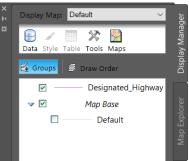


EXERCISE: Connecting to County Boundaries (via drag & drop)

- 1. Open USACE_GIS_3.dwg
- Check that Coordinate system is set to MS83-WF. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...
- Open Windows Explorer window > browse to County_Hwys folder > drag and drop Designated_Highways.shp file



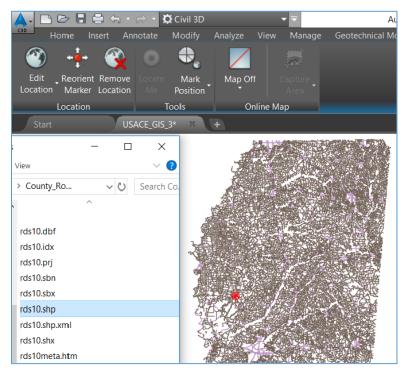
- 4. Color might vary due to the random color palate that is working in the background.
- To view connections, open the TASK PANE palette > from command line type MAPWSPACE > set to ON > from Display Manager tab



- 6. The connected *Designated_Highways.shp* file generates Map Feature type objects that <u>DO NOT</u> reside on an AutoCAD layer. Their display is controlled via a style and can be easily turned ON/OFF by Checking or Clearing the box.
- 7. Continue working on drawing...

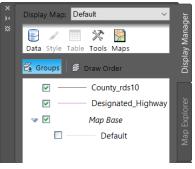


8. Via Windows Explorer window > browse to *County_Roads* folder > drag and drop



Designated_Highways.shp file

 9. To view connections, open the TASK PANE palette > from command line type MAPWSPACE > set to ON > look Display Manager tab



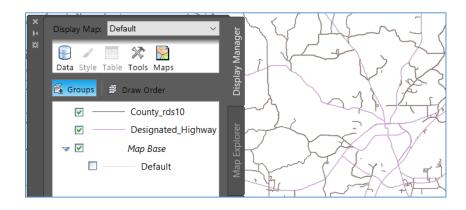
- **10.** The connected **Designated_Highways.shp** file generates Map Feature type objects that <u>DO NOT</u> reside on an AutoCAD layer.
- **11.** Next, Open AutoCAD **PROPERTIES** palette and select a county and/or local roadways centerline. Notice the objects are recognized as Map Feature(s) and NOT AutoCAD entities.





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Color of the Feature Data Object (FDO) connections for the Roadway centerlines might vary due to the random color palate that is working in the background. Their display is controlled via styles and can be easily turned ON/OFF by Checking or Clearing the box.

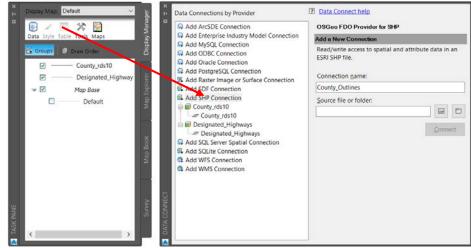






EXERCISE: Connecting to County Boundaries (browse to file)

- 1. Continue working with previous file or Open USACE_GIS_4.dwg
- Check that Coordinate system is set to MS83-WF. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...
- 3. Open the **TASK PANE** palette > from command line type **MAPWSPACE** > set to **ON** > *pick on the* **Data** *button*



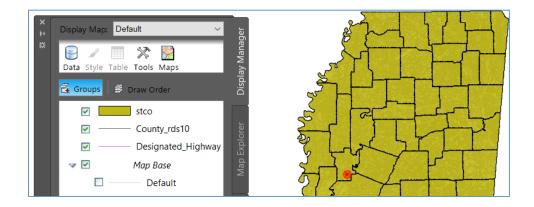
- 4. From the **DATA CONNECT** palette you can Edit or Add new connections
- 5. Select the Add SHP Connection >
 - a. From Connection name: set name to County_Outlines
 - b. Click on the SHP is button: browse to folder County_Boundaries > select County_rds10.shp
 - c. Next click on the **<u>C</u>onnect** Connect button

Data Connections by Provider	2 Data Connect help
Add ArcSDE Connection Add Enterprise Industry Model Connection Add OxAC Connection Add OxAC Connection Add OxAC Connection Add OxAC connection Add PartierSQL Connection Add Starter Image or Surface Connection Add Starter Connection Add Starter Connection Add Starter Connection County_Outlines Designated_Highways Add SQL server Spatial Connection Add	SHP County_Outlines (C.\SOW\USACE\Template Training\1_GI
	Add Data to Map
	Available sources in this connection. Select Items to ad DEdit Coordinate Systems Refresh
	Schema Coordinate System V Cofout Store MS83-TM
	← Add to Map • Map Coordinate System MS83-WF NAD83 Mississippi State Planes, West Zone, US Foot
	Disconnect from Feature Source
	To reconfigure this connection, disconnect, and then edit the

- d. Last click on the <u>Add to Map</u> button.
- e. From model space, you can now see the connected County Boundaries in model space.







- f. The newest connected layer will appear on top of the list on the *Display Manager* tab. Color might vary due to the random color palate that is working in the background.
- 6. Next, Open AutoCAD **PROPERTIES** palette and select a county outline. Notice the objects are recognized as Map Feature(s) and NOT AutoCAD entities.

×							
H			vlap Feature(s) 🔹 📑 🕂 📲				
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		F	eature Propertie	es	-	Obj	
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			COUNTY	69			
			CONAME	Kemper			
			CO_SEAT	DeKalb			
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			WHITE90	4407		Da	
ES			BLACK90	5739		Extended Data	
PROPERTIES			OTHER90	210		tten	
			T18_90	7283		ŵ	
		W18_90	3441				
₽			B18_90	3708			

The next section will review how to control display and appearance of FDO connections.





Controlling Display: ESRI Shape (.shp) Files

Autodesk Map 3D will by default assign colors to Feature Data Objects (FDO) connections to make them stand out. Stylizing features will improve created maps look to a user specified display. Feature Styles are <u>NOT</u> stored in the feature source, it is part of the individual drawing. There are three main types of feature elements:

- 1. Points: control shape, size color.
- 2. Lines: control weight, line type and color
- 3. Polygons: control border color and fill pattern and color

Using the **TASK PANE** palette, the display order (via drag and drop) and visibility of a connection (via check box) can be enabled and disabled.

The **STYLE EDITOR** palette can be used to set the color, weight, transparency and pattern of connected FDO entities. It can be also used to create dynamic labels of attributed data.00

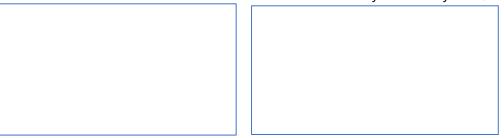
🛕 💼 🖻 🖶 🖶 🔲 - 🖃 🛱 Civil 3D		Autodesk AutoCAD Civil 3D 2016	USACE_GIS_5.dwg	Type a keyword or phrase	: 👔 🚨 Ilavay
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Zoom to Estent	Label Feature Edit Set •	Sea * S ² COGO • → New & COGO • ↓ Tenture Cat		A ST A CONTRACTOR ST	All Innor Pales
Start USACE_GIS_5* *	(B)				1.2
TASK PANE Display Maps Default Display Maps Default Data Style Table Tools Maps Groups Groups County_rds10	Scale Ranges for Layer Defa	h Duplicate X Delete I @ Up @ Dov p Preview: Symbolization finity		Device O Map Inches Add Border	× •
Designated_Highways Stoo Map Base Map Base	😂 New Theme 😸 Add a	Scale kange Rule []: Duplicate 💥 Delete 🗐 Delete All ityle Legend Label Feature Labe None		- 0 · · ·] // ·	k aspect ratio



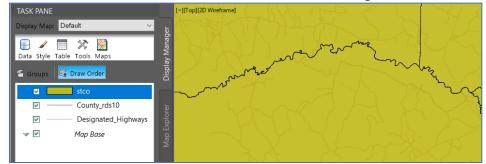


EXERCISE: County Boundaries (polygons)

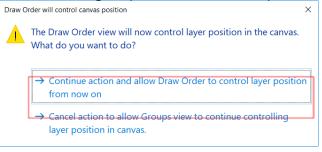
- 1. Open USACE_GIS_5.dwg
- 2. Open the TASK PANE palette > from command line type MAPWSPACE > set to ON
- 3. Use the check box beside the stco connection to turn the county outline layer on/off



4. Pick on the **Draw Order** button > select the **stco** connection > drag to bottom of connections list

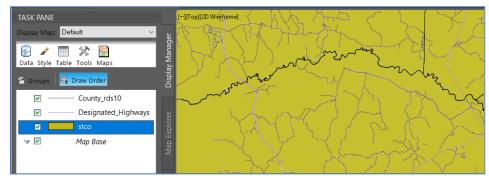


5. You might receive a connection message > pick the" Continue" option

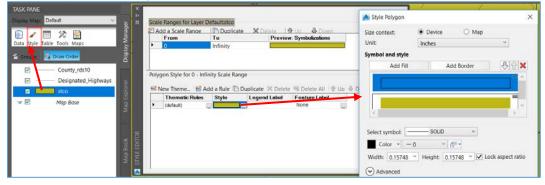






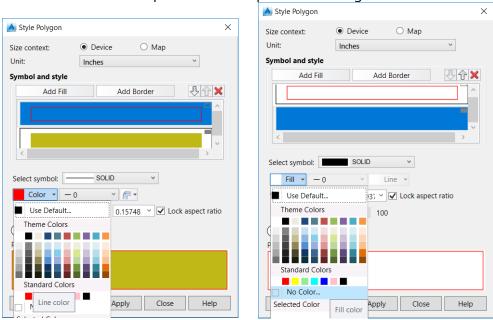


- 6. The roadway centerlines will now appear above the shaded county filled areas.
- 7. Next from the TASK PANE palette > select the stco layer > then click on the Style button > from the STYLE EDITOR palette Style column pick the browse button

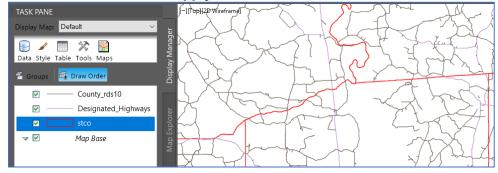




- 8. From the Style Polygon window:
 - *a*. Select the Border > pick the *Color* drop down color > change color to *RED*
 - b. Select the Fill > pick the *Fill* drop down > change to *No Color*



9. To view results > click on the *Apply* button and the *Close* button





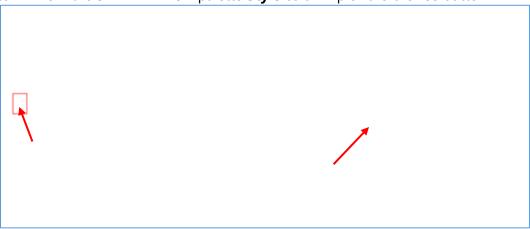


 Next from the TASK PANE palette > slowly double click the stco FDO connection > rename to County Outlines



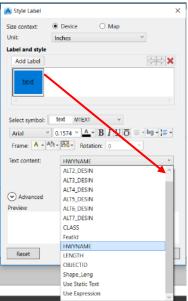
EXERCISE: Stylizing Roadway (lines)

- 1. Continue working from drawing above or Open USACE_GIS_6.dwg
- 2. Open the MAP 3D Open the TASK PANE palette > from command line type MAPWSPACE > set to ON
- 3. From the TASK PANE palette > select the Designated_Highwyas layer > then click on the Style button > from the STYLE EDITOR palette Style column pick the browse button

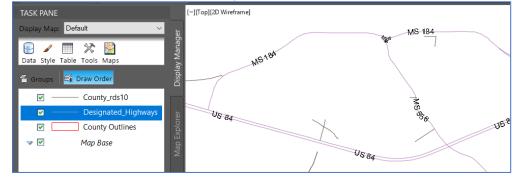




 From the Style Label dialog box > pick on the Add Label button > from the Text content drop down > select HWYNAME



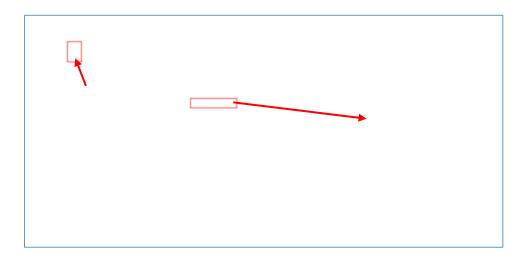
5. To view results > click on the *Apply* button and the *Close* button



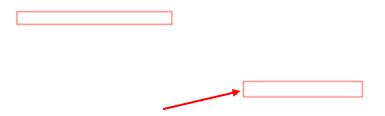
- 6. Continue working from drawing above or Open USACE_GIS_7.dwg
- 7. From the TASK PANE palette > select the Conty_rds10 layer > then click on the Style button > from the STYLE EDITOR palette> pick the New Theme button







- 8. From the *Theme Layer* dialog box:
 - a. **<u>P</u>roperty** field drop down > select **RYTYP**
 - b. Style range > click browse button > from Style and Label Editor > Line Color Yellow > Magenta

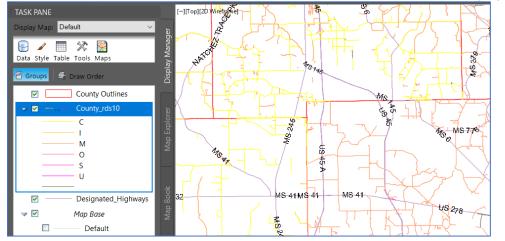




9. To view results > click the **OK** button.

A	From		To		Prev
	0		Infinity		
ne	Style for 0 - Infinity Scale	Range			
	New Theme 💕 Add a Ri	ule ID Duplicate	e 🗙 Delete 😽 Delete All	🔮 Up 🕹 Down	
	New Theme S Add a R	ule I Duplicate	e 🗙 Delete 😽 Delete All	🔮 Up 👶 Down	
	Thematic Rules			Legend Label	
	Thematic Rules "RTTYP" = 'C'			Legend Label	
	Thematic Rules "RTTYP" = 'C' "RTTYP" = 'I'			Legend Label	
	Thematic Rules "RTTYP" = 'C' "RTTYP" = 'I' "RTTYP" = 'M'			Legend Label	
	Thematic Rules "RTTYP" = 'C' "RTTYP" = 'I' "RTTYP" = 'M' "RTTYP" = '0'			Legend Label C I M O	

10. Results viewed in model space, Local Roads centerlines are color coded by *Type*





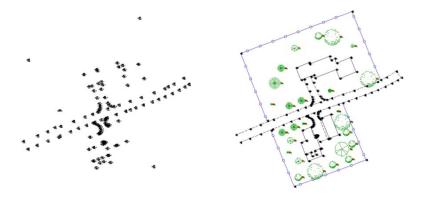
Survey Field to Finish – Processing Survey Data

Introduction

The power of civil 3D comes from its dynamic drawing environment keeping things in sync eliminating the omissions created by blocking information into a series of design bases. Utilizing the interrelated 3D object data from Civil 3D allows the end user to see the impact of design changes throughout the parallel design phases. This synchronization of object data eliminates the omissions and miscommunications of the design team using multiple bases in their project design.

Field to Finish

The goal in field to finish methodology is to create near production drawings utilizing the field data collected for optimum automation using line connectivity commands with standardized field codes. Civil 3D allows for automatic line generation on the proper layers and line types thus eliminating the dot to dot connection in manual drafting practices. Utilizing the survey figure commands, Begin and End, to control "pen down and pen up" actions the field data can be efficiently processed to draft the planimetrics of the base plan. The symbology is linked to the standardized field codes through the Description Key File, thus inserting the CADD standard blocks on their respective layers. All this field data processing is accomplished through the Drawing template, field codes, description key file, figure prefix database, and internal CADD standards.



Learning Objectives

- Configuration Overview
- Importing Points to Drawing
- Importing Points to Survey Data Base





Available Configuration

Configuration that will process field survey data can be found in two places:

- 1. As part of Drawing Template: Prospector or Settings tabs
- 2. External configuration that is NOT part of Drawing Template: Survey tab

As part of Drawing Template:

From TOOLSPACE palette > Settings Tab > Point collection >

a. *Point Styles*: There are *318* marker styles available in template, they will be the symbol for collect survey point. Most are built from AutoCAD blocks.



b. *Label Styles*: There are *23* styles to choose from in template. The annotation will be paired with marker to display attribute as needed.

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imes 100.00	53	\times 100.000
	ш	RANDOM

c. Description Key Sets: this is the 1st level of point management, and can be thought of as a "Filter". Imported points will be matched by RAW Description to the Code column. A single Description Key Set is available, with 237 individual keys to match field collected description to assign point Symbol, Label and Layer.

						2 ?
Code	Style	Point Label	Format	Layer	Scale Parameter	Fi ^
念AC*	✓ <default></default>	✓ <default></default>	TOP OF A.C. PAD	V-PADS-OTLN	Parameter 1	
\$ANT*	SITE_Tower V_(USACE)	✓ <default></default>	S*	C-SITE-STRC	Parameter 1	
念AP	✓ <default></default>	✓ <default></default>	ABANDONED PIPE	V-SITE-STRS	Parameter 1	
: APR*	✓ <default></default>	✓ <default></default>	APRON	V-APRN-GRND	Parameter 1	
念ASP*	e <default></default>	✓ <default></default>	ASPHALT	V-ROAD-ASPH	Parameter 1	
\$ATO*	✓ <default></default>	✓ <default></default>	ASPHALT	V-ROAD-ASPH	Parameter 1	
4ATP	✓ <default></default>	✓ <default></default>	ABUTMENT TOE	V-BRDG-DECK	Parameter 1	
: BAL*	PRKG_Ballast V_(USACE)	✓ <default></default>	BALLAST	V-PRKG-FIXT	Parameter 1	
<						>

From>TOOLSPACE palette > Prospector tab > Point Groups collection



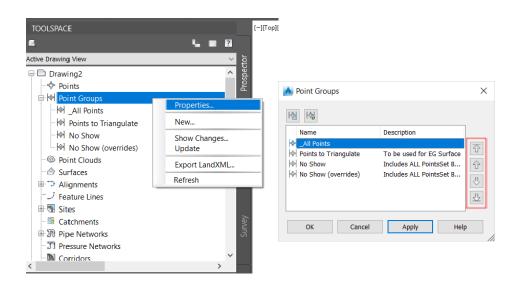


- **d.** *Point Groups*: this is the 2nd level of point management, and can be thought as a "List of Points". There are only 4 groups available in drawing template:
 - _All Points:
 - Points to Triangulate:
 - No Show:
 - No Show (overrides):

As survey data is imported, point groups will need to be updated for data to be re-sorted. New groups can be created and needed to:

- Control Display
- Build Surfaces
- Export
- Create Tables

Display order can be controlled by right click on **Point Groups** collection > select **Properties...**



Both point management options mentioned above will control COGO Points $\overline{\diamond}$ that are imported directly into drawing or Survey Points \square that are imported via Survey Databases.



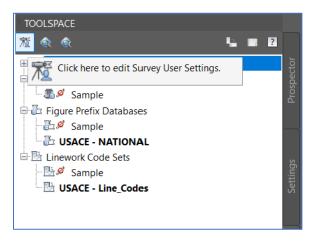


External configuration:

Field to Finish configuration is NOT part of Drawing Template. These external settings can be found from *TOOLSPACE* palette > *Survey* tab

a. Survey User Settings:

Each Civil 3D user can/must set up paths and values here, as these settings are external to the template. From the upper left click on the **Survey User Settings** button.



There is NO way of deploying these settings automatically, from the installer or Drawing Template. Typically paths and configurations default locally to *C:\ProgramData\Autodesk\C3D 2016\enu\Survey*. Most users set paths to a centralized shared network location. A noteworthy setting here is under the *Figure Defaults* collection, this will set the default Layer and Style for the automated linework (figure).

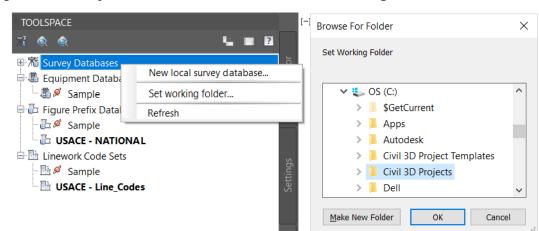




roperty	Value	_
🗄 🔭 Miscellaneous		
🕂 🔭 Survey Database Defaults		
 Survey database settings path 	C:\ProgramData\Autodesk\C3D 2016\enu\Survey\	Eq
 Survey Database Settings 		\sim
 Extended properties definition path 	C:\ProgramData\Autodesk\C3D 2016\enu\Survey\	Ľq
Extended properties definition	Sample	\sim
🕅 🔭 Equipment Defaults		
Tinework Processing Defaults		
 Linework code sets path 	C:\ProgramData\Autodesk\C3D 2016\enu\Survey\	Eq
 Process linework during import 	✓ Yes	_
 Current linework code set 	USACE - Line_Codes	\sim
Process linework sequence	By import order	\sim
🛪 📅 Figure Defaults		
 Figure prefix database path 	C:\ProgramData\Autodesk\C3D 2016\enu\Survey\	Ľc
 Current figure prefix database 	E USACE - NATIONAL	\sim
– Figure style	Pa Standard	\sim
Figure layer	<i>₽</i> 0	\sim
🕅 🔭 Interactive Graphics		_
🕅 Timport Defaults		
🕅 🔭 Export Defaults		
🕅 🔭 Network Preview		
🛪 Setup Preview		
🛪 Figure Preview		
🕅 🔭 Change Reporting		

b. Survey Databases - Working Folder:

Process survey data is stored externally in a collection of files. By default, the path is set to *C:\Civil 3D Projects*. It is recommended to set this on a network location, preferably by year. Path can be set by Right clicking on the *Survey Databases* collection > select *Set working folder*...







c. Figure Prefix Database (.fdb_xdef)

Like the Description Key Set, this configuration is meant to process automated linework (figures) based on field collected data based on RAW Descriptions. If match is found the created figure is matched to settings found here.

ф Б X									
Name	Breakline	Lot Line	Layer		Style		Site		1
ABUT	No	No		\sim	Layer (USACE)	~	Survey Site	\sim	
ASP	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
ASPHREV	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
ASPHREVEDGE	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
B_WALK	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BANK_TOE	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BANK_TOP	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BANKTOE	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
BANKTOP	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BASELINE	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
b BB	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BBERM	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
⊑ BC	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
bent 🔓	No	No		~	Layer (USACE)	~	Survey Site	~	
BERMCRWN	✓ Yes	No		~	Layer (USACE)	~	Survey Site	~	
BERMTOE	✓ Yes	No		\sim	Layer (USACE)	~	Survey Site	~	
BERMTOP	Ves Ves	No		\sim	Layer (USACE)	~	Survey Site	\sim	

d. Linework Code Set Database (.f2f_xdef)

This box allows users to tell Civil 3D to read and process almost any field crew utilized field collection methods used to start, stop continue line and curves.





roperty	Value
🖳 🔡 Information	
- Name	USACE - Line_Codes
Description	Line Code Sets
🖳 🖳 Coding Methods	
 Feature/Code delimiter 	<space></space>
 Field code escape 	/
 Start in comment mode 	🗆 No
Automatic begin on figure prefix	ma 🔲 No
🖳 📴 Special Codes	
- Begin	ST
- Continue	С
End	E
Close	CLS
 Horizontal offset 	Н
 Vertical offset 	V
Stop offsets	SO
🖳 🕒 Line Segment Codes	
- Recall point	JPT
 Connect point 	JNC
Rectangle	CLSRECT
Right turn	RT
Extend	X
🖳 📴 Curve Segment Codes	
- Begin curve	PC
- End curve	РТ
Circle	CIR
Point on curve	OC



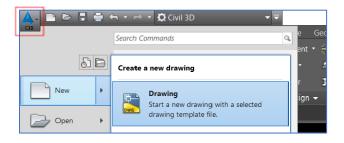


Importing Points: directly into Drawing.

Importing survey data directly into drawings, works like importing blocks, crated COGO points are "live" in drawing allowing for edits in real time. Imported points are processed via Description Key sets, assigning layers, labels and descriptions.

EXERCISE:

 Start by creating a NEW drawing using correct template. From the upper left > click on the Application button > click on New flyout > select Drawing > select/browse to USACE most current drawing template



- 2. Once drawing is created > from the bottom *Status Bar* > switch to the *Model* tab
- Next, set coordinate system. From TOOLSPACE palette > Settings Tab > right click on drawing name
 Edit Drawing Settings... > From the Units and Zone tab > Selected coordinate system code: MS83-WF

and containing Dectring	gs - Drawi	ing2		
Units and zone Tran	sformation	Object Layers Abbreviations Ambient Settings		
Drawing units:		Imperial to Metric conversion:	Scale:	
Feet	~	US Survey Foot(39.37 Inches per Meter)	1" = 50'	
Angular units:		Scale objects inserted from other drawings	Custom scale:	
Degrees	Ŷ	Set AutoCAD variables to match	50	
Zone				
Categories:		USA, Mississippi		ŶŶ
Available coordin	ate system:	E		
NAD83 Mississip	opi State Pla	mes, West Zone, US Foot		
Description: NADB3 Mississp Projection: TM	opi State Pla	ness, West Zone, US Foot		
Detsen:				
84083				

(Alternatively, you can use the Categories & Available coordinate systems drop downs)

4. From the Ribbon > *Insert* tab > *Import* panel >*Points from File* button



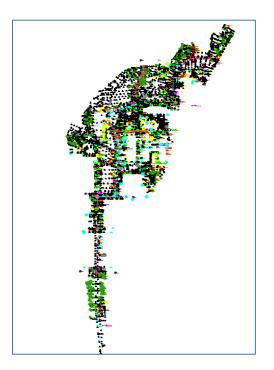
- 5. From the Import Points dialog box:
 - a. Selected Files: Use the Add Files button 🔤 to browse to > select ALL POINTS 5-29-13 REV.txt
 - **b.** Specify point file format: use _USACE NUB_N_E_Z (comma delimited)
 - c. Clear all check boxes > and click the **OK** button

Import Points		
Selected Files:		
File Name		45 ×
<		>
Specify point file <u>f</u> ormat	(filtering OFF):	
ENZ (comma delimited External Project Point _USACE NUMB_N_E_Z	Data	
Autodesk Uploadable F		
NET (man dalimited)		 ~
Preview:		
Add Points to Point C	Sroup.	
	Sroup.	· 参
Add Points to Point C	Group.	~ 校
Add Points to Point C	·	~ 禄
Add Points to Point C No Show Advanced options	·	~ 禄
Add Points to Point Q No Show Advanced options Do elevation adjus	stment if possible	~ [秋]

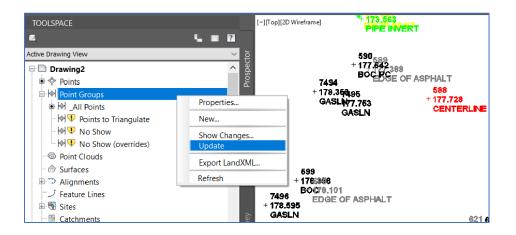
6. Once processes are complete, all points are imported into Model space but might be off screen > Zoom to Extents (double click on wheel mouse). As needed adjust the drawing scale from the Status Bar to make text readable.







Next, from TOOLSPACE palette > on Prospector tab > browse to Point Groups collection > notice the yellow
 shield, denotes out of date content. Right click on collection > click on Update



This is the most common method of importing reduced survey text files directly into Civil 3D. Points are editable as they resided in drawing and can be managed via Description Key Sets, Point Groups or standard AutoCAD Layer control.





Importing Points: Survey Data Base

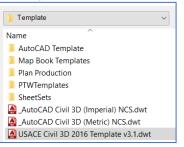
Instead of making the drawing the host of survey data, Civil 3D can process survey data outside of the created drawing in an external Survey Database. Survey Databases allow for consuming survey source data as:

- Field Book File: most familiar format with "RAW" data
- LandXML File: newer options to export data from data collectors or other software
- Point File: reduced text file option, can have linework codes
- Points from Drawing: drawing becomes source of points.

Survey Databases support the automation using line connectivity commands with standardized field codes

EXERCISE:

 Start by creating a *NEW* drawing using correct template. From the upper left > click on the *Application* button > click on *New* flyout > select/browse to USACE most current drawing template



- 2. Once drawing is created > from the bottom *Status Bar* > switch to the *Model* tab
- Next set coordinate system. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings... > From the Units and Zone tab > Selected coordinate system code: MS83-WF
- 4. Survey Data will be created via an Import Wizard. From Ribbon TOOLSPACE > Insert tab > Import panel > pick on the Import Survey Data button
- 5. Specify Database
 - 12. First, pick on the Create New Survey Database button > name it USACE-CLASS





Specify Data Source	Survey databases	
Specify Network Import Options	Name	
	Enter the name of the folder in which to create the new survey database.	
	USACE-CLASS OK Cancel	
Г	Create New Survey Database Edit Survey Database Settings	

 Then, pick on the *Edit Survey Database Settings...* button > set Coordinate Zone to match drawings *MS83-WF*

Survey database	15			
Survey Database Settings			×	
T• #• 74 A3				
Property	Value			
□ 芾 Units			^	
 Coordinate zone 	<none></none>			
- Distance	International Foot	\sim		
- Angle	Degrees DMS (DDD.MMSSS)			
- Direction	Bearings	\sim		
- Temperature	Fahrenheit	\sim		
Pressure	Inches Hg	\sim		
🗄 🔭 Precision			\	
🗄 🔭 Measurement Type Defaults			1	
🕂 🔭 Measurement Corrections			1	
 Curvature and refraction 	No			
- Sea level	No			
 Atmospheric conditions 	No		1	Edit Survey Database Settings
- Horizontal collimation	III No.		~	Editodivey Database Getaliga

NOTE:

Default is blank coordinates and **International Foot**. Common mistake is to forget to set Coordinate here causing a shift in drawings. Also, if **Measurement Corrections** are enabled here, a doubling up can happen if done in data collector too

- **14.** When done click **Next** button
- **15.** Specify Data Source
- 16. Set Data Source type drop down to Point File
- 17. Selected Files: Use the Add Files button 🖾 to browse to > select ALL POINTS 5-29-13 REV.txt
- **18.** Specify point file format: use _USACE NUB_N_E_Z (comma delimited)



Specify Database	Specify the data source type and select the data.								
Specify Data Source	Data source type	e:							
Specify Network	Point File	Point File							
Import Options	Selected Files:								
	File Name			Status					
	C:\SOW\USA	CE\Template Tra	inina\1 Survev\/	L Matches sele	cted point file forma	at			
	Specify point file ENZ (comma de _USACE NUMB_ Autodesk Upload NEZ (comma de	limited) N_E_Z_D (comma dable File						^ ~	
			(comma delimite	d) ALL POINTS :	5-29-13 - REV.bd				
	Point Number	Northing	Easting	Point Elevation	Raw Descripti	Att	Att	Att	1
	100	1020286.2930	2134102.9840	194.0800	IRRCSBD				
	101	1020007.0390	2133548.9030	196.1500	IRRCSBD				
	100	1010000 9420	0100160 7000	100 2000	TODCOD				
	<							2	>

- 19. When done click **<u>N</u>ext** button
- 20. Specify Network
- 21. Because a reduced text file is being used, no Network will be created. As there is NO observations or raw data All points will be considered Non-Control survey points > click <u>Next</u> button

📥 Import Survey Data -	Specify Network			×
Specify Database	Select an existing survey network, Survey networks	or create a new one.		
Specify Data Source	Name		Description	
Import Options				
		Create Ne	w Network	
		Back	Next Cancel	Help

22. Import Options

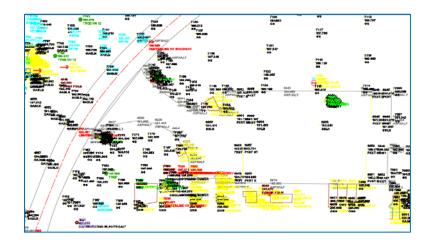
23. Make sure the *figure prefix database* and *linework code set* are set to use the <u>USACE</u> configured files and that *figures* and *points* have be checked to import > then click on the *Finish* button.





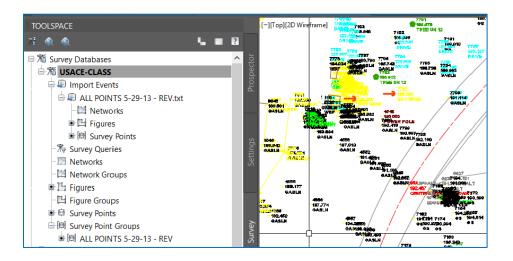
Specify Database	Specify the import settings for the selected data sou	irce.
Specify Data Source	Import settings	
Specify Network		
	Property	Value
Import Options	Point file format	_USACE NUMB_N_E_Z_D (comma deli
	- Point file name	C:\SOW\USACE\Template Training\1_Sur
	Point type	
	Current figure prefix database	E USACE - NATIONAL
	Process linework during import	Ves Ves
	- Current linework code set	USACE - Line_Codes
	Process linework sequence	By import order
	- Import event name	ALL POINTS 5-29-13 - REV.txt
	Import event description	
	Assign offset to point identifiers	No
	Point identifier offset	
	Insert network object	□ No
	Insert figure objects	Ves
	Insert survey points	Ves Ves

18. Once processes are complete, all points are imported into Model space but might be off screen > Zoom to Extents (double click on wheel mouse). As needed adjust the drawing scale from the Status Bar to make text readable.



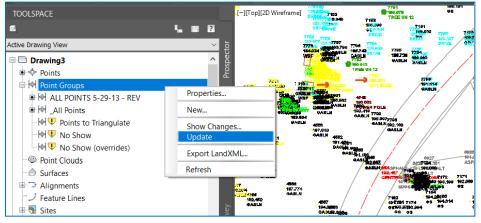
19. Review imported data from **TOOLSPACE** palette > **Settings** tab > **Survey Database**





20. From TOOLSPACE palette > switch to Prospector tab > browse to Point Groups collection > notice two things here:

- a. NEW point group is automatically, with the same name as source file
- **b.** Yellow **U** shield, denotes out of date content. Right click on Point Group collection > click on





Survey Database created Geometry (Survey Networks, Figures and Points) are not all editable as they resided in Survey Database. Typically edits can be done by 3 methods:

1. Editing graphically on screen:

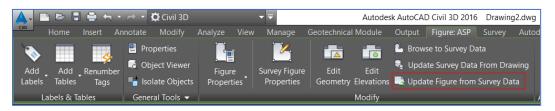




Simple AutoCAD edits such as Grip edits or Erasing geometry is possible. However, changes are NOT applied to Database or original survey file. That if new drawing were to be created edits will not be seen and if data were to ever re-process edits would be lost.

2. Applying Edit to Survey Database:

After graphical edits are made to Survey Figures, they can be written back to Survey Database. Select Figure > from contextual ribbon > click on the **Update Figure from Survey Data** button



A similar process can be used to editing Survey Points. Select Point > from the contextual ribbon > click on *Survey Point Properties* button > edit in window

🛕 - 🗈 🖻 🛢 🖶 🐆 - 🖻 - 🛱 Civ	il 3D 🛛 👻 👻	Auto	desk AutoCA	AD Civil 3D 2016	Drawing2.dwg
- Home Insert Annotate Mo	dify Analyze View Ma	nage Geotechnical Modul	e Output	Survey Surve	ey Point: 7203
Add Edit Laber Tables Text		Survey Point Browse to Ge Properties Survey Data Cal	v∎ edetic ∲		- Create - Imr Points & Cre
Labels & Tables General Tools 👻	Mod	dify A	nalyze CO	GO Point Tools 👻	Launo
7203 + 183.033	Survey Point Properties	Value X 7203 2133627.9442 1020546.1806 183.033 GS	2		
GS	Longitude Latitude Network Import event Original number Original name Startedfined	-90.51386755 32.18170918 ALL POINTS 5-29-13 - REV.txt 7203 OK Cancel Help	3		

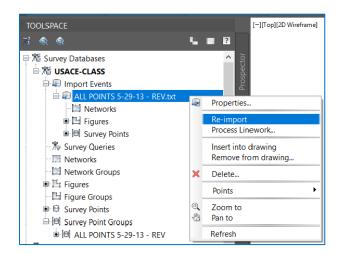
These edits are only written to Survey Database, if new drawing is created these edits will be seen. However, if original source file were ever to be RE-imported (#3 below) edits will be lost.

3. Editing original source file

Any new Survey Database created from edited file will be corrected any existing survey Databases will need to be updated by using the *Re-import* option on Import Event in Survey Database







Survey points can still be managed via Description Key Sets, Point Groups or standard AutoCAD Layer control.





Working with Lidar Data

For this Project we will be using Project Gathered (.LAZ) files. Autodesk Recap supports this point cloud native file format of LAZ as well as the following Point cloud formats:

CL3 (Topcon), CLR (Topcon), E57 FLS (Faro), FWS (Faro), LSPROJ (Faro), LAS PCG PRJ (Leica), PTG (Leica), PTS PTX RCS RDS (3D only; Riegl), TXT XYB XYZ ZFS (Zoller+Fröhlich), ZFPRJ (Zoller+Fröhlich), and E57 PTS PCG RCP/RCS

The Basic Workflow:

- 1. Use Autodesk Recap to Create Point Cloud from .LAZ file
- 2. Use Civil 3D to import Recap Point Cloud
- 3. Use Civil 3D to create Surface

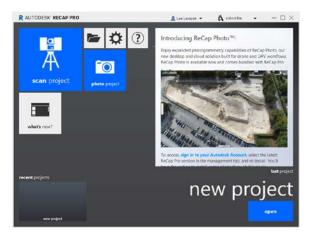


Possessing Lidar Data via Autodesk Recap

- 1. From Autodesk Recap
- 2. Start by clicking on the Scan Project button

File name | version: usace draft training content v2_jonathan.docx ©Copyright 2017 Advanced Solutions, Inc. All Rights Reserved





3. Name Project and click on the **proceed** button

•	import files
	select files to import
	ereste new project finit wir med größet name Mergenzeit Unten apliet is zwei ywar files O'Uten kongenagetu, eis ficzingenon odwat
← sus pro	drag files or folders here pend joct

4. Select or Drag and Drop .LAZ files to import: *erdc_701200_3576000_oct(5cm).laz*



5. Set filtering or advanced options,



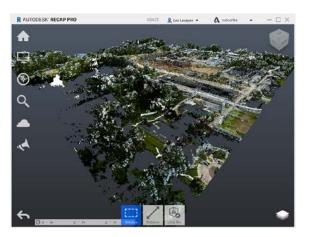




6. Once done click on *import files* button (wait for it...)



7. Once done, click on index scans button



- 8. Navigate, View and Measure as Desired
- 9. Save Project





From Civil 3D

- 1. Start New Drawing using USACE Template
- 2. From the Ribbon *Insert* tab > *Point Cloud* panel > *Attach* button

			Autode	esk AutoCAD Civil 3D 2016	6 Drawing1.dwg	 Decision 	word or phrase	St Q Hardye
Home Irset Annotate		e View Manage						
Kand Desktop Storm Mont Points from File Mont		infraWorks 360	t Create	Attach Clip Adjust	 Underlay Layers *Frames vary* * Snap to Underlays ON * 	Autodesk Attach Field	🗗 OLE Object	Data Downlo
Import -		Infra/Works 360	Block -	Refere	ence 👻	Autodesk ReCap		
Start. Drawing1*	(F) (F)						dex scans and create a	nd edit point cloud
A 900 dao	V 🖉 🕆 🐔	DByLayer	- ByLayer	✓ —— ByLayer ✓ E	ivColor -	project files.		
-gropg2D Wirehamej						RECAP		
						Press F1 for more he	lp	

3. Navigate to the saved RECAP saved file: *erdc_701200_3576000_oct(5cm)*

2					
Constanting of the		<		-	
14		File name:		Qpen	
Treason (¥	Files of type:	Point Cloud Project (* rcp)	Cancel	
			Point Cloud Project ("Ircs) Point Cloud Scan ("Ircs)		

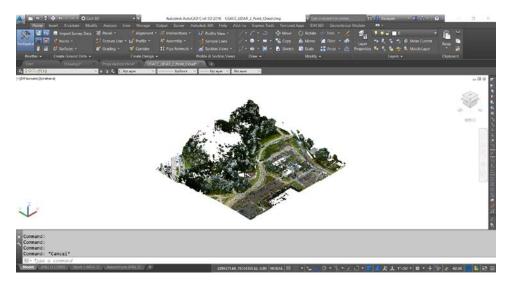
- 4. From Attach Point Cloud dialog box:
- 5. Scale: 1
- 6. Insert: 0,0,0
- 7. Rotation 0
- 8. Import to 0.0

🛕 Attach	Point Cloud			×
<u>N</u> ame:	erdc_700800_3575600_oct(50	em)	~	<u>B</u> rowse
Preview		Path type Full path Insertion point Specify on-screen X: 0.00 Y: 0.00 Z: 0.00	~	Scale Specify on-screen Specify on-screen Specify on-screen Specify on-screen Angle: 0.00 Use geographic location Lock point cloud Zoom to point cloud
Sho <u>w</u> De	etails	ОК		Cancel <u>H</u> elp

9. View and Orbit







10. Select Point Cloud > from contextual Ribbon > Civil 3D panel > *Create Surface from Point Cloud* button



- **11.** Follow wizard
- **12.** General: Set Name and Style

enerol		
ant Cloud Selection	Name	
on-Ground Point Filtering	SURF «[Next Counter(CP)]>	
	Description	
	Style	
	🗠 V_TOPO_Contours_18_58 (USACE) 🔷 📕 💌 🖪	
	Render material	
	G ByBlock →	
	Layer	
	HM-SURF-*	

13. Point Cloud Selection (would recommend reducing area for processing speed)



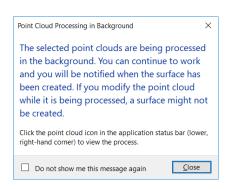


General > Park Coul Street from Hen-General Park Filtering	Ct Ct	2				
	Selection Window area	Pont Cloud Name	Points Selected 2007/105	Percentage to import 100%	Distance Between P 0.011534202756	
	Total number of points	1elected 2027105				
	< Bock	lest > Ore	te Surface	Cencel	eric .	

14. Non-Ground Point Filtering: method

Create TIN Surface from	n Point Cloud - N	on-Ground Point	t Filtering			×
Creater In January Iou Entendi Entendia Selection	Filter method Planar avera (Ringing information No filter	ige	- netrog	<u>.</u>		
	< <u>B</u> ack	∐ext >	Create Surface	Cancel	Help	//

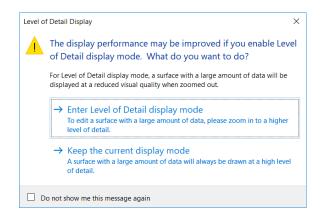
- 15. Select the Create Surface button
- 16. Because of Point Density will take a while, and will possess in Background



17. You might receive a Level of Detail Display dialog box



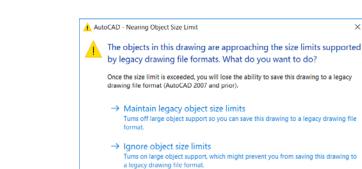




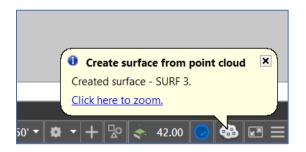
×

Cancel

18. You might receive an AutoCAD message **19.** to CAD – Nearing Object Site Limit dialog box



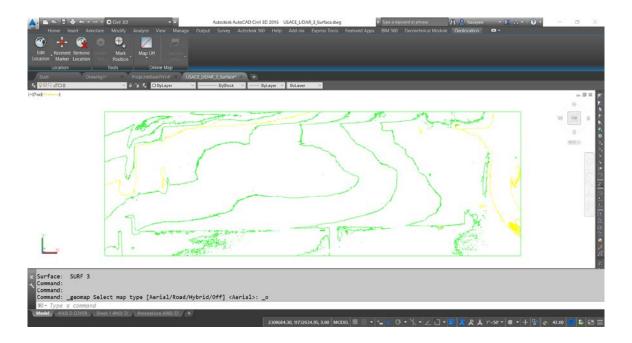
20. Lower Right of AutoCAD tray will notify you once Surface is Complete



21. Once computing is done, you can disable the Point Cloud to only show the newly created Surface.







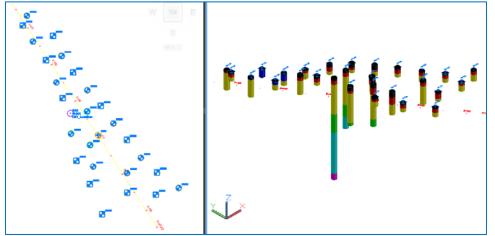




Working with Geotechnical Data

The Geotechnical Module provides tool to quickly process Geotechnical Data and create dynamic visual representations of collected as:

- Civil 3D COGO points at Northing and Easting (seen in Plan View)
- Strata data will be hosted in Database (SQL database)
- 3D Solids "Stacks" with matching boring data (seen in 3D)
- Civil 3D surfaces from strata
- Civil 3D profiles from strata



The Basic Workflow:

- 1. From Civil 3D connect to bore hole data
- 2. Create Surfaces
- 3. Create Profiles

NOTE: For this to work the Geotechnical Module extension needs to be installed.





Creating/Connecting to Data Base and Importing Data:

Databases created by the Geotechnical Module are created and stored locally and can be found at: C:\Users\<USERNAME>\AppData\Local\Microsoft\Microsoft SQL Server Local DB\Instances\Geotechnical Module.

EXERCISE: Importing Geotech Data

- 1. From Civil 3D > Start New Drawing using USACE Template
- 2. Open File: USACE_Geotech_1.dwg
- **3.** From the Ribbon Geotechnical Module tab > Data Management panel > Connect button



4. Next, *Login* to local Geotechnical Module Database

Login	
Database	
Geotechnical Module	
	Manage Connections
Username	
Administrator	
Password	
	Login Cancel



5. From the dialog box pick on the *Create* button.



 Fill in fields as desired and pick the Save button (You MUST give Project ID, Name Status and Category, the rest are optional)

Project Details			
Project ID		Contractor's Name	
For Class		UNK	
Name		Project Engineer	
Geotech Example		UNK	
Status	Manage	Office	
Desk Study	*	Mobile, Al	
Category	Manage	General Project Comments	
Default	•	** Your Notes Here**	
Location of site			
UNK			
Client Name			
UNK			

7. Once Connection has been created pick **OK** button

eotechnical Moc	iule								
Project ID	Ŧ	Project title	Ŧ	Status	Ŧ	Category	Ŧ	Location of site	Ŧ
For Class		Geotech Example		Desk Study		Default		UNK	
	(A)							Page 1 of	+ 1 (1 of 1)
⊆reate	Edit	Delete						<u>O</u> K	⊆ancel





8. Then from the Geotechnical Module tab > Data Management panel > Connect button >



- 9. From the dialog box
- **10.** File Selection:
- 11. Pick on the Add button > browse to and select: GEOL.csv and HOLE.csv files
- 12. File Format: CSV
- 13. Mapping: Geotechnical Module 2014/2015
- 14. Delimiter: Command (,)
- 15. Quote Character: <none>
- 16. When done click *Next* button

Geotechnical Module					
File Selection	Specify the file form	at and add the files to import.			
File Checks	File Format	CSV *	Delimiter	Comma (,)	Ŧ
Create Submission	Mapping	Geotechnical Module 2014/2015 *	Quote Character	<none></none>	
Location Selection					
	GEOL 12KB	CSV			
Preparation					
Plan	HOLE	CSV			
Import	1KB				
	Add	Clear		Overwrite with e	mpty values
			Back	Next	⊆ancel

17. File Checks:

Should read files as "Valid", click the Next button

File Selection	Please wait while the selected files are checked for usability.	
File Checks	HOLECSV	Valid
Create Submission	1KB	1 Warning
Location Selection		
Preparation	GEOLCSV 1218	Valid 1.Warning
Plan		
Import		
	No errors were found.	
	<u>Back</u> N	ext <u>Cancel</u>

18. Create Submission:

Processes will be a quick flash, and will move on to next automatically





19. Location Selection:

Option is presented here to use or not borings into project via check box [] (all are selected by default). Click *Next* button.

e Selection								
e Checks		Location 7	Туре 🔻	Ground Leve 7	Final Depth 7	Start 7	End	T
eate Submission		BH127	CP	13.45	12.50			
ation Selection		BH128	CP	13.69	11.75			
		BH129	CP	13.60	21.95			
paration		BH130	CP	14.00	20.00			
1		BH134	CP+RC	13.89	52.70			
ort		BH135	CP	13.69	30.15			
		BH136	CP	11.69	10.05			
		BH137	CP	6.40	10.05			
		BH138	CP	5.69	10.05			
		BH139	CP	5.19	6.10			
		BH140	CP	11.89	5.05			
		BH141	CP	13.10	5.50			
	Select	t All Clear						

20. Preparation:

Processes will be a quick flash, and will move on to next automatically

21. Plan:

Show report of import. Click on Next button

Geotechnical Module						
File Selection	The following are the changes	which will be ap	plied.			
File Checks	Table 🔻	Additions 7	Updates 7	Unaffected 7		
Create Submission	Location Details	28	0	0		
	Orientation and Inclination	1	0	0		
Location Selection	Field Geological Descriptions	128	0	0		
Preparation						
Plan						
Import						
				Back	Next Cancel	

22. Import:

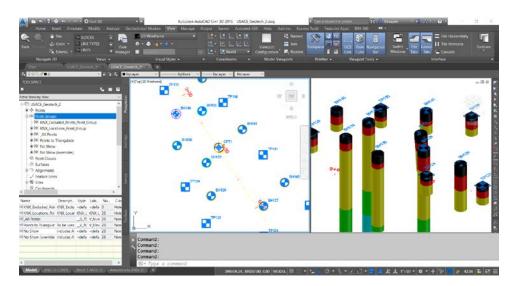
If no errors are found bars should show to 100%. When done click *Finish* button.

Geotechnical Module				
File Selection				
File Checks				
Create Submission				
Location Selection				
Preparation				
Plan				
Import				
				_
				100%
	import complete.			
				100%
		Back	Finish	Gencel

- 23. When process is completed data will appear:
- 24. Points listed in Prospector, "KNX" point groups are automatically



- **25.** Plan View will show points as borings
- 26. Model 3D view will show points with matching 3D borehole cylinder with strata
- 27. Layers will be created too with "KNX" prefix



× ▶ Current layer: 0 ★ 🐔 🍃 🖋 🛼 🛢 💋 📾	- 9: 9 - 8		knx* × ≎☆
Filters	S Name		Linetype
	KNX_BOULDER_CLAY		Continuous
All Used Layers Architectural-A	KNX_COARSE_GRAINED_IGNEUOS	🕴 🔅 🔐 🖬 🛉 🕴	Continuous
É ≣ © Civil-All	KNX_FILL	🕴 🔅 🔐 🖬 white	Continuous
🛛 🖉 🖽 Electrical-All	✓ KNX_GLACIAL_TILL	🕴 🔅 🔐 🖬 red	Continuous
Z 🖬 🛱 Fire_Protection-	A 🖉 🛩 KNX_LIMESTONE	🕴 🔅 🔐 🖬 green	Continuous
≥ Genteral An Sector An	I 🖉 🛩 KNX_PEAT	🕴 🔅 🔐 🖬 🛉	Continuous
Hazmat-All	KNX_Plan_View_Location_Blocks	🕴 🔆 🔐 🗖 150	Continuous
표 🖬 Interiors-All 집 🛱 KNX	KNX_SANDSTONE	🕴 🔆 🔐 🖬 yan	Continuous
E The Civil-All E The Civil-All E Civil-A	✓		
	·		
Invert filte	« <		>
All: 8 layers displayed of	2187 total lavers		





Creating Strata Surfaces

As points only have one elevation associated to them, we will pull for the created Database strata data to create top/bottom subsurfaces. Via the panorama the Geotechnical Module to creates dynamic Civil 3D Surfaces and Point Groups

EXERCISE:

- 1. Continue working or open USACE_Geotech_2.dwg
- 2. From the Geotechnical Module tab > Asset Management panel > Strata button



 The Strata Manger Panorama > Check *Top* and *Base* columns [] Surfaces and Point Groups created automatically

5 = 1							-	The	-	1	
ve Draving View 🗸 🖉	10	10			500 C	10		1		-	
H HY KNG_ANDRINKI - Fug_Reint_Since HI DOL Excused_Plants_Fond_Since HI DOL Controls, Flant_Gines HI M Protocontols, Flant_Gines HI M Protocontols Flant_Gines HI Protocontols HI Protocont	Bang B	N. Geo	ogy Code		-			6	6) (s)	0	2.4
⇒ Surfaces # ⊕* BOULDER CLAY - Base	II State	Top	Base	-	Geology Code	T Location Count	7 Top Minimum	T Top Maximum	T Base Minimum	Y Base Maximum	Thickne
BOULDER CLAY - Top	0	(11)	: [1]	12	FILL	28	0.00	0.00	0.10	2.60	0.10
				128	PEAT	4	0.10	0.40	0.30	4.00	0.40
#⊕* FBL - Top	•	- 10									
#⊕* Fill - Top #⊕* GLACIAL TILL - Bese #⊕* GLACIAL TILL - Top	8			12	GLACIAL TILL	24	0.30	2.60	1.20	5.30	0.70
# ⊕ * FILL - Top # ⊕ * GLACHALTILL - Base # ⊕ * GLACHALTILL - Top # ⊕ * UMESTONE - Base	000					24 27					
 Interface Interface	0000				GLACIAL TILL	7.5	0.30	2.60	1.20	5.30	0.70
# ⊕ ⁺ Fill - Top # ⊕ ⁺ GLACAL TILL - Base # ⊕ ⁺ GLACAL TILL - Top # ⊕ ⁺ UMESTONE - Base # ⊕ ⁺ UMESTONE - Top	0000				GLACIAL TILL BOULDER CLAY	7.5	0.30 0.80	2.60 6.30	1.20 4.30	5.30 18.50	0.70 1.30

Band by: specify the type of geotechnical data to be used to create the surfaces. **State**: icon indicates if the data in the project from which the surface was created has altered

Surfaces are using the latest data

Surface needs re-synchronizing with the database.

Top: Toggles to show or hide the top surface of the stratum,

Base: Toggles show or hide the bottom surface of the stratum,

Strata name: The column name will change to reflect the current Band by option, the value displayed is the unique name for the stratum. The value is dependent on the band by option.





Creating Geotechnical Profiles

The Geotechnical Module has the option to Select Alignments from Drawing or Create Alignments on the go for Profiles. Creating Profile Views is based on Civil 3D technology, using Geotechnical Module wizard to project surfaces and borehole log strips.

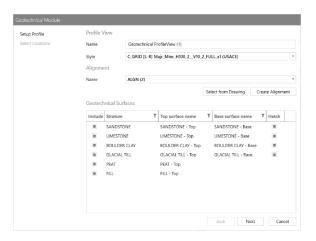
NOTE:

For profiles to be created drawing must be connect to a project and have strata surfaces created

EXERCISE:

- 1. Continue working or open USACE_Geotech_3.dwg
- 2. From the Geotechnical Module tab > Profile panel > Create button >

- 3. The Geotechnical Style Set wizard > *Setup Profile* window:
 - a. Name: leave default
 - b. *Style*: leave default
 - c. Alignment: AL (2)
 - d. *Geotechnical Surface*: default ALL sleeted (if a Top and Base was created for a material a Hatch will automatically be generated)



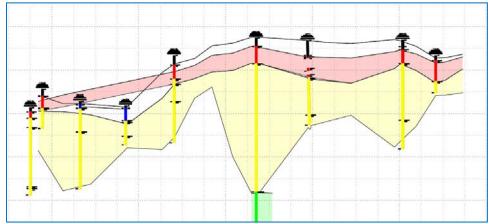




- **4.** Select Locations window:
 - a. **Style**: Select from the predefined list of styles to use when creating the borehole log strips on the profile.
 - b. Filter Location:
 - **i. By Buffer**: Enter a distance to use to find all borehole locations within the specified distance from the alignment. The Dynamic Toggle will search for new borehole locations within the buffer distance to project onto the Profile View when the alignment is modified.
 - ii. From drawing: ability to select locations from the drawing

Setup Profile	Style Locations			
Select Locations	Style	Geology Code		
	Filter Locations			
	By buffer	20.00 🗘 🔳 Dynamic		
	From drawing	Select		
	Selected Locatio	ns		
	Location ID	T Location Type	▼ Status	¥ Easting (m)
	BH127	Loading	Loading	
	BH135	Loading	Loading	
	BH136	Loading	Loading	
	BH137	Loading	Loading	
	BH138	Loading	Loading	
	CPT1	Loading	Loading	
	TP121	Loading	Loading	
	TP126	Loading	Loading	
	TP127	Loading	Loading	
		(i)		► Page 1 of 1 (9 of

 After clicking the *Finish* button, it will return to model space to select insertion point for creation of Profile View



The Hatch patterns can be control from:

- From Ribbon > Geotechnical Module tab > Assets Management panel > Hatches button
- Profile View Properties > Hatch tab





For more information, from Ribbon > **Geotechnical Module** tab > click on the **Help** button to PDF help file

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CSV Geotechnical Module 2014/2015 Mapping	
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Step 2: File Checks	
Step 3: Locations Selected	
Step 4: Plan	
Step 5: Import	
Creating and Managing Database Connections	
Updates	
To check for Updates	





Surfaces: from other data sources

Introduction

The most accurate source for surface creation is field collected data, however at times the need to move forward with less accurate data available at hand or sometimes surveying task are outsourced and need to recreate existing site conditions. We will look at two methods for creating surfaces:

- Using contour polylines
- Using Land XML file

Surface from Polylines

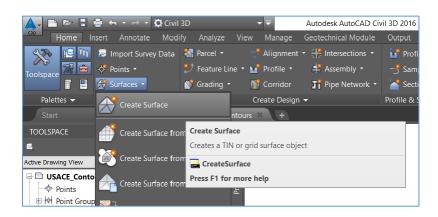
When creating surfaces from contour polyline data accuracy is sacrificed in this method. Elevation are only given at vertices and triangulation is interpolated in-between contours.

The Basic Workflow:

- 1. Create Surface
- 2. Add Contour Data
- 3. Edit Surface as necessary

EXERCISE:

- 1. Open File: USACE_Contours.dwg
- From the Ribbon Home tab > Create Ground Data panel > expand Surfaces button > select Create Surface button



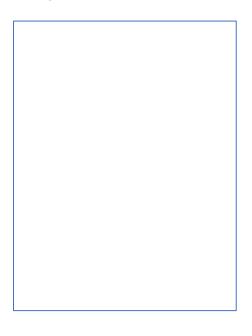
3. From the *Create Surface* dialog box name surface *EG Contour*s and click the *Ok* button





ype: TIN surface V	Surface layer: HM-SURF-EG Contours
Properties	Value
Information	
Name	EG Contours
Description	Description
Style	V_TOPO_Contours_1ft_5ft (USACE)
Render Material	
Kender Material	V_TOPO_Contours_1ft_5ft (USACE)
	V_10P0_Contours_itt_5it (USACE)

 From the TOOLSPACE palette > Prospector tab > expand the Surfaces category > expand EG Contours > expand Definitions > right click on Contours > select Add...



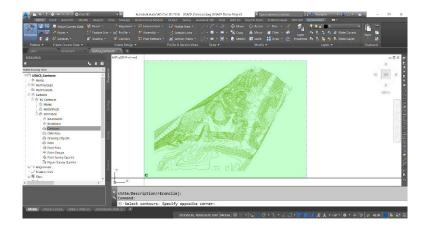
5. From the *Add Contours Data* dialog box > pick *Ok* button





Weeding factors	
Distance: 15.000'	Angle:
15.000	₩₹
Supplementing factors	
Distance:	Mid-ordinate distance:
100.000'	1.000'
Filling gaps in contour data Swapping edges Adding points to flat triangl Adding points to flat edges	e edges

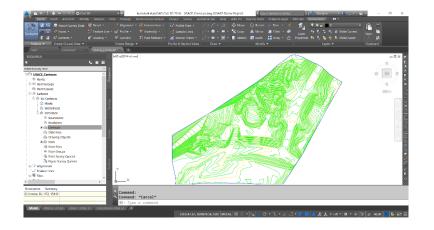
6. From model space > window over ALL contours > hit enter once done.



7. From model space surface will be created











Surface from XML file

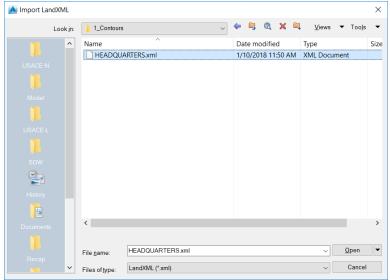
When receiving survey data form contracted surveyors, ask for a LandXML export file of the existing ground surface. It is a more accurate method of rebuilding a terrain as not only elevations are shared, but boundaries and break lines come through as well.

EXERCISE:

- 1. Start by creating a **NEW** drawing using default template.
- 2. Switch to Model tab
- Set coordinate to MS83-WF. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...



- 4. From the Ribbon *Insert* tab > *Import* panel > *LandXML* button
- 5. From the Import LandXML window browse to > HEADQUARTERS.xml



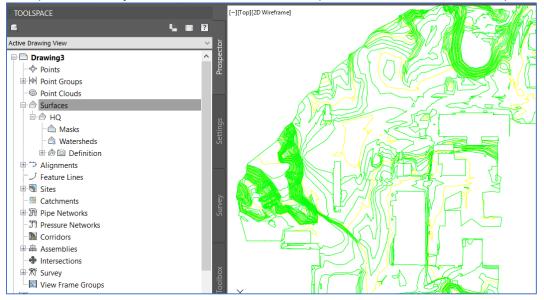
6. From the Import LandXML window > uncheck *CgPoints*





🛕 Import LandXML		×
Alignments Site:		Edit LandXML Settings
Parcels Site:	 C 	
Project name:K:\SURVEY	\1025 USACE\102511.01 manufacturer:Autodesk,	t:squareFoot diameterUnit UTCX5BURG\dwg\HEADQ\ Inc. manufacturerURL:ww
<		>
Browse	ОК С	ancel Help

7. Once the import is done, you can see Surface from Prospector tab and from model space







Sites, Feature Lines & Grading Objects

Introduction

Drawing contours by hand has long been the method how sites are graded, Civil 3D presents an easier more efficient way to grade. Typical workflow is to start with as site drafted using 2D polyline defining building foot prints, pavement, curbs, etc. These drafted AutoCAD 2D linear elements will serve as a starting point to create Civil 3D Feature Lines to assign 3D elevations. To then create Grading Objects to create a Finished surface.

Key Concepts

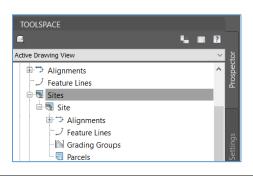
- Understanding Sties, Feature Lines and Grading Objects
- Feature Line and Grading Tools
- Building Pad (split level)
- Retaining Wall
- Detention Pond
- Parking Lot

SITE: Understanding Feature Lines & Grading

To work with Feature Lines and Grading Objects you will first need to understand awesome power that is unlocked when dealing with Sites inside of Civil 3D. Remember with great power comes great responsibility.

Understanding Sites

First, do not get the term "*Sites*" confused with a physical coordinate location or project extents/limits. The simplest explanation is that *Sites* are repositories of data. Found and managed from on the *TOOLSPACE* > *Prospector* tab > *Sites* collection. Sites can host of four of Civil 3D objects types: Alignments, Feature Lines, Gradings and Parcels



Note:

Alignments and Feature Lines are the ONLY 2 Civil 3D objects that can exist outside of Sites. It was only after the service pack that Civil 3D 2016 first enabled the "Site Less" Future Line option.



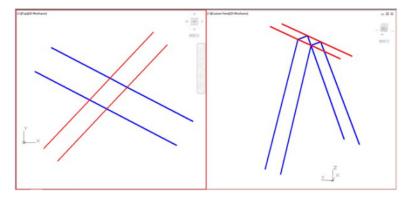


Objects inside of the same Site will interact with each other. To avoid interactions new Sites can be created to silo data and kept apart. Typical behavior of data in same site:

- **Alignments**: will act as parcel lines, as if they close a Parcel will be created. Aliments can cause Parcels to split.
- *Feature Lines:* will interact with each other creating new verities
- **Grading Groups:** grading will also push/pull and clean up to each other.
- **Parcels**: parcels will resize and subsidizing Easley use of shard lot lines. Linework must close for a parcel to exits and data to appear here.

Understanding Feature Lines

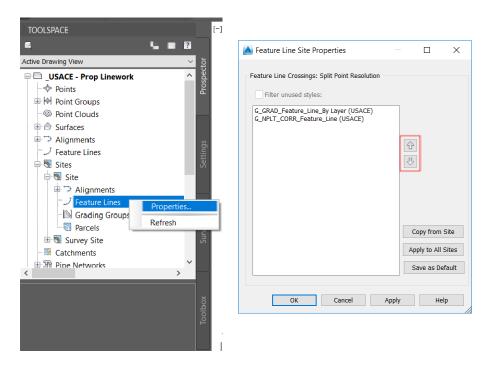
Features Lines have incredible intelligence or clumsiness when placed inside of the same Site. A "phantom" Point of Intersection (PI) will be created where lines cross. This newly created vertex will create elevation changes, most of the time causing unwanted results.



To control this behavior within a Site, from **Prospector** tab > expand **Sites** collection > expand Site used > right click on **Feature Lines** collection > select **Properties...> from** the dialog box > **Feature Lines Crossing: Split Point Resolution** is where available styles in drawing can be organized. Based upon the order a hierarchy will be established to control how lines push and pull each other.







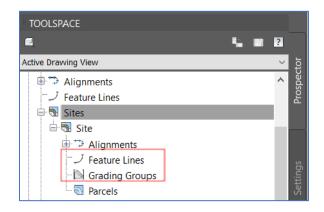
If NO interaction is desired Feature Lines, users will have two options: move them to different **Sites** (create new ones as needed) or moved them to site **<None>**

TOOLSPACE	[][Top][2D Wireframe]	Move to Site ×
Active Drawing View	Frospector	Destination site:
J Feature Lines J Feature Lines Grading Groups Parcels Survey Site Survey Site J Pipe Networks J Pipe Networks Orridors Assemblies	Properties Apply Feature Line Names Apply Feature Line Styles Remove Dynamic Links Raise/Lower Add to Surface as Breakline Move to Site Copy to Site	
Intersections TS Survey Survey Data Shortcuts ICAUsers Name	Select Select Zoom to Pan to Refresh	This command may change data in both the source and destination sites. OK Cancel Help

The idea of a "Site-Less" Feature Line is great, it simplifies workflows as a starting point and can cleans up the clutter of keeping track of multiple sites. If *Grading Objects* are to be created from *Feature Lines* they <u>MUST</u> be inside of the *Site*.



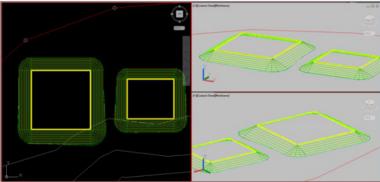




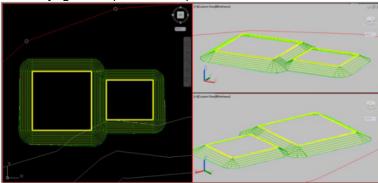
Understanding Grading Objects

Like the behavior of Feature Lines, when Grading Objects are collected in the same site they will interact with each other. In the examples below look at how contours clean up:

1. Grading Objects spread apart where they don't touch while daylighting.



2. Grading Objects where daylights slopes clean up.





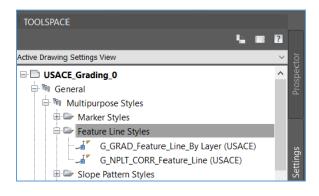


Feature Line Tools

Unlike AutoCAD lines or polylines, Figure Lines provide unique interfaces to Name, Control and Edit this intelligent Civil 3D object.

Feature Line Configuration

There are **2** configured Feature Line Styles in template. They can be from the **TOOLSAPCE** > **Settings** tab > **General** category > **Multipurpose Styles** collection > **Feature Lines Styles**



Feature Line Properties

The dialog box has two tabs to edit and obtain information:

- Information: tab to assign or change a Feature Line Style or Name (optional)
- Statistics: read out of Feature Line details in read only fields.

formation Statistics	Information Statistics	
✓ Nome <give here="" name="" undue=""> ✓ Style ▲ G_GRAD_Feature_Line_By Layer (USACE) ✓</give>	Property Number of Points P1 Points Elevation Points 20 Length 30 Length Minimum Elevation	Value 2 2 0 35.410' 3.5.410' 0.000'
	Maximum Elevation Minimum Grade Maximum Grade	0.00% 0.00% 0.00%
	Breakline Data:	
	Surface	Breakline Group





Creating Feature Lines: from objects

The most common method for creating Feature Line is converting them from 2D AutoCAD linework. From the *Ribbon* > *Create Design* panel > *Feature Line* flyout > *Create Feature Lines from Objects*.

	🚔 🕂 - 🖻 - 🛱 Civil Insert Annotate Mod		Autodesk A nical Module		ISACE_Grading_1.dwg itodesk 360 Help	Add-ins
Toolspace	 Import Survey Data Points • Surfaces • Create Ground Data • 		ersections + sembly + letwork +	Profile View - -3 Sample Lines Section Views - Profile & Section Views	/ • / • ⇒ / • ● • ■ • ♥ • @ • ♥ •	+‡+ Move *& Copy A Strete
Start	Drawing1*	Create Feature Lines from Objects				
[-][Top][2D Wireframe]		← → ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	Creates feat A feature lin recognize a	ure Lines from Objects ure lines from lines, arcs, j le is a special type of line nd use as a footprint.		
		Create Feature Line from Stepped Offs	CreateF	eatureLines r more help		

The provided dialog box allows for assignment of:

- Site: recommend Site < None> as starting point. Set specific site if known.
- *Name*: optional, recommend giving unique names
- *Style*: optional, will control look and split point behavior.
- *Layer*: target layer for feature line
- Conversion options:
 - o *Erase existing entities*: option to keep original linework
 - o **Assign elevation**: will open new dialog box to set elevations
 - Weed points: will remove elevations, at user input

When the Assign elevation is selected a second dialog box will be presented more options:





- *Elevations*: set elevation from TIN surface
- From Gradings: set elevation from Grading Objects
- From surface: will assign verities elevations form target surface.
 - o Insert intermediate grade break points: will add new vertex over tin lines.

Ste: None			
Image: Conter(CP)> Assign Elevations Style G. GRAD_Feature_Line_ByLayer(USACE) Image: Conter(CP)> Style Image: Conter(CP)> Image: Conter(CP)> Image: Conter(CP)> Image: Conter(CP)> Image: Conter(CP)> Image: Conter(Conter(CP)> Image: Conter(Conter(CP)> Image: Conter(Conter(CP)> Image: Conter(Conter	Site:		
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Length 5.000' Close Point Removal 30 distance 0.100' 0 of 2 vertices will be weeded			
Close Point Removal 3D distance 0.100' 0 of 2 vertices will be weeded		Crade 0.01%	
☑ 3D distance 0.100' 0 of 2 vertices will be weeded		Grade 0.01%	
☑ 3D distance 0.100' 0 of 2 vertices will be weeded			
☑ 3D distance 0.100' 0 of 2 vertices will be weeded			
0 of 2 vertices will be weeded		✓Length 5.000'	
		Close Point Removal	
		Close Point Removal	
OK Cancel Help		Close Point Removal	
OK Cancel Help		Close Point Removal	
		Close Point Removal S 3D distance 0.100' 0 of 2 vertices will be weeded	





The Elevation Editor

Using the auxiliary editor window can be used to edit Feature Lines, Parcel Lines or Survey Figures. A few tips on how to use this box.

- When **NOTHING** is Selected = **EVERYTHING** is Selected
- The Value of Cell in **1st Row** is Key
- Use Shift or Ctrl key for multiple or controlled selections.
- Green triangles \blacktriangle are Geometry Points (PI). The X, Y and Z values are edible.

i,	G, 🖂 🕅	合 🖑 🕅 1.0	000'	1941 🖪	
R	Station	Elevation	Length	Grade Ahead	Grade Back
	0+00.00	201.152'	65.505'	-3.30%	3.30%
	0+65.51	198.990'	47.466'	-1.65%	1.65%
	1+12.97	198.208'	37.415'	-524.41%	524.41%
	1+50.39	2.000'	106.595'	186.83%	-186.83%
	2+56.98	201.152'			

Station: identifies vertex distance from starting point.

Elevation: point elevation at station.

Length: distance from previous point.

Grade Ahead: grade change here will edit elevation at next point.

Grade Back: grade change here will edit elevation at previous point.

Select Line - Selects a different feature line, lot line, or survey figure for editing.

Q Zoom To - Zooms the drawing display to the selected PI or elevation point.

Quick Profile - Creates a quick profile of the feature line.

Raise/Lower - Adjusts the elevation of rows either upward or downward. Prompts for a new elevation for the first point, then adjusts all rows by the same relative amount.

 \widehat{T} **Raise Incrementally** - Adjusts the elevations of all points upward by the increment value.

Lower Incrementally - Adjusts the elevations of all points downward by the increment value.

Set Increment Value – Specifies the value to be used by the Raise and Lower commands.

Televations - Specifies that the elevations of all selected rows are flattened to either the same elevation as the first row in the selection, or a constant grade from the start elevation to the end elevation of the selection.

 $d_{+} = \frac{1}{2}$ **Insert Elevation Point** - Inserts an elevation point between the start and end stations of the footprint, creating an intermediate elevation point.

Delete Elevation Point - Deletes an elevation point between the start and end stations of the footprint. You can delete only a single-row selection of intermediate elevation points.

Levations from Surface - Set elevations from a surface in the drawing.

A Reverse - This command affects the labeling and stationing of feature lines.

Show Grade Breaks Only -Select to display just the feature line start/end points and any grade breaks in between. This option simplifies the editing process by allowing elevation edits to span multiple points.





Unselect All Rows - Clears any selected rows. This allows the Raise, Lower, and Flatten commands to affect the entire length of the footprint.

Editing Feature Lines Tools

Civil 3D provides advanced editing tool options that can be used on Civil 3D or AutoCAD entities. There are 2 major panels in the Feature Line contextual tab that collect tools for edits:

- Edit Geometry panel
- Edit Elevations panel

	-		Autodesk A	utoCAD Ci	vil 3D 20	16 USACE_Gradi	ing_1.dwg		► <i>Т</i> у	pe a keywora		8	🖁 👤 Ilav	vayen
Analyze View	w Manage	Geotecl	hnical Module	Output	Survey	Feature Line	Autodesk 360) He	lp Add-ins	Express	Tools Fe	eatured App	s BIM 3	360
Feature Line Properties			Add to Surf Apply Feature Apply Feature	ure Line Na	ames	Insert PI Delete P	ンスス マスの チク		Elevation Inse Editor	+ ● rt Elevation Point	X + O Delete Ele Poir	evation	レッ マン マ ヤ	
		Modify	-			Edit G	eometry			Ec	lit Elevatio	ons		

Edit Geometry tools:

Insert / Delete Pl: Inserts/Deletes a vertex on a feature line, survey figure, parcel line, polyline, or 3D polyline

- Break: Breaks a feature line, survey figure, or parcel line.
- 🔀 **Trim**: Trims feature lines, survey figures, or parcel lines.
- Join: Joins connecting feature lines, survey figures, polylines, parcel lines, or 3D Polylines.
- **Reverse**: Reverses the direction of a feature line, survey figure, parcel line, polyline, or 3D polyline.
- *Edit* Curve: Edits the radius of a feature line arc, parcel line arc, or survey figure arc.
- *Fillet*: Fits a curve between two segments of a selected feature line, survey figure, parcel line, or 3D polyline.
- Fit Curve: Fits a curve from a selection of vertices with a feature line, survey figure, parcel line, or 3D polyline.
- **Smooth**: Replaces feature/figure line segments with arcs.
- Weed: Removes unnecessary points from features lines, polylines, or 3D polylines.

Stepped Offset: Creates a new feature line from an offset and difference in elevation from a selected feature line, survey figure, polyline, or 3D.

Edit Elevations tools

Elevation Editor: Edits the vertex elevations of feature lines, survey figures, and parcel lines

Insert/ Delete Elevation Point: Inserts/Deletes an elevation point between two vertices on a feature line, survey figure, parcel line, or 3D polyline

Quick Elevation Edit: Identifies elevations and grades that can be selected and edited as the pointing device moves over feature lines or parcels in the drawing

Edit Elevations: Edits the vertex elevations of a survey figure, parcel line, or 3D polyline at the Command Line Interface

- Set Grade/Slope between Points: Edits the vertex elevations at the Command Line Interface
- A Insert High/Low Elevation Point: Insert Elevation Point from 2 point selection
- Raise/Lower by Reference: Raises or lowers a at a given slope/grade from a specified location





Set Elevation by Reference: Sets a vertex elevation on a feature line, survey figure, parcel line, or 3D polyline at a given grade/slope from a specified location

Adjacent Elevations by Reference: Specify elevations based on a grade, slope, or elevation difference from points on another feature

Specify elevations of the second seco

Elevations from Surface: Assigns elevations to a feature line, survey figure, parcel line, or 3D polyline from a specified surface

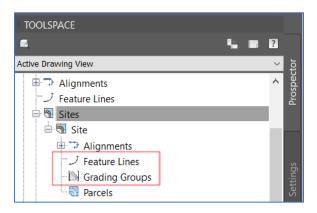
A Raise/Lower: Raises or lowers a feature line, survey figure, parcel line, or 3D polyline

Grading Objects Tools

Grading Objects are built off a base Feature Line and a Grading Criteria, after that Grading can be built off other Grading Objects. The 3D grading is driven from *Grading Criteria*, which are scripted methods that dictate how a slope projects from the base starting Feature Line. These grading methods or strategies can be preconfigured and stored in the *Grading Criteria Set*.



Once a Grading Objects is created it can be found in the **Prospector** tab within the host **Site** in the **Grading Group** collection. The starting base Feature Line must be in the same Site as the Grading Objects are to be created.



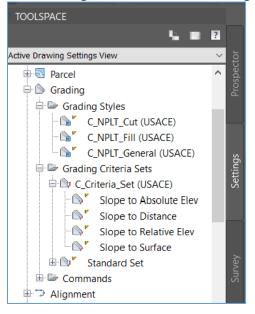




Grading Configuration

There are two (2) main Grading Categories found in the **TOOLSPACE** > **Settings** tab > **Grading** collection:

- 1. Grading Styles: There are 3 configured Grading Styles in template.
- 2. Grading Criteria Sets: There is 1 Grading Criteria Set with 4 configured criteria.

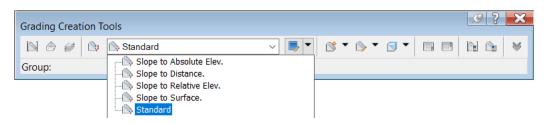






Grading Objects Dialog Bar

From the *Home* tab > *Create Design* panel > *Grading* fly out > *Grading Creation Tool* button



- Set Grading Group Select the current grading group, or create a new group.
- Set Target Surface Select the surface to use as a target.
- 🕮 **Select a Criteria Set** Sets the current criteria set, from which you can select specific criteria.
- 🕞 Standard 🛛 🗹 Grading Criteria dropdown Sets Grading Strategy.
- Style Picker Use these options to edit the current criteria or create a new criteria.

GRADING CREATION TOOLS

- **Create Grading** Creates grading object using the current style and criteria.
- Copy Create Grading Copies an existing grading objects criteria and style
- **Create Transition** Creates a transitional slope between two grading objects.
- Screate Infill Creates a grading face to fill in feature lines or holes in gradings.

GRADING EDITING TOOLS

- **Edit Grading** Uses command line prompts to change the criteria of a grading object.
- Delete Grading Deletes a grading and removes it from the grading group.
- **Change Grading Group** Moves selected grading objects to specified destination group.

GRADING UTILITIES

- **Grading Volume Tools** Opens the Grading Volume Tools dialog bar.
- **Create Detached Surface** Creates a new surface that is not associated with the grading group and does not update to reflect changes in the group.
- **Grading Editor** opens the Grading Editor dialog box opens for tabular editing.
- **Grading Elevation Editor** Prompts you to select an existing feature line or lot line, then displays the Grading Elevation Editor dialog box.
- Grading Group Properties Opens the Grading Group Properties dialog box.
- Grading Properties Opens dialog box to view the properties of an individual grading.

Expand - Shows or hides the current grading criteria values and the style selectors.

Grading Properties

Use this dialog box to view and change the styles and properties for the selected grading.

• **Grading Group**: Specifies the grading group for the selected grading.





- Style Name: Specifies the grading style for the selected grading.
- Property & Value: Displays information about the grading type and grading criteria.

rading Group	Property	Value
GRAD 3 v 🛍	E General	10410404
	Grading Type	Criteria
Description:	Criteria	Slope to Distance
	Criteria Set	C_Criteria_Set (USA

Grading Group Properties

Dialog box has two tabs to view or change general information for the grading group.

- **Information** tab: The options for Automatic Surface Creation and Volume Vase Surface are usually set when the grading group is created, but they can be changed here
- **Properties** tab: Use this read-only tab to review properties and statistics of the grading group.

		Property	Value	Criteria Used	Count
sradi	ng Group 1	Gradings	3	Distance @ Grade	1
escri	ption:	Grading Group Surface	Grading Group 1	Surface @ Slope	1
_	0	Base Surface	EG		
		Cut Volume	5265.27 Cu. Yd.		
		Fill Volume	8639.36 Cu. Yd.		
	×	Net Volume	Fill: 3374.09 Cu. Yd.		
	Tessellation spacing: 10.0000'			Styles Used	Count
	Tessellation angle:			Residential Grading	2
	3.0000 (d)			Cut Slope Grading	1
	3.0000 (0)				
	ne Base Surface	Target Surfaces			
Volu		EG	1		
Volu		EG			

Grading Volumes

Use this toolbar to adjust the cut and fill volumes for a grading group. For Grading Volumes to work make sure the *Automatic Surfaces Creations* and *Volume Base Surfaces* are both checked from the *Grading Group Properties* dialog box. If buttons on this toolbar are not available (dimmed) required data is unavailable.





Grading \	/olume Tools			9 ? 🗙
	Entire Group	◯ Selection	😒 🖾	1.000'
Cut:		Fill:	Net:	· ·
5265.27 0	Cu. Yd.	8639.36 Cu. Yd.	Fill: 337	4.09 Cu. Yd.
Group: G	rading Group 1			

Set the Grading Group - Click to specify the grading group to adjust. The name of the group is displayed along the bottom of the toolbar.

🕅 Grading Group Properties - Opens the Grading Group Properties dialog box.

- Entire Group Click to adjust the elevation of the whole grading group.
- Selection Click to select one or more features. Click to select the features to adjust.

Raise the Grading Group - Raises the elevation of the grading group by user specified value.

Lower the Grading Group - Lowers the elevation of the grading group by specified value.

Auto-Balance Volume - Specify a target value for net volume and automatically balance cut and fill volumes to approach the target. If necessary, re-run the command to get closer to the target.

Expand - Shows/Hides the history of cut and fill adjustments. This history is erased when you close the toolbar.

Volume Display Window: Displays the current cut and fill volumes and the resulting net requirements for the grading group. This display updates whenever you modify either of the two surfaces involved in the comparison.

Creating Building Pads and Sidewalks

This section will focus on building pads and sidewalks for the First and Lower Levels. Various grading ideas will be implemented to set needed design elevations to site.

- Building pads at Finish Floor Elevation (FFE)
- Building drop offset with elevation drop
- Temporary grading surface to set elevations along sidewalks
- Sidewalks projected to temporary surface for elevations
- Creation of preliminary grading surface

EXERCISE: Finished Floor Elevations (FFE)

- 1. Open USACE_Grading_1.dwg
- 2. Xfref:
 - a. EX Site.dwg
 - b. Corridor.dwg
- From TOOLSPACE > Prospector tab > browse to Data Shortcut collection > right click select > Set Working Folder...





- a. Set path to class path: < Project Path Here>
- b. Expand *Surfaces* collection
- c. Right on HQ > select Create reference...
- d. Set Style to: _NO_Display (USACE)
- e. Click **OK** button

Q		Н	HM-SURF-HQ				
Prop	erties		Value				
🗆 In	formation						
	Name		HQ				
	Description	Description					
	Style		V_TOPO_Contours_1ft_5ft (USACE)				
	Render Material						
		🛕 Sele	ect Surface Style X				
			o_Display (USACE) 🗸 📕 🗖 📃				
		O	OK Cancel Help				

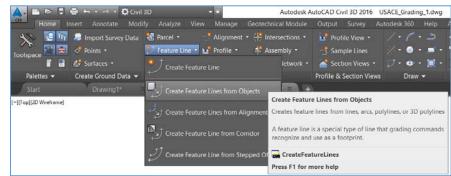




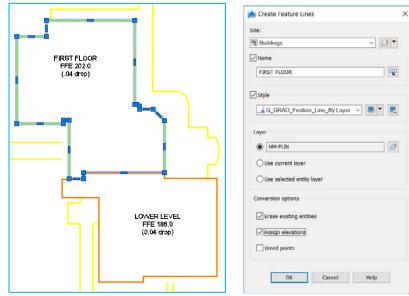
- 4. From *Prospector* tab > browse to *Sites* collection > right click > Select *New...*
 - a. Name: Buildings

🛕 Site Properties - Site		×
Information 3D Geometry Numbering		
Name:		
Buildings		
Description:		
^		
>		

- 5. Zoom and pan to First Floor building foot print
- 6. From the Ribbon Home tab > Create Design panel > Feature Line flyout button > Create Feature Line from Objects



- 7. Select the north FIRST FLOOR building outline (green)
- 8. From the *Create Feature Lines* dialog box:
 - a. Site > Buildings
 - b. V Name: "FIRST FLOOR"
 - c. ✓ Style: use default
 - d. Erase existing entities
 - e. 🗸 Assign elevations



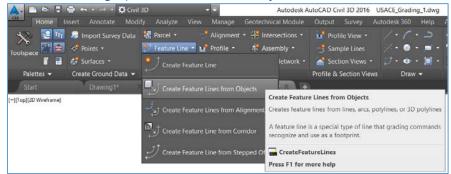




f. From the *Assign Elevation* dialog box > set *Elevations* > 202

Assign Elevations	2
Options	
Elevation: 202	
○ From gradings	
○ From surface	
🔿 Site_Base Bid 🗸	e.
✓ Insert intermediate grade break points	
☑ Insert intermediate grade break points	
OK Cancel Help	

- g. Click OK button
- 9. Zoom and Pan to the Lower Level building foot print
- **10.** From the Ribbon > Create Design panel > Feature Line flyout > Create Feature Line from Objects button



- **11.** Select the south LOWER LEVEL building outline (orange)
- 12. From the *Create Feature Lines* dialog box:
 - a. Site: Buildings
 - b. 🗸 Name: LOWER LEVEL
 - c. **✓ Style** use defaults
 - d. Erase existing entities
 - e. 🗸 Assign elevation





		🔺 Create Feature Lines 🛛 🗙
		Site:
		🕲 Buildings 🗸 🗸 🖓 💌
FIRST FLOOR FFE 202.0		☑ Name
(.04 drop)		LOWER LEVEL
		Style
	۲ <u>ـ</u>	🧃 G_GRAD_Feature_Line_By Layer 🗸 📑 🔻 🔣
<u> </u>) [Layer
	ר ו	HM-FLIN
		O Use current layer
• <u>-</u> 8		O Use selected entity layer
		Conversion options
	LOWER LEVEL	Erose existing entities
<u> </u>	FFE 186.0	☑ Assign elevations
	(0.04 drop)	Weed points
		OK Cancel Help

f. From the **Assign Elevation** dialog box > set **Elevation** > **186**

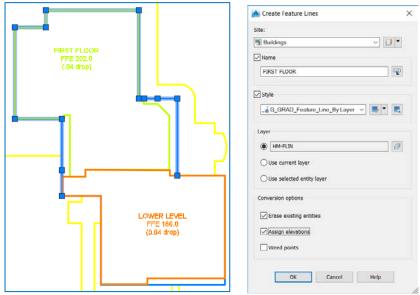
Elevation	in:	186			
O From g	radings				
O From s	urface				
🗁 Site	_Base Bid			~	40
🗹 Inse	rt intermedia	ate grade brea	ak points		



EXERCISE: Building Footprint Offsets

Next create a building footprint offset with a **0.04**' elevation drop from the FFE for the First Floor and Lower Level linework

- 1. Continue working from previous or open USACE_Grading_2A.dwg
- 2. Make sure Layer C-BLDG-FTPT 3 is visible (blue linework)
- 3. From the Ribbon > Create Design panel > Feature Line flyout button > Create Feature Line from Objects >
- 4. Select the northern outer offset building outline
- 5. From the *Create Feature Lines* dialog box:
 - a. Site: Buildings
 - b. ✓ Name: FIRST FLOOR OFFSET
 - c. ✓ Style: use default
 - **d.** ✓ Erase existing entities
 - e. ✓ Assign elevations



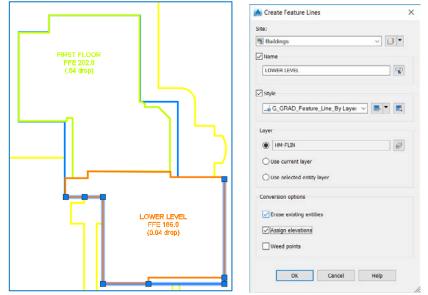
f. From the Assign Elevation dialog box > set Elevation > 201.96

🔥 Assign Elevations	\times
Options	
Elevation: 201.96	
O From gradings	
O From surface	
A HQ 🗸	
✓ Insert intermediate grade break points	
OK Cancel Help	





- 6. From the Ribbon Home tab> Create Design panel > Feature Line flyout > Create Feature Line from Objects button >
- 7. Select the **southern** outer offset building outline
- 8. From the *Create Feature Lines* dialog box:
 - a. Site: Buildings
 - b. ✓ Name: LOWER LEVEL OFFSET
 - c. ✓ Style: use default
 - d. ✓ Erase existing entities
 - e. ✓ Assign elevations



f. From the Assign Elevation dialog box > set Elevation > 185.96

Assign Elevations	×
Options	
Elevation:	
◯ From gradings	
○ From surface	
🗟 Site_Base Bid 🔍 🖸	
Insert intermediate grade break points	
OK Cancel Help	
	/





EXERCISE: First Floor Sidewalks – setting elevations for temporary linework

Using Civil 3D tools from the contextual ribbon elevations will be set-2% slope from building offset outlines using two commands:

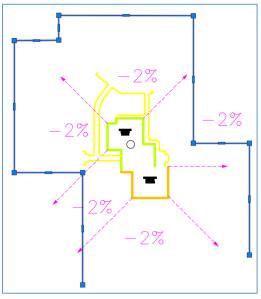
🖄 Adjacent Elevations by Reference:

This command allows to edit multipole vertices by projecting proposed elevations from source linework.

Grade Extension by Reference:

This command steps users through singular vertex edits, by project proposed elevations from source linework.

- 1. Open USACE_Grading_3.dwg
- First, from the Ribbon Home tab > Create Design panel > Feature Line dropdown > First create Feature
 Lines from Objects button
- 3. Select the outer most polyline



- 4. From the *Create Feature Lines* dialog box:
 - a. Site: <*None*>
 - **b.** ✓ Name: North Outer Perimeter
 - c. ✓ Style : default
 - d. Layer: default
 - e. 🗸 Erase existing entities





🛦 Create Feature Lines	×
Site:	
🖏 <none> 🗸 🗸</none>	
✓ Name	
North Outer Permiter	
Style	
🚽 G_GRAD_Feature_Line_By Layer 🗸 📕 💌 📃	
Layer	
HM-FLIN	
O Use current layer	
○ Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

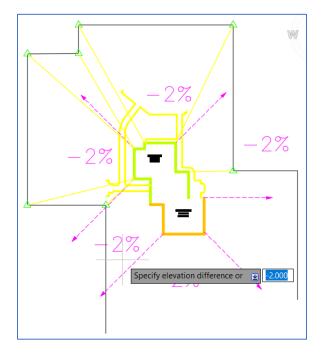
5. Next, select the *GREEN* inner *First Floor Offset* Feature Line > from contextual ribbon > *Edit Elevation* panel > pick the *Adjacent Elevations by Reference* button

	Autodesk AutoCAD Civil 3D 2016 USACI		The second s	llavayen • 🗙 🛆 • 😧 • 🔤 🛛
N	Manage Geotechnical Module Output Survey		on Insert Elevation Delete Elevation	are Line: FIRST FLOOR OFFSET
	Geometry Elevations 💱 Apply Feature Line Styles Modify 👻	。そう Edito Edit Geometry	r Point Point i at the second	Adjacent Elevations by Reference Specifies the elevations of a feature line, survey figure, parcel line, or 3D polyline based on a grade, slope, or elevation difference from polinis on another feature
		W B		AdjacentFeatureElevsByRef Press F1 for more help
	FIRST FLOOR FFE 202.0 (.04 drop)			
4		5		
		• '		

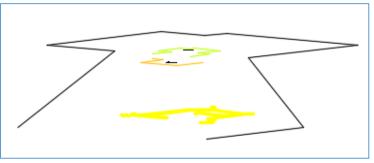
- a. When prompted to Select object to edit > pick the previously created outer most line North
 Outer Perimeter
- b. From command line > Specify by Grade > -2



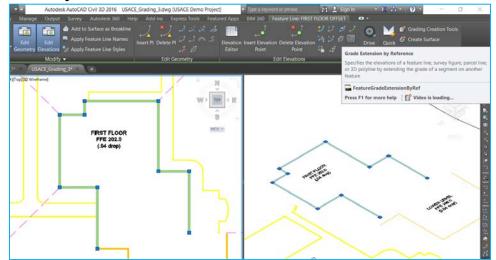




6. Notice, when viewed in 3D, the starting and end points of the line were not edited. This is expected as seen from the previous command, not all vertices were selected.



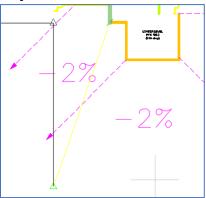
- 7. Each vertex that did NOT get raised will have to be edited one by one.
- 8. Select the *GREEN* inner First Floor Offset Feature Line > from contextual ribbon > *Edit Elevation* panel
 - > Grade Extension by Reference 📐 button



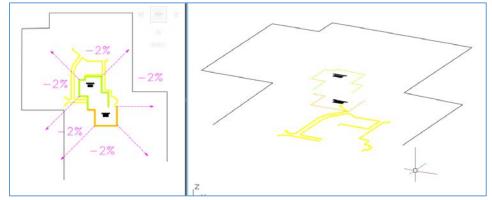




- a. When prompted to **Select reference segment** > select inner **GREEN** left most segment reference segment,
- b. Next prompt Specify point > select the most outer line outer perimeter segment as target, focus on the point to be edited marked with green triangle ▲
- c. On command line > Specify Grade > -2



9. Repeat as necessary to assign elevations to ALL points



Once linework has been set to correct elevation, a temporary surface can be created to elevate surrounding sidewalk linework.

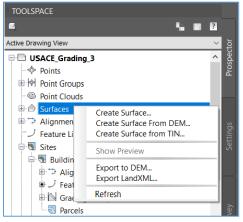




EXERCISE: First Floor Sidewalks – Temporary Surface

With the necessary linework set to the needed elevations a temporary surface will be created using offset and projection linework, which will later be used to set sidewalk elevations.

- 1. Open USACE_Grading_4.dwg
- 2. From **TOOLSPACE** Prospector tab > browse to **Surfaces** category > right click> select **Create Surface...**



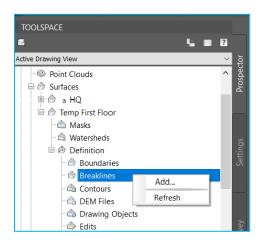
- 3. From the *Create Surface* dialog box >
 - a. Name > Temp First Floor
 - **b.** Style > G_TOPO_Surface_Edits

TIN surface	Surface layer:
The Surface	
Properties	Value
🗉 Information	
Name	Temp First Floor
Description	Description
Style	V_TOPO_Contours_1ft_5ft (USACE)
Render Material	V_TOPO_Contours_1ft_5ft (USACE)
	Select Surface Style Cancel Help
•	w surface which will appear in the list of surfaces in

From TOOLSPACE > Prospector tab > expand Temp First Floor surface > expand Definition collection
 right click on Boundaries > select Add...







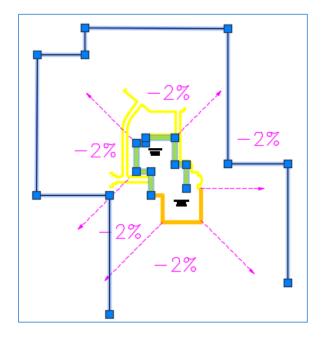
- 5. From the **Add Breaklines** dialog box >
 - a. Desccripton: First Floor
 - **b.** Type: Standard
 - c. UWeeding Factors: unchecked

Description:			
First Floor			
Гуре:			
Standard			~
File link options:			
Break link to file			
Weeding factors			
Distance :		Angle:	
15.000'	10	004.0000 (d)	$\square^4_{\mathbb{C}}$
Supplementing factors			
Distance:		Mid-ordinate distance:	
100.000'	4.2	1.000'	1

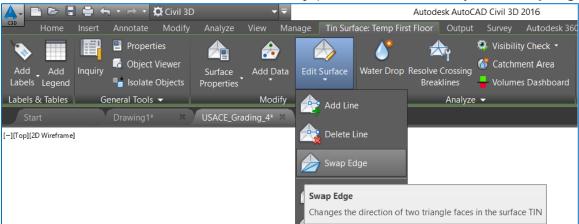
6. From screen select the First Floor offset and the previouly created outter line.







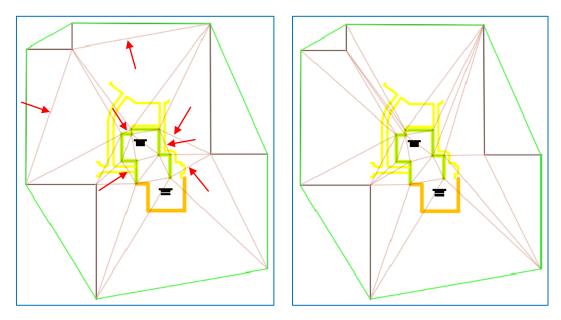
- **7.** The created surface will need to be edited to ensure the -2 % is being followed. Make sure TIN Lines project correctly from inside to outer edges.
- 8. Select the surface from > contextual ribbon > *Modify* panel > *Edit Surface* flyout > *Swap Edge* button



9. Select the TIN Lines to correct triangulation. This process is very user/site speficic.







Once surface edited are complete the created surface will be used to elevate surrounding sidewalk linework. After elevations are set the temp surface can be deleted.

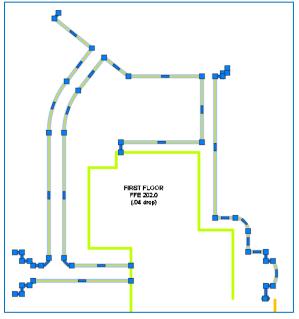




EXERCISE: First Floor Sidewalks – projecting linework

With the temporary surface in place that slopes away from building at -2% in place, the next step is to create sidewalk features that pull those elevations.

- 1. Open USACE_Grading_5.dwg
- 2. First, select all the YELLOW 2D polylines surround the northern First Floor (select simlar works great)



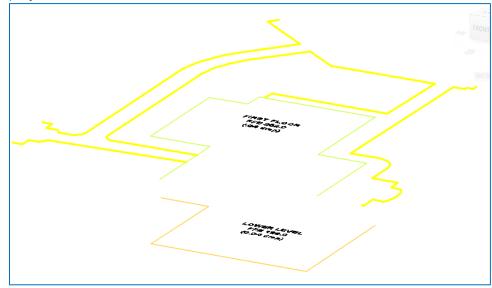
- 3. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Create Feature Lines from Objects button
- 4. From the *Create Feature Lines* dialog box:
 - a. Site: <**None**>
 - b. ✓ Name : North Sidewalks
 - c. ✓ Style : use default
 - d. Layer: Use selected entity layer
 - e. 🗸 Erase existing entities
 - f. ✓ Assign elevation
 - g. From the Assign Elevations dialog box >
 - i. From surface > Temp First Floor
 - ii. Uncheck Insert intermediate grade break points





A Create Feature Lines	×		
Site:			
Name North Sidewalks <[Next Counter(CP)]>			
✓ Style			
Layer		Assign Elevations	
Use current layer		Options	
Conversion options		From gradings From surface	
Erase existing entities Assign elevations		Temp First Floor	
Weed points		Insert intermediate grade break points	
OK Cancel Help		OK Cancel Help	

5. 2D Sidewalk polylines have ben converted to Feature Lines and have been elevated, as seen in 3D view.



6. After Sidewalk geometry is elevated, all temoprary lines and surfaces can be deleted.

A similar process will be followed in the next section to set elevation around the southern Lower Level Perimeter Sidewalks.





EXERCISE: Lower Level Sidewalks – setting elevations for temp surface linework

The same Civil 3D tools used in previous exercises will be used for Lower Level linework. Using Civil 3D tools from the contextual ribbon elevations will be set-**2%** slope from building offset outlines using two commands:

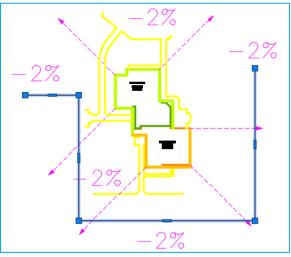
🖾 Adjacent Elevations by Reference:

This command allows to edit multipole vertices by projecting proposed elevations from source linework.

Grade Extension by Reference:

This command steps users through singular vertex edits, by project proposed elevations from source linework.

- 1. Open USACE_Grading_6.dwg
- First, from the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from
 Objects button
- **3.** Select the outer most polyline



- 4. From the *Create Feature Lines* dialog box:
 - a. Site: <*None*>
 - b. ✓ Name: South Outer Perimeter
 - c. ✓ Style: use default
 - d. Layer: use default
 - e. 🗸 Erase existing entities





A Create Feature Lines X
Site:
🖫 Buildings 🗸 🗸 🗸
✓ Name
South Outer Perimeter
Style
🛁 G_GRAD_Feature_Line_By Layer 🗸 📕 💌 🖳
Layer
HM-FLIN
O Use current layer
Ouse selected entity layer
Conversion options
✓ Erase existing entities
Assign elevations
Weed points
OK Cancel Help

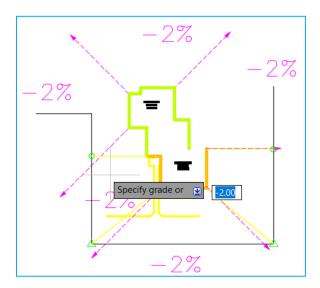
5. Next, select the ORANGE inner Lower Level Offset Feature Line > from contextual ribbon > Edit
 Elevation panel > Adjacent Elevations by Refence button 2010

Autodesk AutoCAD Civil 3D 2016 USACE_Grading_7.dwg [USACE Demo Project]	🕅 🕂 Sign In 🔹 🛪 🌚 🗧 🖂 🗸 Sign In
	BIM 360 Feature Line: LOWER LEVEL OFFSET
Geometry Elevations & Apply Feature Line Styles & U Editor Modify + Edit Geometry	Point Point Adjacent Elevations by Reference Edit Elevations Specifies the elevations of a feature line, survey figure, parcel line, or 3D polyline based on a grade, slope, or elevation difference
- H-	[+](Cutom View][2D Wireframe] From points on another feature AdjacentFeatureElevsByRef Press F1 for more help Video is loading
	TOT TO THE
LOWER LEVEL FFE 186.0 (0.04 drop)	- 200 g 40 m
	Z

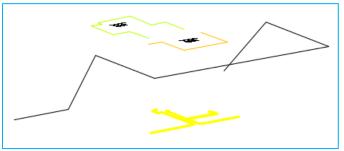
- a. When prompted to Select object to edit > pick the previously created outer most line South
 Outer Perimeter
- b. From command line > Specify by Grade > -2



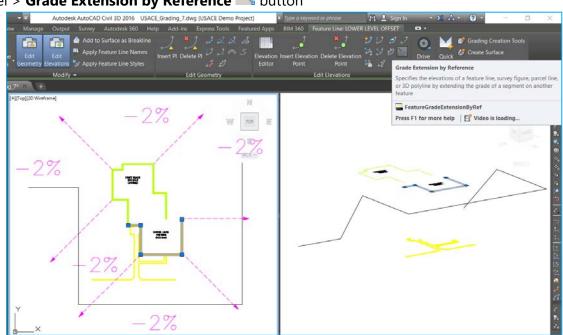




6. Notice, when viewed in 3D the starting and end points of the line were not edited. This is expected as seen from the previous command, not all vertices were selected.



- 7. Each vertex that did NOT get raised will have to be edited one by one.
- 8. Select the ORANGE inner Lower Level Offset Feature Line > from contextual ribbon > Edit Elevation

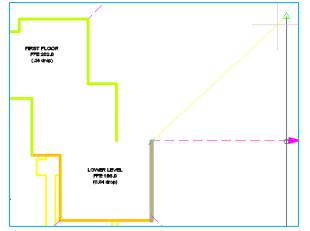




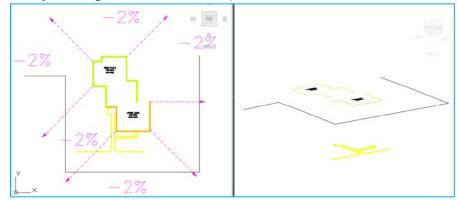




- a. When prompted to **Select reference segment** > select inner **ORANGE** left most segment reference segment,
- b. Next prompt Specify point > select the most outer line outer perimeter segment as target, focus on the point to be edited marked with green triangle ▲
- c. On command line > Specify Grade > -2



9. Repeat as necessary to assign elevations to ALL points



Once linework has been set to correct elevation, a temporary surface can be created to elevate surrounding sidewalk linework.





EXERCISE: Lower Level Sidewalks –temporary surface

With the necessary linework set to the needed elevations a temporary surface will be created using offset and projection linework, which will later be used to set sidewalk elevations.

- 1. Open USACE_Grading_7.dwg
- From TOOLSPACE Prospector tab > browse to Surfaces category > right click> select Create Surface...

TOOLSPACE			
6	5 B	?	
Active Drawing View		\sim	to
USACE_Grading Opints Point Groups Opint Clouds	3	^	Prospecto
 Image: Burfaces Image: Burfaces Image: Burfaces Image: Burfaces Image: Burfaces Image: Burfaces Surfaces Surfaces<!--</td--><td>Create Surface Create Surface From DEM Create Surface from TIN</td><td></td><td>Settings</td>	Create Surface Create Surface From DEM Create Surface from TIN		Settings
🖨 🖏 Sites	Show Preview		Set
i≕ S Buildin in the state in t	Export to DEM Export LandXML		
⊕ 🖾 Gra	Refresh		
- 🗟 Parcels			vey

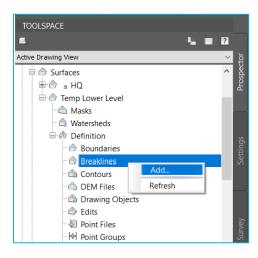
- 3. From the *Create Surface* dialog box >
- 4. Name > Temp Lower Level
- 5. Style > G_TOPO_Surface_Edits

Гуре:		Surface layer:
TIN surface	~	HM-SURF-Temp Lower Level
Properties		Value
Information		
Name		Temp Lower Level
Description		Description
Style		V_TOPO_Contours_1ft_5ft (USACE)
Render Material		V_TOPO_Contours_1ft_5ft (USACE)
Salacting OK will crast	Ск	tt Surface Style

6. From **TOOLSPACE** > Prospector tab > expand **Temp Lower Level** surface > expand **Definition** collection > right click on **Boundaries** > select **Add**...



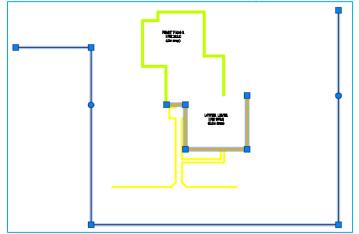




- 7. From the Add Breaklines dialog box >
- 8. Desccripton: Lower Level
- 9. Type: Standard
- **10.** Weeding Factors: unchecked
- 11. USuppelmenting Factors: unchecked

📥 Add Breaklines		;
Description:		
Lower Level		
Type: Standard		~
File link options:		
Break link to file		
Weeding factors		
Distance:		Angle:
15.000'	1	004.0000 (d)
Supplementing factors		
Distance:		Mid-ordinate distance:
100.000'	1	1.000'
	01	Consul Unio
	OK	Cancel Help

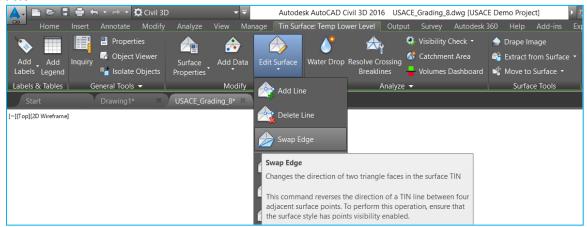
12. From screen select the Lower Level offset and the previouly created outer line.



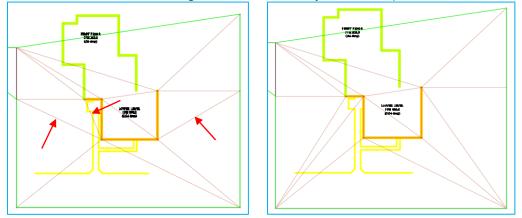




- **13.** The created surface will need to be edited to ensure the -2% is being followed. Make sure TIN Lines project correcity from inside to outer edges.
- 14. Select the surface from > contextual ribbon > Modify panel > Edit Surface flyout > Swap Edge button



15. Select the TIN Lines to correct triangulation. This is very user/site specific.



Once surface edited are complete the created surface will be used to elevate surrounding sidewalk linework. After elevations are set the temp surface can be deleted.

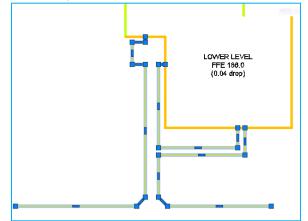




EXERCISE: Lower Level Sidewalks – projecting linework

With the temporary surface in place that slopes from building at -2% in place, the next step is to create sidewalk features that pull those elevations.

- 1. Open USACE_Grading_8.dwg
- 2. First, select all the **YELLOW** 2D polylines surround the northern **Lower Floor** (select similar works great)



- 3. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Create Feature Lines from Objects button
- 4. From the *Create Feature Lines* dialog box:
 - a. Site: <**None**>
 - b. ✓ Name : South Sidewalks
 - c. ✓ Style : use default
 - d. Layer: Use selected entity layer
 - e. 🗸 Erase existing entities
 - f. ✓ Assign elevation
 - g. From the Assign Elevations dialog box >
 - i. From surface > Temp Lower Level
 - ii. \Box Uncheck Insert intermediae grade break points





🛕 Create Feature Lines	×		
Site:			
South Sidewalks <[Next Counter(CP)]>			
Style G_GRAD_Feature_Line_By Layer ∨ ■ ▼ ■			
Layer		🔥 Assign Elevations	×
O Use current layer		Options	
Use selected entity layer		O Elevation: 0.000'	
Conversion options		○ From gradings	
Erase existing entities		From surface	
Assign elevations		Temp Lower Level	
Weed points		Insert intermediate grade break points	
OK Cancel Help		OK Cancel Help	

5. 2D Sidewalk polylines have been converted to Feature Lines and have been elevated, as seen in 3D view.

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and the second		
	Schular (200)	>

6. After Sidewalk geometry is elevated, all temoprary lines and surfaces can be deleted. In the following section ALL the created 3D geometry will be used to create terrain.

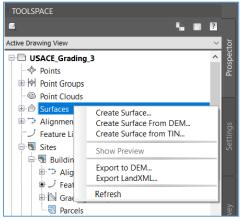




EXERCISE: Buildings and Sidewalks Proposed Surface

Now that the Northern and Southern building foot prints, offsets and surrounding sidewalks Feature Lines have been created and elevated, a proposed surface can be created using all proposed Feature Lines.

- 1. Open USACE_Grading_9.dwg
- 2. From TOOLSPACE Prospector tab > browse to Surfaces category > right click> select Create Surface...



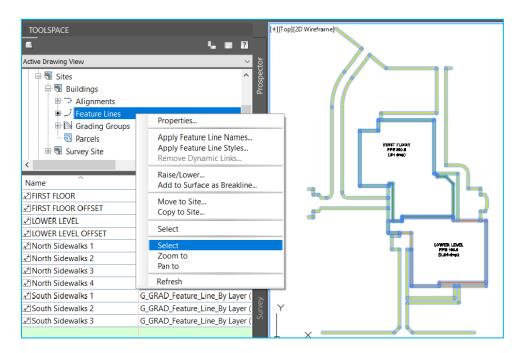
- 3. From the *Create Surface* dialog box >
 - a. Name > Proposed Site
 - **b.** Style > G_TOPO_Surface_Edits

Properties Value Information Proposed Site Description Description Style G_TOPO_Surface_Edits (USACE) Render Material V_TOPO_Contours_1ft_Sft (USACE) Select Surface Style Select Surface_Edits OK Cancel Help OK Prospector. Select new surface window with appear in the list or sonraces in	ype: FIN surface	\sim	Surface layer: HM-SURF-Proposed Site	Ł
Name Proposed Site Description Description Style G_TOPO_Surface_Edits (USACE) Render Material V_TOPO_Contours_Ift_Sft (USACE) Select Surface Edits Image: Contours_Ift_Sft OK Cancel Help	Properties		Value	
Description Description Style G_TOPO_Surface_Edits (USACE) Render Material	Information			
Style G_TOPO_Surface_Edits (USACE) Render Material V_TOPO_Contours_Iff_Sft (USACE) Select Surface Edits Image: Contours_Iff_Stt (USACE) OK Cancel Help Selecting OK will create a new surrace winch with appear in the first or surraces in	Name		Proposed Site	
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Selecting OK will create a new surrace window will create a new su	Style		G_TOPO_Surface_Edits (USACE)	/
G_TOPO Surface Edits	Render Material		V TOPO Contours 1ft 5ft (USACE)	/
			V_HOLO_CONTOURS_IN_ONE (USINC	

4. From TOOLSPACE > Prospector tab > expand Sites collection > expand Buildings collection > right click on Feature Lines > Select







From TOOLSPACE > Prospector tab > expand Proposed Site surface > expand Definition collection > right click on Boundaries > Add...

TOOLSPACE		
6 L.B.	?	
Active Drawing View	\sim	to
Gurfaces Gurfa	^	Prospecto
→ Masks → Watersheds → Definition → Boundaries → Breaklines		
Contours Contours DEM Files Call Drawing Objects Call Contours Call Contours		

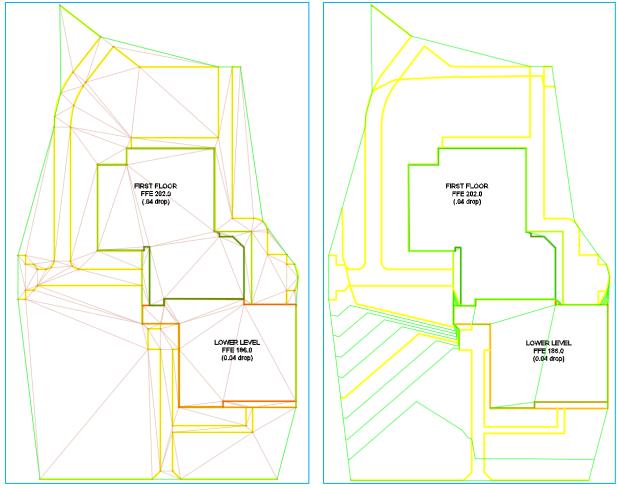
- 6. From the **Add Breaklines** dialog box:
 - a. Descripton: Building Breaklines
 - b. Type: Standard





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Supplementing factors		
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7. After picking **OK** the surface will be immediately built.



This is a step towards grading and creating Finished Ground conditions.



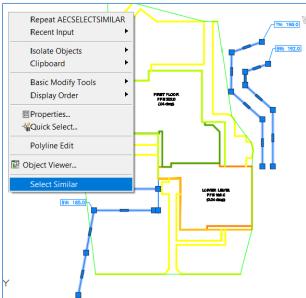


Grading: Site Features - Retaining Walls and Loading Dock

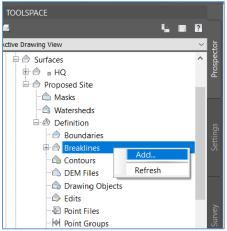
Continuing with site work, next the focus will be on Retaining Wall features and Loading Dock Area. Proposed elevations have already been set to the entities. They will address transitions from First Floor and Lower Level along with adjacent Loading Dock elevations. It is only a matter of adding them to the design surface

EXERCISE: Adding Retaining Walls

- 1. Open USACE_Grading_Site_1.dwg
- From Model Space select any of the BLUE lines on either side of buildings > right click > Select Similar



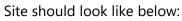
3. From **TOOLSPACE** > **Prospector** tab > expand **Proposed Site** surface > expand **Definition** collection > right click on **Boundaries** > **Add...**

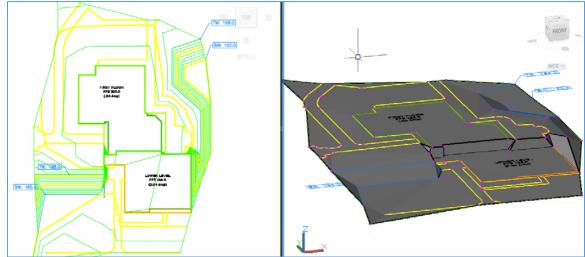


- 4. From the **Add Breaklines** dialog box:
- 5. Descripton: Site Ret Walls
- 6. Type: Standard



🛕 Add Breaklines)
Description		
Description: Site Ret Walls		
Site Ret Walls		
Туре:		
Standard		~
File link options:		
Break link to file		
Weeding factors		
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15.000'	10	004.0000 (d)
Supplementing factors		
Distance:		Mid-ordinate distance:
100.000'	1	1.000'
	ОК	Cancel Help





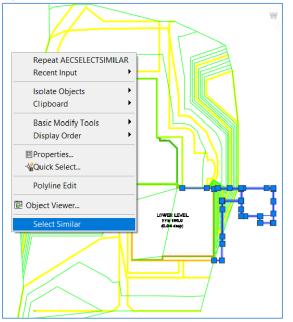
Site is now taking better shape showing proposed conditions. Next, the Dock Area3D linework will be added.



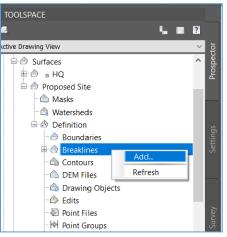


EXERCISE: Adding Loading Dock

- 1. Open USACE_Grading_Site_2.dwg
- 2. From Model Space select any of the BLUE lines on eastern side of site > right click > Select Similar



From TOOLSPACE > Prospector tab > expand Proposed Site surface > expand Definition collection > right click on Boundaries > Add...



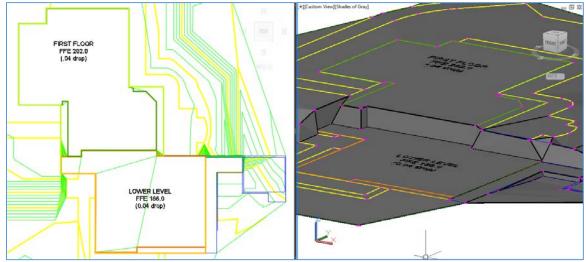
- 4. From the **Add Breaklines** dialog box:
 - a. Descripton: Loading Dock
 - b. Type: Standard





🙏 Add Breaklines		
Description:		
Loading Dock		
Туре:		
Standard		
File link options:		
Break link to file		
Weeding factors		
Distance:		Angle:
15.000'	18	004.0000 (d)
Supplementing factors		
Distance:		Mid-ordinate distance:
100.000'	1	1.000'
	ОК	Cancel Help

5. Site should look like below.



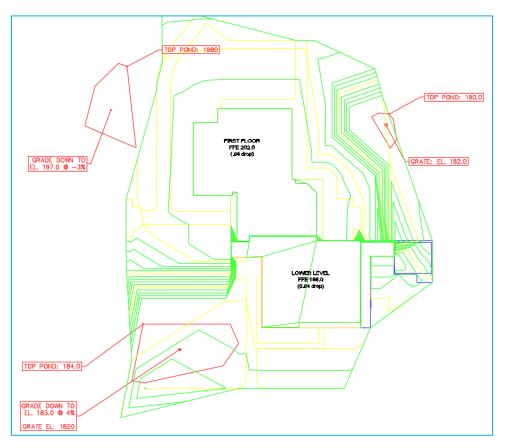
Site Features will be continued to be added to surface. Once the major work has been added, attention can be given to "*tweaking*" triangles to create a cleaner looking surface.





Grading: Ponds

Next attention will be focused on the proposed ponds on site, slightly different techniques will be used on all three.



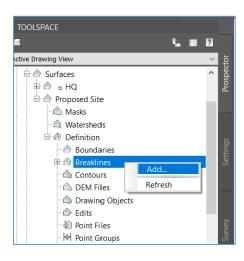
EXERCISE: North East Pond

- 1. Open USACE_Grading_Site_3.dwg
- 2. Select both Inner and Outer *RED* linenwork on North East side of site (EL 190.9 and EL 182.0)

From TOOLSPACE > Prospector tab > expand Proposed Site surface > expand Definition collection
 right click on Boundaries > Add...



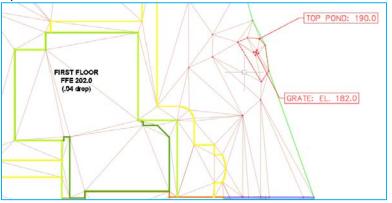




- 4. From the Add Breaklines dialog box:
 - a. Descripton: Loading Dock
 - b. Type: Standard

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File link options:			
Break link to file			
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Supplementing factors			
Distance:		Mid-ordinate distance:	
100.000'	1	1.000'	1º
	ОК	Cancel	Help

5. Surface should be updated to look like below:





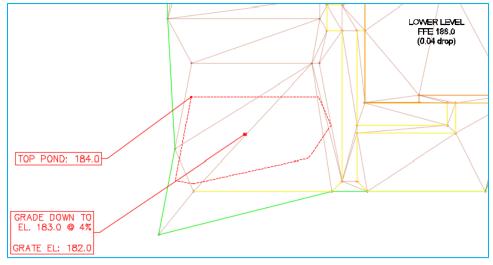


EXERCISE: South West Pond

- 1. Open USACE_Grading_Site_4.dwg
- 2. From *Prospector* tab > browse to *Sites* collection > right click > Select *New...*
- 3. From the *Site Properties* dialog box > Name: *Pond*

🔥 Site Properties - Site		\times
Information 3D Geometry Numbering		
Name:		
Ponds		
Description:		
~		

4. Pan and Zoom down to the South West linework.



- From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from
 Objects button
- 6. Select the *RED* outer most polyline labeld *TOP POND: 184.0*
- 7. From the *Create Feature Lines* dialog box, set values as seen below (Name: *NE Top Pond 184*)





A Create Feature Lines X
Site:
Nond V
✓ Name
SE Top Pond 184
✓ Style
🛁 G_GRAD_Feature_Line_By Layer 🗸 📑 🗖
Layer
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O Use current layer
Use selected entity layer
Conversion options
✓ Erase existing entities
Assign elevations
Weed points
OK Cancel Help

- 8. Once done click the **OK** button
- 9. From the Ribbon > Home tab > Create Design panel > Grading dropdown > Grading Creation Tools button
- **10.** From the *Grading Tool* bar > Pick on *Set Grading Group* buttton
- **11.** From Select *Grading Group* dialog > Pick on the *Create Grading Group* button



Grading Creation Tools	🥑 ? 💌
🕅 🗁 🥔 💿 Slope to Absolute Elev	- F & • • • • • • • • • • • • • • • • • •
Group: TEMP BLDG GRADES	Surface:
Group: TEMP BLDG GRADES	Surface: Name: PONDS Description: Use the Group Name Surface style: C_TOPO_Contours_1ft_5ft V V Volume base surface
	OK Cancel Help

- 12. When done click on **OK** buttons to close out boxes.
- 13. From the Grading Tool bar > Set criteria drop down > Slope to Absolute Elve
- **14.** Then from *Create Grading* flyout > select *Create Grading* button



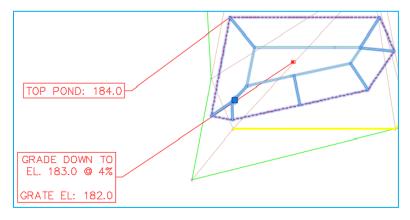
- **15.** From screen select on the previously created Top of Pond Feature Line > from command line:
 - a. Select the grading side: Pick any point on the inside
 - b. Apply to entire length: YES
 - c. Relative Elevation: **183**
 - d. Cut Format: Grade
 - e. Cut Grade: **4**
 - f. Fill Format: Grade
 - g. Fill Grade: 4
- **16.** Command loops > Hit **Esc** key from keyboard to exit command
- 17. A 3D Grading Objet is created





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18. Next, add in Top of Pond Feature to Surface as Breakline > descripton: **POND SE TOP**

Description: POND SE TOP Type:
Standard V
File link options: Break link to file
Weeding factors Distance: Angle: 15.000' 004.0000 (d)
Supplementing factors Distance: Mid-ordinate distance: 100.000' I.000'
OK Cancel Help

🔺 Add Breaklines

🔺 Add Breaklines

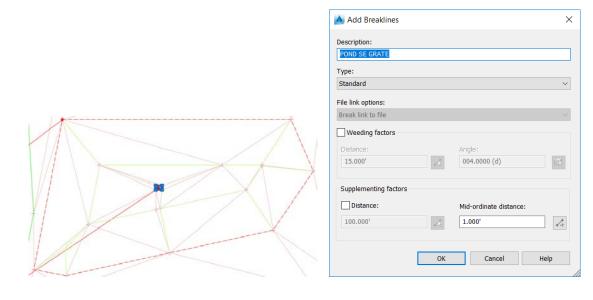
19. Then, add in Grading Featre Line to Surface as Breakline > descripton: **POND SE BTM**

	Description: POND SE BTM
	Туре:
	Standard \vee
	File link options:
*	Break link to file $\qquad \qquad \lor$
	Weeding factors
	Distance: Angle:
	15.000' 004.0000 (d)
	Supplementing factors
fi V	Distance: Mid-ordinate distance:
	100.000' 1.000'
	OK Cancel Help

20. Last, add a Grate Box polyline to Surface as Breakline > **POND SE GRATE**





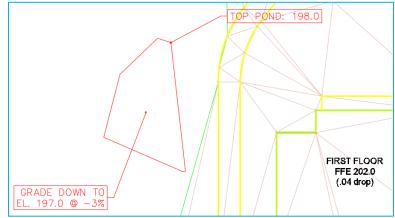






EXERCISE: North West Pond

- 1. Open USACE_Grading_Site_5.dwg
- 2. Pan and Zoom to the North West linework.



- 3. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 4. Select the **RED** outer most polyline labeld **TOP POND**: 198.0
- 5. From the Create Feature Lines dialog box, set values as seen below (Name: NW Top Pond 198)

▲ Create Feature Lines ×
Site:
Pond V
✓ Name
NW Top Pond 198
☑ Style
G_GRAD_Feature_Line_By Layer ∨ ■▼ 🔍
Layer
O HM-FLIN
O Use current layer
• Use selected entity layer
Conversion options
Erase existing entities
Assign elevations
Weed points
OK Cancel Help

- 6. Once done click the **OK** button
- 7. From the Ribbon > Home tab > Create Design panel > Grading dropdown > Grading Creation Tools button
- 8. From the Grading Tool bar > Set criteria dropdown > Slope to Absolute Elevation
- 9. Then from *Create Grading* flyout > select *Create Grading* button



Grading Creation Tools					9 ?	×
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		😤 Cop	/ Create G	irading		
		Crea	te Transiti	on		
		🕒 Crea	te Infill			

10. From screen select on the previously created Top of Pond Feature Line > from command line:

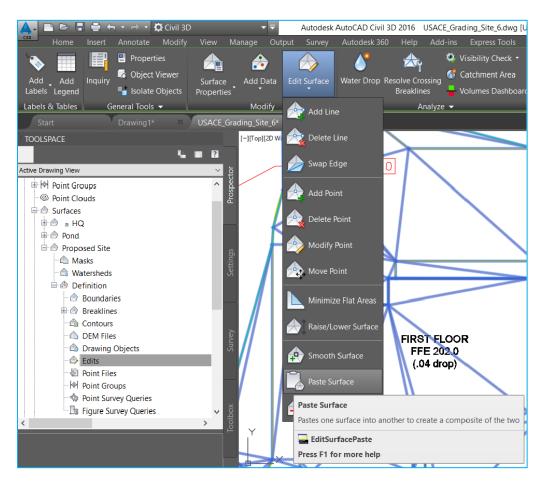
- a. Select the grading side: Pick any point on the inside
- b. Apply to entire length: YES
- c. Relative Elevation: **197**
- d. Cut Format: Grade
- e. Cut Grade: **3**
- f. Fill Format: Grade
- g. Fill Grade: 3
- **11.** Command loops > Hit **Esc** key from keyboard to exit command
- **12.** Select the created 3D Grading Object
- **13.** From contextual ribbon > pick *Grading Group Properites* button
- **14.** From Grading Group Properites dilog box > Infromation tab > ✓ Automatic Surfce creation
- **15.** From Create Surface Dilog box > review and pick **OK** button

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	Pond					
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- **16.** Pick on the **OK** buttons to exit out of ALL dialog boxes. Back in the model space a NEW suface is created.
- 17. Select the Proposed Site surface > from contextual ribbon > Edit Surface flyout > select Paste Surface button



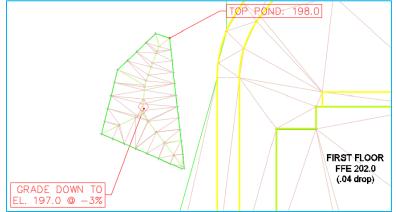




18. From *Select Surface to Paste* dialog box > pick on *Pond* surface > pick *OK* button

🛕 Select Surface to Paste		×
Name PhQ Pond	Description Description Description	R

19. On screen the previously created *Pond* surface has been added to *Proposed Site* surface



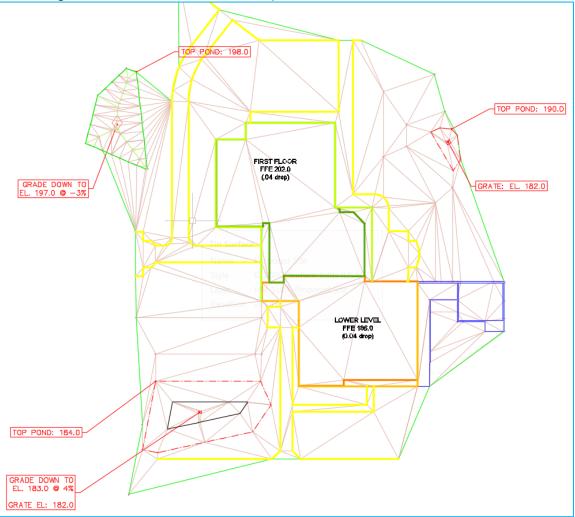
20. To fill the void add Outer Boundary to Proposed Site surface





TOOLSPACE	[-][Top][2D Wireframe]
a 🐘 🔛 🖬	
Active Drawing View 🗸 రై	
Active Drawing View Open and Surfaces Open and S	Add Boundaries X
Watersheds Definition Boundaries Contours Contours DEM Files Drawing Objects Point Files Point Files Point Groups Point Survey Queries Figure Survey Queries	Name: Outer Type: Outer Violation Violation Mid-ordinate distance: 1.000' OK Cancel

21. All Pond designs have now been added to Proposed Site surface







GRADING: South Parking Lot

For grading in the Parking Lot, Feature Lines will be created with key proposed elevations using two commands:

🞾 Quick Elevation Edit:

Identifies elevations and grades that can be selected and edited as the pointing device moves over feature lines or parcels in the drawing

^I Set Grade/Slope between Points:

Edits the grade/slope between vertex elevations at the Command Line Interface

Elevation Editor:

Edits the vertex elevations of feature lines, survey figures, and parcel lines

🖉 Adjacent Elevations by Reference:

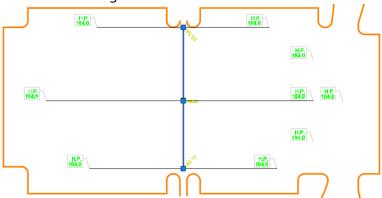
Project elevations based on a grade, slope, or elevation difference from points on another feature

EXERCISE: Creating Feature Lines on Parking Lot

- 1. Open USACE _Grading_PK_1.dwg
- 2. From Prospector tab > browse to Sites collection > right click > Select New...
- 3. From the Site Properties dialog box > Name: Pond

🔥 Site Properties - Site		\times
Information 3D Geometry Numbering		
Name:		
Parking Description:		
×		

- 4. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 5. Select the single vertical line in Parking Lot Area.



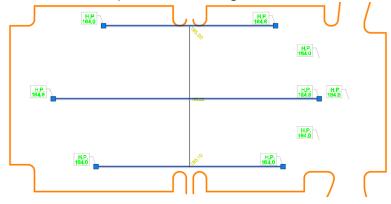
6. From the Create Feature Lines dialog box, set values as seen below:





🔥 Create Feature Lines	×
Site:	
🖫 Parking 🗸 🖸 💌	
☑ Name	
Vertical	
☑ Style	
G_GRAD_Feature_Line_HIGH_By V	
Layer	
HM-FLIN	
OUse current layer	
O Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

- 7. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 8. Select the three horizontal lines that span across Parking Lot Area.



9. From the *Create Feature Lines* dialog box, set values as seen below:



A Create Feature Lines ×	
Site:	
Parking V	
☑ Name	
HORIZONTAL <[Next Counter(CP)]>	
✓ Style	
_d G_GRAD_Feature_Line_Med_By I ∨ ■ ▼	
Layer	
HM-FLIN	
O Use current layer	
O Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

10. Confirm that correct elevations are set on Feature Line. Selet created Feature Line > from Contextual ribbon > Edit Elevatons > Elevations Editor button

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Elevation	i	🔍 💆 🕅	순 🖑 🕅 1.0	000' 📩 📩	1341 🗏		×
Elevi		Station	Elevation	Length	Grade Ahead	Grade Back	A
В		0+00.00	184.800'	135.142'	0.89%	-0.89%	PANORAMA
Gradi	24	1+35.14	185.999'	128.525'	-0.93%	0.93%	N
G		2+63.67	184.800'				PAN
	<					>	



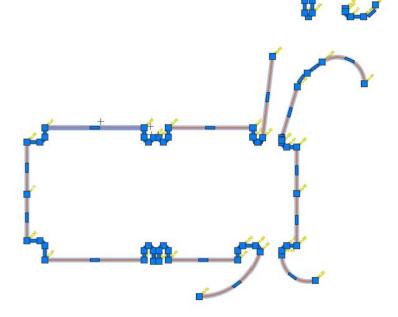


EXERCISE: Creating Curb Feature Lines

- 1. Open USACE _Grading_PK_2.dwg
- 2. Select any of the **ORANGE** curb lines > right click > select similar
- 3. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 4. From the *Create Feature Lines* dialog box, set values as seen below:

🔥 Create Feature Lines	\times
Site:	
Parking V	
✓ Name	
CURB-EOP <[Next Counter(CP)]>	
✓ Style	
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Layer	
O HM-FLIN	
O Use current layer	
Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

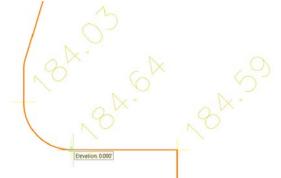
5. Next, elevations will be assgned per on screen notes to each of the six created CURB EOP Feature Lines



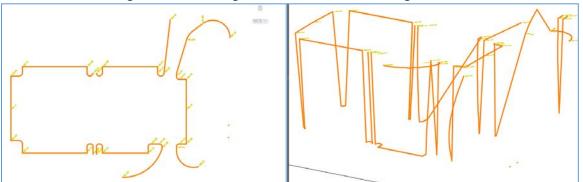




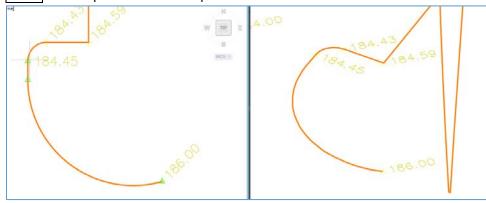
- 6. Select created Feature Line > from **Contextual** ribbon > **Quick Elevation Edit** button
- 7. Hovering over end point will give you feed back on elevation



- 8. To edit elevation value > left click on vertex > from command line set elevation as needed
- 9. Once elevation are all asigned, the Parking Curb will still need editing, some elevations are still at 0.00



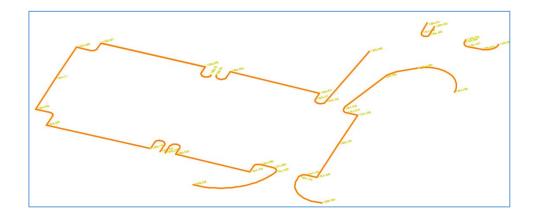
- 10. Contiue working with drawing or OPEN USACE_Grading_PK_3.dwg
- 11. Select created Feature Line > from *Contextual* ribbon > *Set Grade/Slope between Points* button 却
 - a. Pick start point vertex > verify elevation is correct
 - **b.** Trace over line > pick end point vertex
 - c. Hit *Enter* to accept caluatated slope



12. Once elevations have been set between points, all lines wil be elevated in 3D view











EXERCISE: Creating Curb and Gutter

First TOP and BACK of Curb polylines will be converted to feature lines. Then elevations from already set EOP.

- 1. Open USACE _Grading_PK_4.dwg
- 2. First, select any of the *GREEN* curb lines > right click > select similar
- From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 4. From the *Create Feature Lines* dialog box, set values as seen below:

🔥 Create Feature Lines 🛛 🗙
Site:
Parking V
✓ Name
CURB-TOP <[Next Counter(CP)]>
✓ Style
G_GRAD_Feature_Line_low_By L; 🗸
Layer
O HM-FLIN
O Use current layer
Use selected entity layer
Conversion options
Erase existing entities
Assign elevations
Weed points
OK Cancel Help

- 5. Select any of the CYAN curb lines > right click > select similar
- 6. From the Ribbon Home tab > Create Design panel > Feature Line dropdown > Feature Lines from Objects button
- 7. From the *Create Feature Lines* dialog box, set values as seen below:





A Create Feature Lines ×	
Site:	
S Parking	
✓ Name	
CURB-BOC <[Next Counter(CP)]>	
☑ Style	
🔓 G_GRAD_Feature_Line_low_By L: 🗸	
Layer	
O HM-FLIN	
O Use current layer	
Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

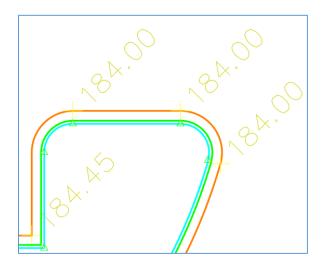
- 8. Next, Select any of the *ORANGE* feature line > from Contextual ribbon > *Edit Elevations* panel > select *Adjacent Elevations by Reference* button ₺
- 9. Select an adjecetn *GREEN* feature line > from commnad line > <u>Grade</u> > -2



- **10.** Repeat process across entire Parking Lot area
- 11. Then, Select any of the newly elevated *GREEN* feature lines > from Contextual ribbon > *Edit Elevations* panel
- > select Adjacent Elevations by Reference button
- 12. Select an adjacent CYAN feature line > from commnad line > Elevation Difference > .5







13. Repeat process across entire Parking Lot area

14. Once all lines are elevated site will look like below in 3D:



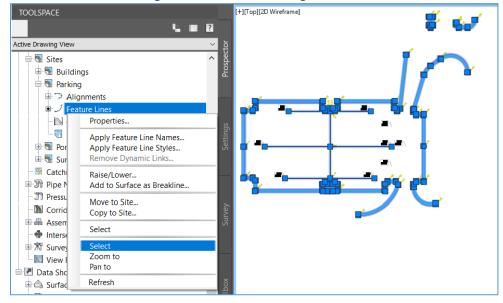




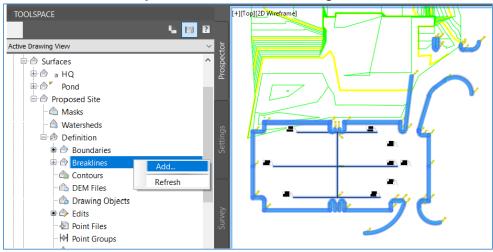
EXERCISE: Adding Parking Lot data to Surface

This section will be adding ALL Parking Lot feature lines to the **Proposed Site** surface. Additional High Point spots will be added to refine surface.

- 1. Open USACE _Grading_PK_5.dwg
- 2. From *Prospector* tab > *Sites* > *Parking* > *Feature Lines* > right click > *Select*



3. From Prospector tab > Surface > Proposed Site > Definiton > right click on Breaklines > Add..



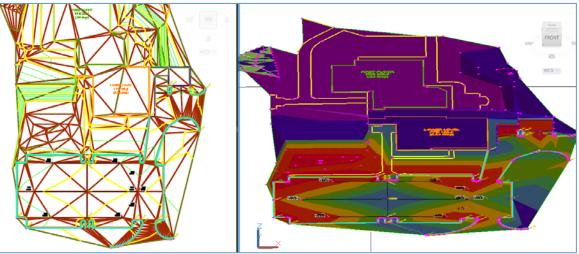
4. From Add Breaklines dialog box



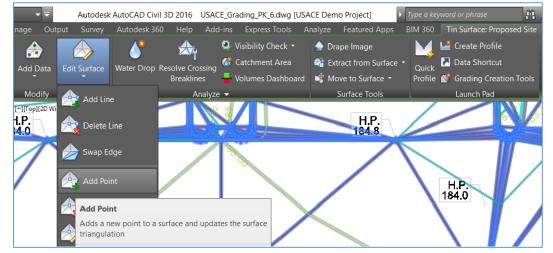


Description: Parking Lot			
Туре:			
Standard			\sim
File link options:			
Break link to file			\sim
Weeding factors			
Distance:		Angle:	
15.000'	100	004.0000 (d)	Сļ
Supplementing factors			
Distance:		Mid-ordinate distance:	
100.000'	1	0.100'	\checkmark_{2}
	ОК	Cancel Help	

5. Suface will then look like below:



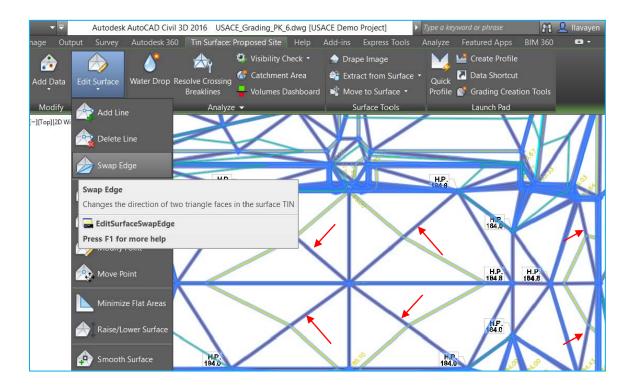
6. Select Surface > from Contextual ribbon > *Modify* panel > *Edit Surface* flyout > *Add Point* button



7. Select Surface from Contextual ribbon > *Modify* panel > *Edit Surface* flyout > *Swap Edge* button





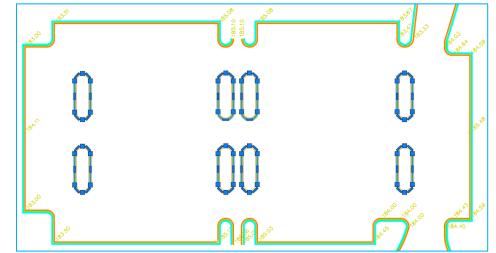






EXERCISE: Creating Islands

- **1.** Open USACE _Grading_PK_6.dwg
- 2. Select any of the *GREEN* outside EOP Islands



3. From Ribbon *Home* tab > *Createn Design* panel > *Feature Line* flyout > *Create Feature Lines from Objects* button

🔥 Create Feature Lines 🛛 🗙	
Site:	
Isub-EOF <[Next Counter(CP)]>	
Style	Assign Elevations
G_GRAD_Feature_Line_Med_By I	Options
Layer	From gradings
Use current layer	From surface Proposed Site
Conversion options	☑ Insert intermediate grade break points
Erase existing entities Assign elevations	OK Cancel Help
Weed points	
OK Cancel Help	

- 4. Next, select any of the **ORANGE** top curb islands > right click > **select similar**
- 5. From the Ribbon *Home* tab > *Create Design* panel > *Feature Line* dropdown > *Feature Lines* from *Objects* button
- 6. From the Create Feature Lines dialog box, set values as seen below:





🔥 Create Feature Lines 🛛 🗙
Site:
🖣 Parking 🗸 🗸 🗸
ISLND-TOP <[Next Counter(CP)]>
✓ Style
G_GRAD_Feature_Line_HIGH_By ∨ ■▼ 📃
Layer
O HM-FLIN
O Use current layer
Use selected entity layer
Conversion options
Erase existing entities
Assign elevations
Weed points
OK Cancel Help

- 7. Select any of the CYAN back of curb islands > right click > select similar
- 8. From the Ribbon *Home* tab > *Create Design* panel > *Feature Line* dropdown > *Feature Lines* from *Objects* button
- 9. From the *Create Feature Lines* dialog box, set values as seen below:

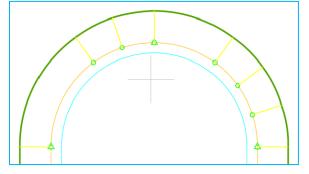
A Create Feature Lines	×
Site:	
Parking ~	
☑ Name	
ISLND-BOC <[Next Counter(CP)]>	
☑ Style	
🛁 G_GRAD_Feature_Line_Med_By l 🗸 🔍	
Layer	
O HM-FLIN	
O Use current layer	
Use selected entity layer	
Conversion options	
Erase existing entities	
Assign elevations	
Weed points	
OK Cancel Help	

10. Next, Select any of the **ORANGE** feature line > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button



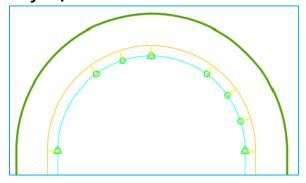


11. Select an adjecetn *GREEN* feature line > from commnad line > <u>*Grade*</u> > -2

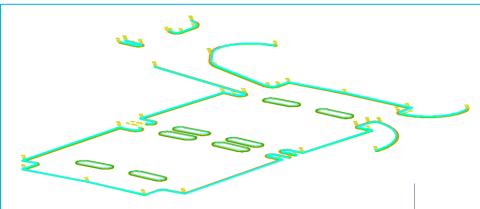


12. Repeat process across entire Parking Lot area

13. Then, Select any of the newly elevated **ORNAGE** feature lines > from Contextual ribbon > **Edit Elevations** panel > select **Adjacent Elevations by Reference** button



- 14. Select an adjacent CYAN feature line > from command line > Elevation Difference > .5
- 15. Repeat process across entire Parking Lot area
- 16. Completed Elevated Islands will look like this in 3D Orbit:



17. Contiue working or open **USACE-Grading_PK_7.dwg**.

18. Select all the created and elevated Islands feature lines > add to **Propsoed Site** surface as breaklines





Alignments

Introduction

Alignment objects can represent road centerlines, pipe networks, and other construction baselines. Creating and defining a horizontal alignment is one of the first steps in roadway, railroad, or site design. You can draw the alignment geometry as a polyline, and then create the named alignment from that geometry.

Key concepts

- Creating
 - o By Layout
 - o From Objects
 - o Properties
- Editing:
 - o Grip
 - o Tabular
 - o Edits
- Labels:
 - o Label Sets
 - Station / Offset

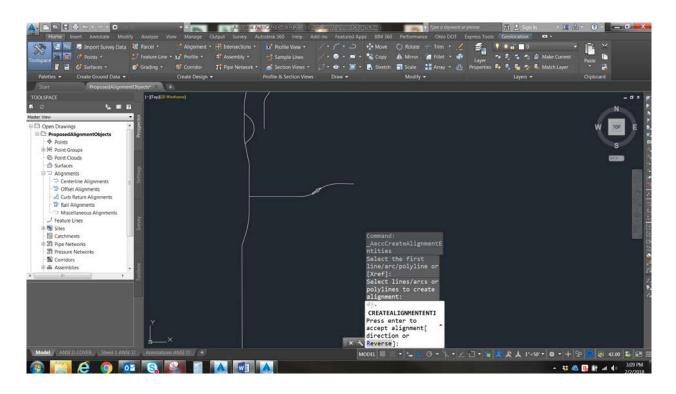
Creation of Alignments

EXERCISE:

 Alignments can be created from polylines. From the Home tab>Create Design panel, select the Alignment pull down bar and then "Create Alignment from Objects". Select the polyline near the end that you wish stationing to begin and hit enter. An arrow appears showing the direction in which station will proceed. You may select "R" to reverse stationing, if you wish. Use **ProposedLignmentObject.dwg**







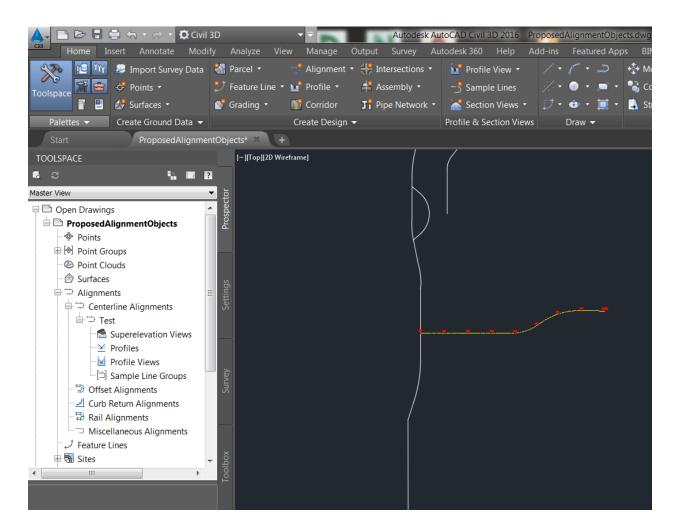
2. Hit return to open the "Create Alignment from Objects" dialog.

Name:	
ALGN (<[Next Counter(CP)]>)	1
Type:	
Centerline	
Description:	
	-
Sta	ting station: 0+00.00'
Ceneral Design Criteria	
Site:	
None>	• 🗗 •
Alignment style:	
V_ALGN_CL (USACE)	- 😹 - 🔣
Alignment layer:	
HN-ALGN-*	8
Alignment label set:	
V_ALGN_PARL_LT_Majr100_Minif	60 (USA 🔹 🌉 🔣
Conversion options	
Add curves between tangents	
Default radius:	
200.000'	
Erase existing entities	

3. The alignment name, type, and other properties can be preselected in this dialog. Select OK, when these options have been completed, and the alignment is created in both the Drawing Window and Prospector.





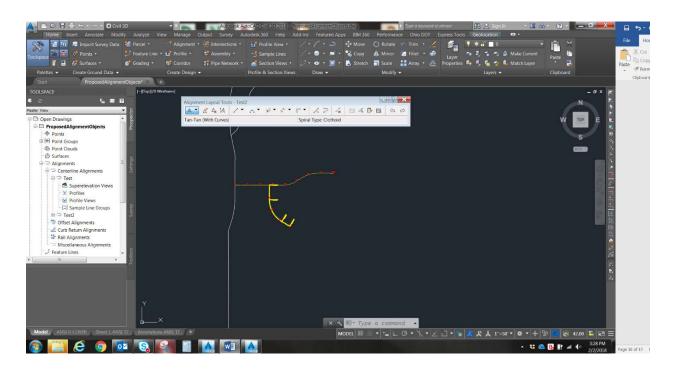


EXERCISE: Alignment Creation Tools

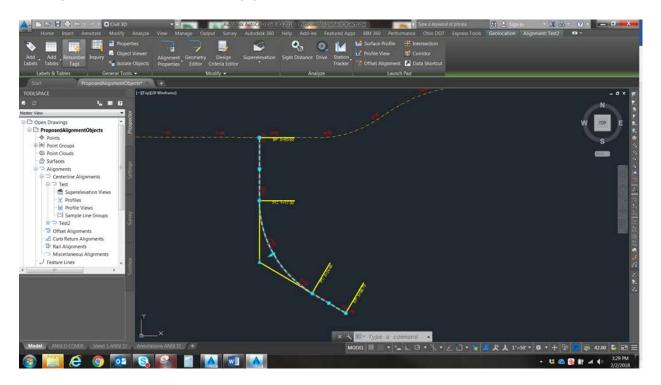
 Alignments can also be created using "Alignment Creation Tools". From the Home tab>Create Design panel, select the Alignment pull down bar and then "Alignment Creation Tools". Complete the "Create Alignment - Layout" dialog that appears. It provides the same property selection options that the "Create Alignment from Objects" dialog does. Select OK, when these selections have been completed. Use the "Alignment Layout Tools" bar that appears to create an alignment by layout. Use **ProposedLignmentObject.dwg**







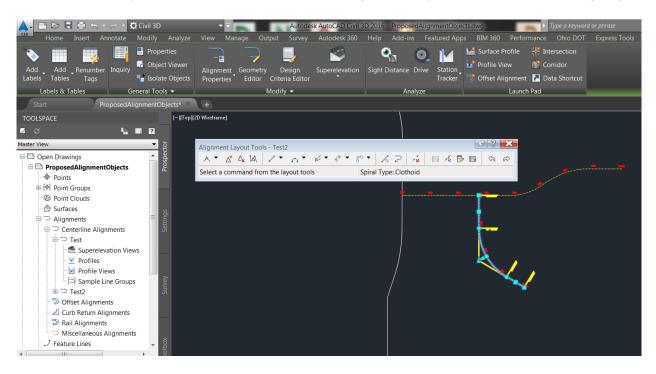
2. Alignments can be edited using grips or options available from the Contextual Ribbon.







3. The "Geometry Editor" provides access to the "Alignment Layout Tools" bar for editing alignments.







Profiles & Profile Views

Introduction

Use the profile view grid to display one or more profiles for a horizontal alignment.

When you create a profile view, you specify which existing profiles to display on the grid. Use these profiles as a reference for drawing new layout profiles on the grid.

A profile view can include one or more related profiles, along with multiple data bands along the X-axis, above or below the grid. Data bands annotate the profiles with stationing, elevation, horizontal geometry, and other data that assists engineering analysis.

Key Points

- A single profile view is typically used to design and edit a profile. It displays the specified station range of the corresponding alignment in a single profile view grid.
- Multiple profile views are useful for plotting shorter segments of a profile in individual profile view grids of a consistent length and vertical scale.
- Stacked profile views are a collection of related profiles drawn in separate, vertically arranged profile views. Typically, a centerline profile is contained in one profile view, and its left and right offsets are drawn in profile views that are placed above and below the centerline profile view.
- A profile can be split within either a single or multiple profile view. This allows a profile view to display a profile elevation range that is greater than the specified height of the profile view.

Create a Profile View

EXERCISE:

 Use ProposeAlignments.dwg Necessary prerequisites for creating existing surface profiles are an alignment and an existing surface. From the Home tab>Create Design panel, select the "Profile" pull down bar, then "Create Surface Profile". From the "Create Profile from Surface" dialog, select the alignment and surface. Station limits can also be adjusted within this dialog. The surface can also be sampled at offset distances from the selected alignment. When selections have been completed, select "Add", then "Draw in profile view".

The "Create Profile View" dialog appears.





ሉ Create Profile View - General	
<u>General</u>	Select alignment:
Station Range	T Boulevard
<u>otation rtango</u>	Profile view name:
Profile View Height	<[Parent Alignment]> PROF VIEW (<[Next Counter(CP)]>)
Profile Display Options	Description:
Pipe/Pressure Network	
<u>ripe/riessule network</u>	
<u>Data Bands</u>	Profile view style:
Profile Hatch Options	C_GRID [L-R] Majr_Minr_H100_25V5_2-5 ▼ Profile view layer:
	HM-PROF-VIEW
	Show offset profiles by vertically stacking profile views
	< Back Next > Create Profile View Cancel Help
	< Back Next > Create Profile View Cancel Help

This presents a series of ordered dialogs that allow for the selection of profile view properties. The General dialog appears, above. It provides for the selection of the alignment, profile name, profile view style, and stacking of offset profiles.





2. The Station Range dialog allows for automatic or user specified settings of the profile view station range.

A Create Profile View - Station I	Range		
<u>General</u>	Station range		
Station Range	Automatic	Start: -0+00.45'	End: 61+43.72'
Profile View Height Profile Display Options	O User specified range	-0+00.45'	61+43.72'
<u>Pipe/Pressure Network</u>			
<u>Data Bands</u>			
Profile Hatch Options			
	1+00	2+60 3+00 4+00 5+00 4+00 7+00 8+00	
	< Back	Next > Create Profile	View Cancel Help





3. The Profile View Height dialog offers similar options for the profile height as were available for the station range. It also offers controls for split profile styles and settings.

A Create Profile View - Profile	e View Height			
<u>General</u>	Profile view height	Minimum:	Maximum:	
Station Range	Automatic	157.66'	203.41'	
Profile View Height	O User specified	150.00'	210.00'	
Profile Display Options	Split profile view			
Pipe/Pressure Network	First split view style:		Split station :	
<u>Data Bands</u>	🕍 C_GRID [L-R] Majr_	_Minr_H100_ 🔻 🍺 👅	Exact station	
Profile Hatch Options	Intermediate split view s		Datum option:	
	🕍 C_GRID [L-R] Majr_	_Minr_H100_ 👻 🎼 🔳	Exact elevation	
	Last split view style:	_Minr_H100_ 💌 🍺 💌 🛽	EQ.	
			26 7+60 1.60	
		Back Next >	Create Profile View Cancel	Help





4. The Profile Display Options dialog provides control over the display of the profiles.

🔥 Create Profile View - Profile D	isplay Optic	ons					1	1	X
<u>General</u>	Specify prot	file display (options:						
Station Range	Name	Draw	Clip Grid	Split At	Description	Туре	Data Sou	Offset	Update M L
Profile View Height	Surface		۲	۲		<u>\~</u>	HQ	0.00'	Dynamic
Profile Display Options									
Pipe/Pressure Network									
<u>Data Bands</u>									
Profile Hatch Options									
			111						4
I									
			< Back	Next >	Crea	ate Profile \	/iew	Cancel	Help





5. The Data Bands dialog provides control over the location and style of the data bands displayed.

🛕 Create Profile View - Data I	Bands X
<u>General</u>	Select band set:
Station Range	The c_BAND_STA_Ex Pr_Majr_Minr_BELOW (USACE) ▼ 💽 ▼ 💽
Profile View Height	Some of the data bands need to be associated with appropriate data sources (such as profiles, sample lines groups or materials). Please select them below.
Profile Display Options	List of bands
Pipe/Pressure Network	Location:
Data Bands	Bottom of profile view
Profile Hatch Options	
	Set band properties:
	Band Type Style Profile1 Profile2 Alignment Geometry Points
	Profile Data C_GRID_STA_⊈∄Surface Boulev Surface Boulev Boulevard ···
	< Back Next > Create Profile View Cancel Help

6. The Profile Hatch Option provides control over hatching of cut, fill, and volumes between multiple surfaces in the profile view.



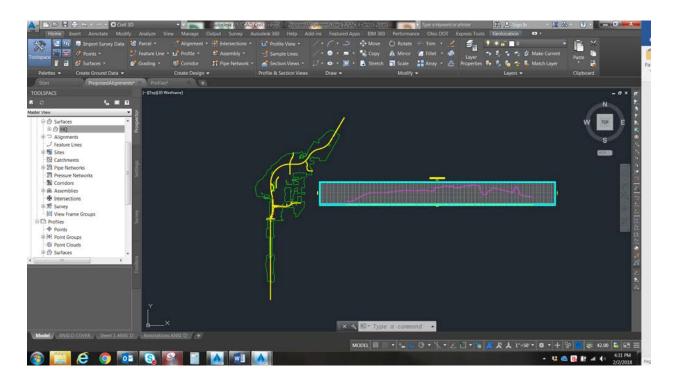


🔥 Create Profile View - Profile I	Hatch Options			X
<u>General</u> <u>Station Range</u>	Cut Area:	Hatch Area	Profile	Shape Style
Profile View Height Profile Display Options Pipe/Pressure Network Data Bands	Fill Area:			
Profile Hatch Options	Multiple boundaries:			
	From criteria:			
	< Back Ne	ext > Create Profile Vie	w Cancel	I Help

7. Once all settings have been made, select "Create Profile View" and pick a point in the Drawing Window that corresponds to the lower left corner of the Profile view. The profile view is created.







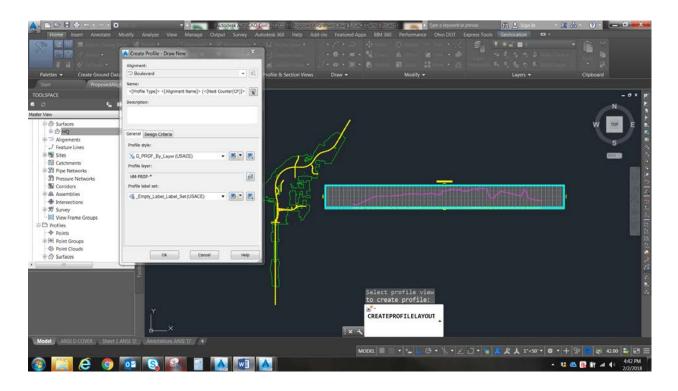
Create a Proposed Profile

EXERCISE:

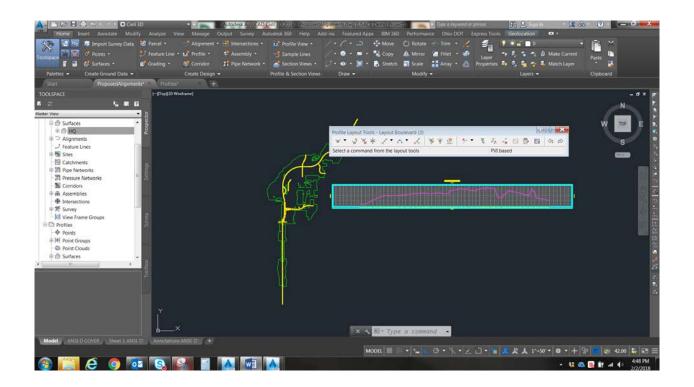
 To create a proposed or layout profile, select the "Profile Creation Tools" pull down bar from the Home tab>Create Design panel>Profile pull down bar. Then, select the profile view in which to design the proposed profile. The "Create Profile – Draw New" dialog appears. This dialog provides options for naming the profile, adding a description, and selecting the profile and label set styles. Use **Profiles.dwg**







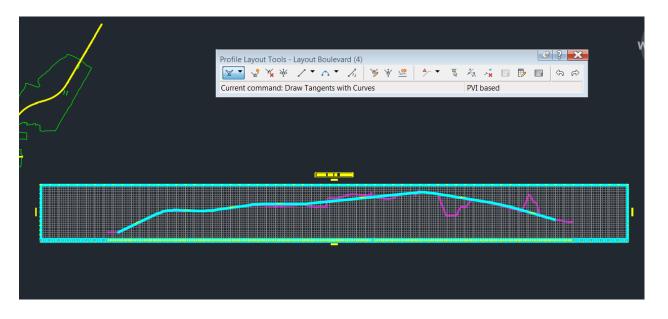
2. Select OK when settings have been completed to display the "Profile Layout Tools" bar. This provides tools for designing a profile, like the "Alignment Layout Tools.



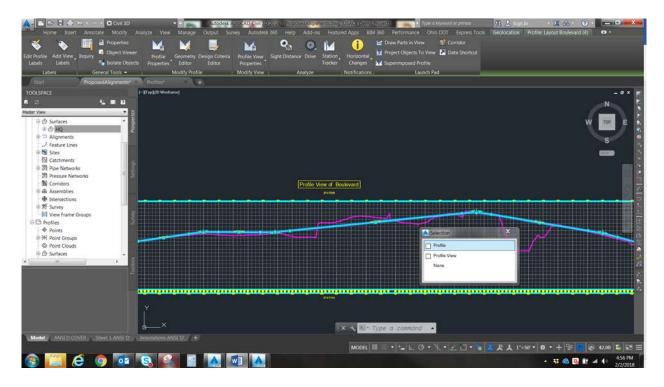




3. Additionally, Osnaps and Transparent Tools can be used in laying out a proposed profile.



4. Proposed profiles can be edited by selecting them and using grips or options available from the contextual Ribbon, like alignments.



The "Geometry Editor" provides access to the "Profile Layout Tools" bar for editing profiles.





Corridors

Toolspace, Right Click the drawing name (at the top the view window) and select "Edit Drawing Settings" to open the Drawing Settings dialog

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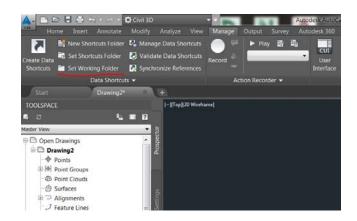
On the Units and Zone tab, set the coordinate system.

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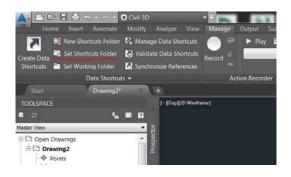


If the Working Folder has not been set, from the Manage tab>Data Shortcuts pane select "Set Working Folder" and use the "Browse for Folder" dialog to select the Working Folder.



Note: The working Folder is the directory that contains the project folders.

From the Manage tab>Data Shortcuts pane select "Set Shortcuts Folder" to open the "Set Data Shortcuts Folder" dialog and set the current project.





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Note: Any project within the Working Folder can be selected.

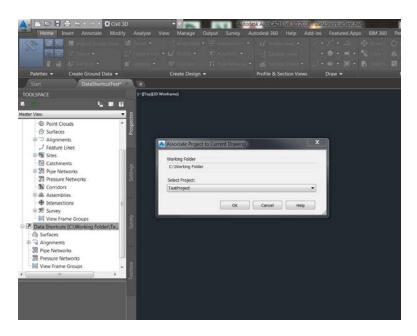
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New drawings can be created and associated with a project by Right Clicking the "Data Shortcuts" folder in the Prospector tab of Toolspace and selecting "Associate Project to Current Drawing". This brings up the "Associate





Project to Current Drawing" dialog, which allows for the selection of any project within the Working Folder, which is displayed at the top of the dialog.

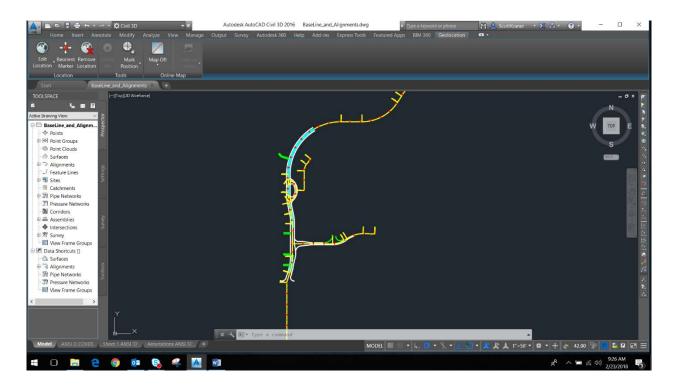


Data Shortcuts were created by selecting the "Create Data Shortcuts" icon in the Data Shortcuts pane of the Manage tab, as indicated in the Project Set Up section. Data References are created by Right Clicking the object under the Data Shortcut area of Prospector and Selecting "Create Reference. The Create <selected object> Reference dialog appears allowing adjustment to some of the data referenced objects settings. Selecting OK creates a data reference of the object within the new drawing. You usually need to zoom to the newly created data reference.

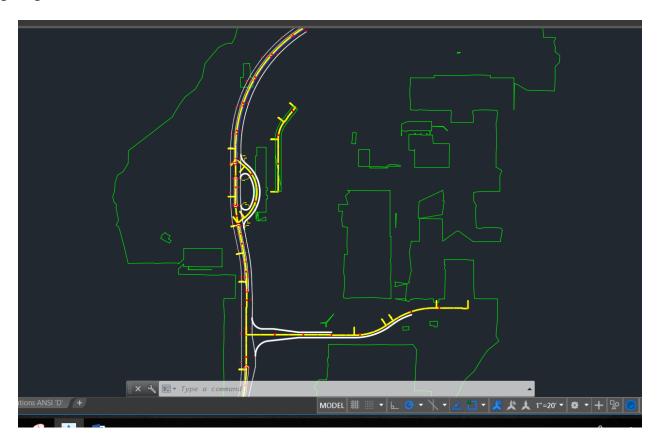
To develop corridors, you will need to create Data References in the new drawing for the existing surface, as well as all required alignments and profiles. Additional geometry information is also usually required. This information is used to control corridor transitions and establish additional baselines. The existing surface can be set to "No Display" to improve visibility.







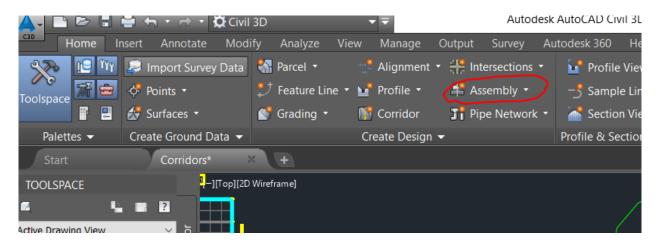
Alternately, the existing surface can be displayed using a "Border Only" style to allow analysis of corridor daylighting issues.







Corridor Assemblies are created by selecting the "Assembly" pull-down and the "Create Assembly" command, which brings up the "Create Assembly" dialog.







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		🔒 G_NPLT	_Assemb	oly (US)	~	, 🕶 📃		
		Code set style	e:					[
		🛃 G_CORF	Simple	(USAC	× [, 🕶 📃	1	ļ
	\mathbf{x}	Assembly lay	er:					
	×	HM-ASSY				Ø		
\		ОК	(Cancel		Help		

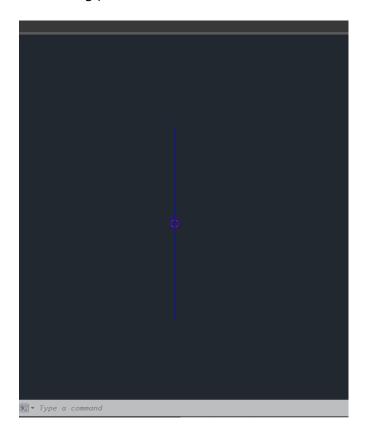
The assembly name, description, and style properties can be preselected in this dialog. Select OK, when these options have been completed, you are directed to place the assembly marker or baseline in the drawing.





Command: _AeccCreateAssembly			
🛛 🗙 🔦 🔐 CREATEASSEMBLY Specify assembly	baseline location:		▲
	Model 🏢 📰 🕶 🛌 🥝	- * * 🗹 🗖 • 🙎 🕯	K ★ 1"=20' ▼

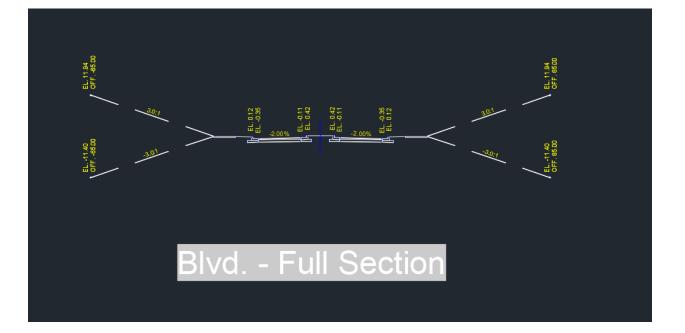
Clicking on a clear location in the drawing places the marker and zooms in so that subassemblies can be placed.



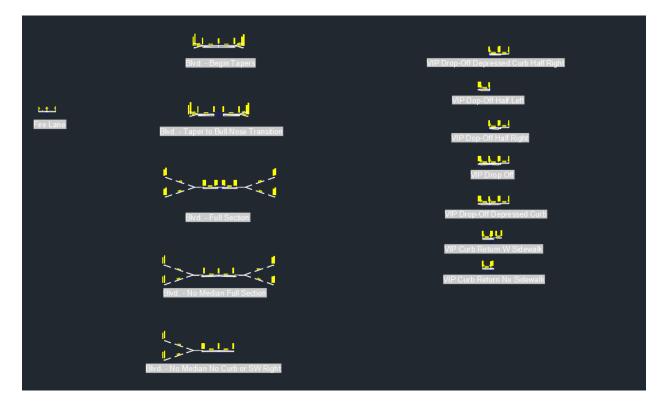
Assemblies are created by adding Subassemblies to this marker, working from the center out, usually beginning on the right side. The marker denotes the point on the Assembly that will attach to the Profile Grade Line (PGL). Corridors are created by connecting appropriate Assemblies along Corridor Regions at specified frequency intervals. Assemblies are very similar to typical sections developed for many roadway project plans.







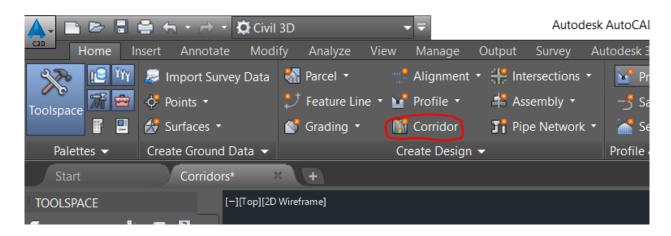
Most projects require numerous Assemblies utilized in multiple regions to achieve the intended design.



A Corridor is created by selecting the Corridor pull-down on the Create Design pane of the Home tab.







This brings up a dialog very similar to other Civil 3D Object dialogs. This provides for the creation of a Corridor name and description. It also allows the style, alignment, profile, assembly, and surface to be set.





Profil	e View 🔹 🔐	/ • { •	2	🔹 Move	🕐 Rotat
	le Lines 🛛 🗧	%•• • •	,=' •	Copy	
	🛕 Create Cor	ridor		×	Scale
Profile & S	Name:				Modi
	CORR (<[Next	Counter(CP)]>	»)		
	Description:				
				^	
				×	>
	Corridor style:				
	S_NPLT_C	orridor (USAC	L		\nearrow
	Corridor layer:				1
	HM-CORR			Ð	
	Alignment:				
	🕽 Boulevard		,	× 🛋	
	Profile:				
	🕍 Layout Boule	evard (2)		/	
	Assembly:				
	<none></none>		,	~	
	The <none> se</none>				
	corridor. Regior can be added la	ns, assemblies ater.	, and targe	ts	
	T				
	Target Surface:				
	<none></none>				
	Set baseline	and region pa	rameters		
	ОК	Cancel		Help	
_					

Checking the "Set baseline and region parameters" box opens a dialog for making these settings.





inple Lines 🛛 😯 🖉 🔹 🖓 Copy
X S Name: CORR (<[Next Counter(CP)]>)
Description:
Corridor style:
Corridor layer:
HM-CORR
Boulevard V
Profile:
Assembly:
The <none> selection creates an empty corridor. Regions, assemblies, and targets can be added later.</none>
Target Surface:
<none></none>
OK Cancel Help

🛕 Baseli	ne and Regio	on Paramete	ers - CORR (4	4)					×
		Add B	Baseline		Set all Frequ	encies		Set all Targe	ets
Name		Alignm	Profile	Assembly	Start St	End Sta	Frequen	Target	Overrides
📫 🍢	🕑 BL - Bo	Boulevard	Layout B		-0+00.45'	61+43.72'			
🕵 Sele	ct region from	drawing				Lock Regio	ns To: Geom	etry Locking	~
				[ОК	Cano	el /	Apply	Help
				l					

From this dialog, or the Parameters tab of the Corridor Properties dialog, regions can be created and managed. Alignments, profiles, and assemblies can be set.





- 8- 0			-		Add B	aseline	Set all Frequencies	Set all Targets	
lame	Alignment	Profile	Assembly	Start Station	End Station	Frequency	Target	Overrides	
BL - Fire Lane - (6)	Fire Lane	Layout Fire Lane (6)	Fire Lane	0+00.00'	3+15.61' 3+15.61'	Te 5.000"	E	8	E
Select region from drawing								s To: Geometry Locking	

Stations, frequency, and targets can also be set.

** 🕷 🖸 🗖					Add 8	saseline	Set all Frequencies	Set all Targets	
Name	Alignment	Profile	Assembly	Start Station	End Station	Frequency	Target	Overrides	
BL - Fire Lane - (6)	Fire Lane	Layout Fire Lane (6)		0+00.00	3+15.61		8		
G RG - Fire Lane - (.			Fire Lane	0+00.00'	"≩ 3+15.61'	"≹ 5.000'	H	E	ł
Select region from drawing							Lock Region	s To: Geometry Locking	2

This dialog can get somewhat involved for complex Corridors.





· · · ·						Add Baseline		Set all Frequencie	is.	Set all Target	5
Name	Alignment	Profile	Assembly	Start Station	End Static	on F	requency	Target		Overrides	
😑 📫 🏾 🗹 BL - Boulevard - (7)	Boulevard	Layout Boulevard (2)		-0+00.45	61+43.72			8		-	
🚓 🖌 🗹 RG - Blvd Begin	<u>.</u>		Blvd Begin Tapers	22+73.51	22+98.97	T\$ 1	0.000'	8		=	ŧ
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- 📇 🖌 🖂 RG - Blvd Bull			Blvd Bull Nose Full	23+00.47"	"R 23+04.47"	ेरे 1	0.000'	8	1	-	ł
- RG - Blvd Full S	<u> </u>		Blvd Full Section	23+04.47*	24+61.96	- TA 1	0.000'	8			E
- 🛱 🖌 🖂 RG - Blvd Bull			Blvd Bull Nose Full	24+61.96*	12 24+68.69	Te 1	0.000'	-		-	ŀ
- 🚓 🖌 🗹 RG - Blvd No M	L.		Blvd No Median Ful_	24+68.69*	25+04.97*	Ta 1	0.000'	E			ŀ
-曲 🛛 🗹 RG - Blvd No M	12		Blvd No Median No	25+04.97*	Te 26+36.03*	Te 1	0.000'	8		=	ŀ
- 🔐 🐨 RG - Blvd No M	<u> </u>		Blvd No Median Ful	26+36.03*	27+31.76	- Ta 1	0.000'	H		-	5
-A RG - Blvd Bull			Blvd Bull Nose Full	27+31.76	"i 27+80.22"	Te 5	000'	8		-	8
- 🖓 🕑 RG - Blvd Full S			Blvd Full Section	27+80.22	29+49.89	-21	0.000'	8		-	E
-A RG - Blvd Full S	HK		Blvd Full Section N	29+49.89*	1 29+63.41	-2 I	0.000'	8		3	5
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- 🚓 🖉 🛛 RG - Blvd No M			Blvd No Median No	29+68.91	***************************************	31	0.000'	8	1]	ł
- 📇 🗹 RG - Blvd Bull			Blvd Bull Nose No	30+32.64	TR 30+35.52'	TQ 1	0.000'	8		-	E
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- 🚓 🖌 🕢 RG - Blvd Bull			Blvd Bull Nose No S	31+30.11	31+31.70	~Q 1	0.000'	lee!			ŀ
용 RG - Blvd Bull			Blvd Bull Nose No	31+31.70"	Ta 31+35.61"	- T-	0.000'	8	ł	=	ł
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- A RG - Blvd Bull			Blvd Bull Nose No	31+82.60"	Te 31+88.10"	31	0.000'	-	ł	-	E
- RG - Blvd Full S	4		Blvd Full Section N	31+88.10"	Te 32+16.17"	- G 1	0.000'	H		-	E
高 I I RG - Blvd Full S	-		Blvd Full Section	32+16.20	°i∦ 37+46.59°	- T	0.000'	8	1	-	5
Select region from drawing								Lo	ck Regions To: 0	Geometry Locking	ý

Below is an example of the frequency dialog. It provides several methods of setting frequency parameters.

	Frequency to Apply Assemblies	×	d Basel
	Property	Value	
evard (2)	Corridor Information		
	🗄 Alignment		-
	Along tangents	10.000'	
	Along curves	At an increment	-
	Curve increment	10.000'	-
	Mid-ordinate distance to define c	0.100'	
	Along spirals	10.000'	1
	At alignment geometry points	No	1
	At superelevation critical points	No	
	E Profile		-
	Along profile curves	10.000"	-
	At profile geometry points	No	
	At high/low points	No	1
	Offset Target		
	At offset target geometry points	Yes	-
	Adjacent to offset target start/end	Yes	-
	Along offset target curves	At an increment	-
	Curve increment	10.000"	
	Mid-ordinate distance to define c		1
			-
			-
	49 ×		-
	Station Desc	ription	
	- Particular - Parts		-
			-
_	1		-
	OK	Cancel Help	
	UN	Cancel Help	1
_			22

Target mapping is set in the dialog, below. It allows point targets on select subassemblies to be assigned to target alignments, baselines, and profiles in order to control width, slope, and transitions.





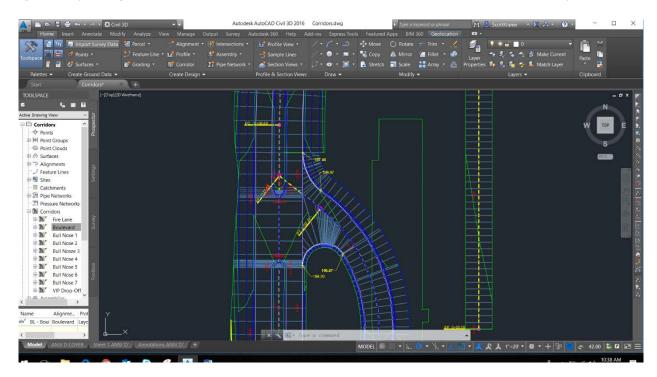
Corridor name:						
Boulevard		7			[
ssembly name:			rt Station:	End Station:		
Blvd Begin Tapers			+73.51	22+98.97		
birdi. begin rapero				22.50.57		
Target	Object Name		Subassembly	Assembly Group		
Surfaces	<click here="" set<="" td="" to=""><td>t all></td><td></td><td></td><td></td><td></td></click>	t all>				
 Target Surface 	🚖 HQ		DaylightMaxWidth	Right		
- Target Surface	🚖 HQ		DaylightMaxWidth	Left		
└── Width or Offset Targets						
 Width Alignment 	<none></none>		LaneSuperelevationA	Right		
 Target Alignment 	<none></none>		DaylightMaxWidth	Right		
 Width Alignment 	<none></none>		LaneSuperelevationA	Left		
Target Alignment	<none></none>		DaylightMaxWidth	Left		
Slope or Elevation Targets						
 Outside Elevation Profile 	<none></none>		LaneSuperelevationA	Right		
Outside Elevation Profile	<none></none>		LaneSuperelevationA	Left		
	1					
			ок	Cancel Help		



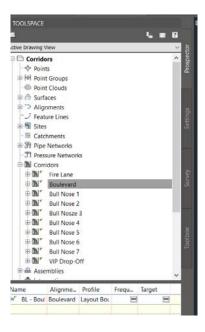


Intersections

Intersections can be created using an Intersection Creation Wizard, or manually. The complex nature of the median geometry along the Boulevard Corridor made Manual Intersection creation necessary.



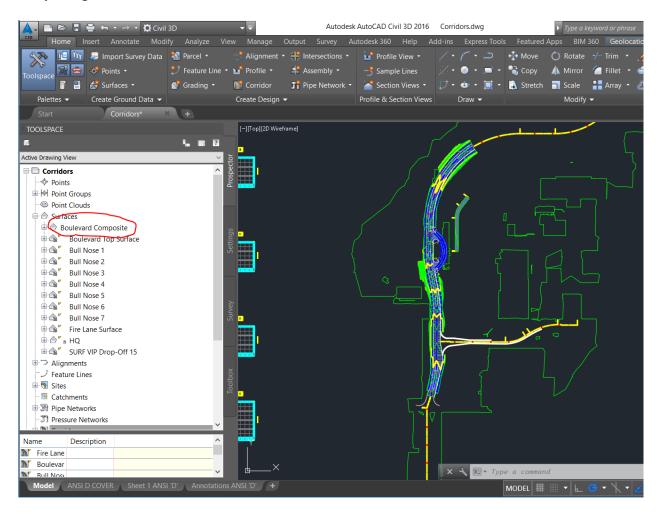
Additionally, the development of median bull noses and a section of median, which is offset from the alignment centerline, made it necessary to create separate corridors for these portions of the design.





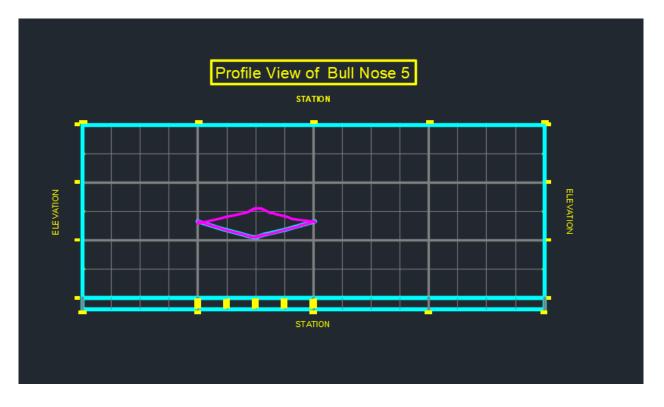


Separate top surfaces were created for each corridor and merged into a composite surface. The VIP Corridor was similarly merged into this surface.









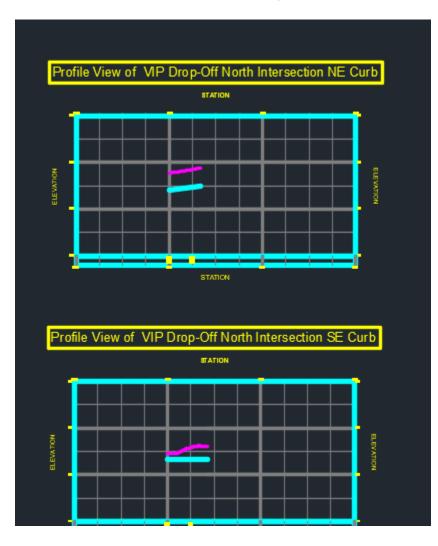
Transitional profiles were developed to facilitate the creation of median bull noses.

This allowed for the use of the roadway corridor top surface to be used in the development of the transitional profiles controlling the bull nose corridors.





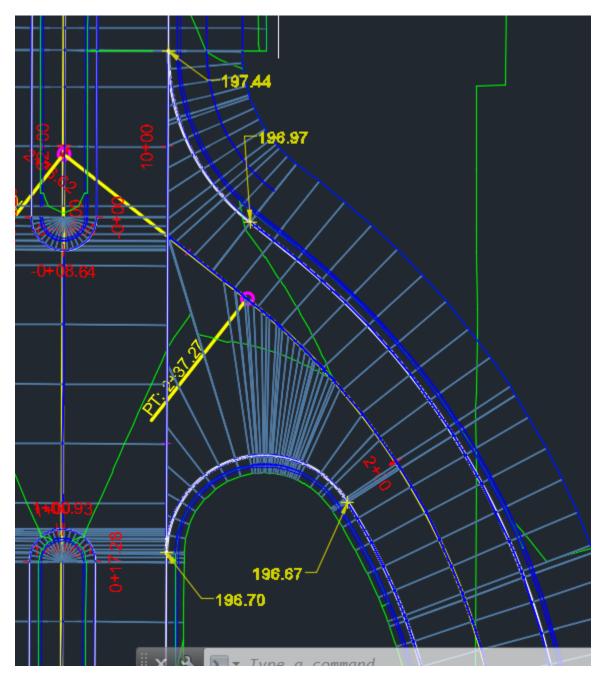
Similar transitional profiles were developed and used to manually create the VIP intersection Corridors.



Here the required top surface elevations were developed using spot elevation annotation at appropriate corridor top surface locations.







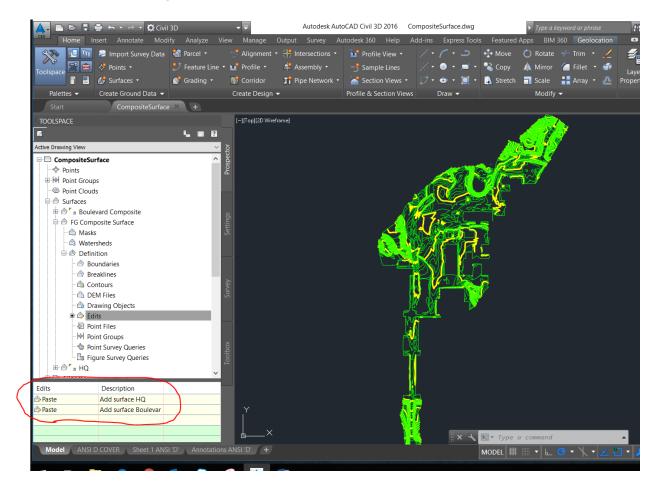
Proposed transitional profiles were then manually adjusted using the Profile Creation Tools.





Composite Surface

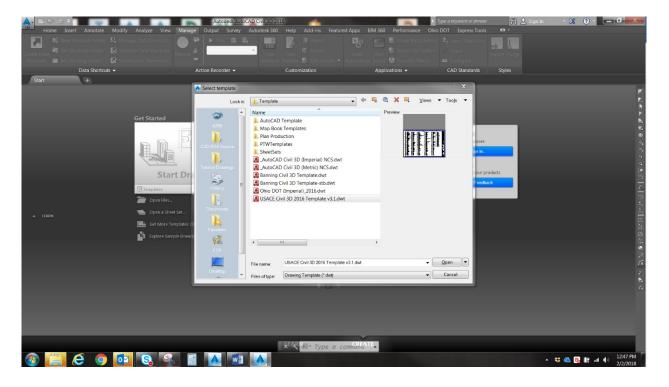
A total FG composite surface was created in a separate drawing by pasting the composite Boulevard Corridor top surface to the "HQ" existing surface.







XML Surface Import

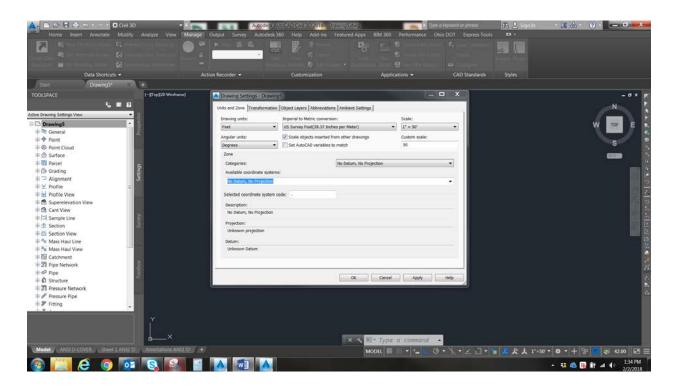


Open a new drawing using the **USACE template**.

From the Settings tab of Toolspace, Right Click the drawing name (at the top the view window) and select "Edit Drawing Settings" to open the Drawing Settings dialog







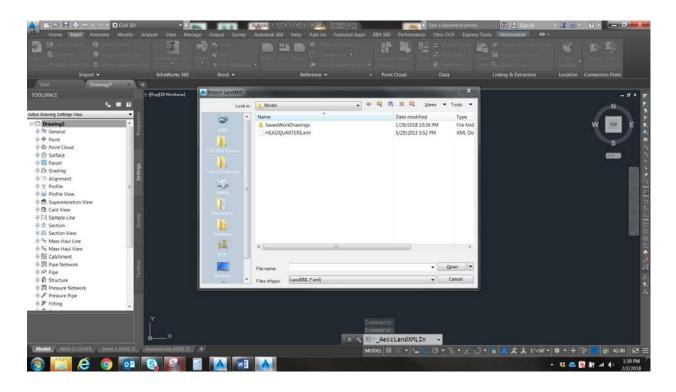
On the Units and Zone tab, set the coordinate system.

📐 Drawing Settings - Drawing	15		
Units and Zone Transformation	Object Layers Abbreviation	s Ambient Settings	
Drawing units: Feet	Imperial to Metric conversio US Survey Foot(39.37 Inch		Scale: 1" = 50' •
Angular units: Degrees	Scale objects inserted fr	=	Custom scale: 50
Zone Categories: Available coordinate systems	31	USA, Mississippi	•
NAD83 Mississippi State Pla Selected coordinate system of Description:			•
NAD83 Mississippi State Pla Projection:	nes, West Zone, US Foot		
ТМ			
Datum: NAD83			
		OK Cancel	Apply Help

From the Insert tab>Import pane select LandXML to open the "Import LandXML" dialog.







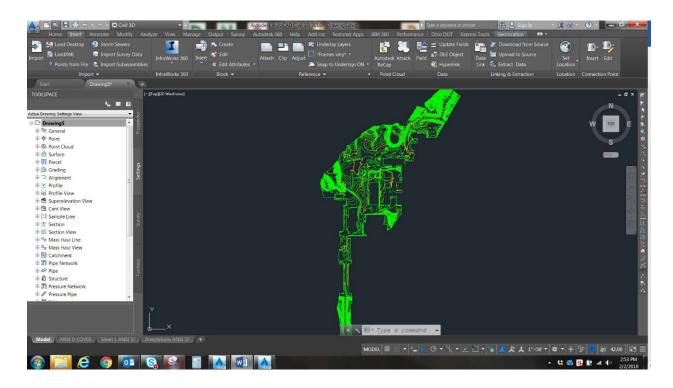
Select the desired XML file and select "Open".

Minport LandXML	Minport LandXML
Alignments Site: Alignments Site: Barcels Site: Current Site Current Site Site Site Current Site Sit	Alignments Site: Parcels Site: Site Units (1) Project name:K:\SUKVEY/1025 USACE\102511.01 VICKSBURC\dwg\HEADQU Application desc:Civil 30 manufacturer:Autodesk, Inc. manufacturerURL:www CgPoints name:HQ (6991) CgPoints name:HQ 2 (642) CgPoints name:HQ3 (36) V Surfaces (1)
III III Browse OK Cancel Help	III Browse OK Cancel Help

The "Import LandXML" dialog allows you to select sites, edit settings, and control what data is imported. For example, the points in this XML file can be omitted. Select OK and the XML surface is imported into the Drawing. The drawing can be associated to a Civil 3D project and saved to an appropriate file name, as required.











Cross Sections & Sample Lines

Creating Cross Sections in Civil 3D is accomplished in 2 phases:

- 1. Creating Sample Lines: physical on-screen line on baseline.
- 2. Creating Section Views: plotted grid with linework.

Working with Sample Lines

Like Alignments, Sample Lines are the 2D linework shown in plan view. Sample Lines host the data that will be in the Section Views (grids) and sever as the basis for Sectional Volumes (computing materials). Sample Lines recognize:

- Surfaces (in drawing or via xref)
- Corridors (in drawing or xref)
- Pipe Networks (only in drawing)

Sample Lines only need an Alignment present in drawing to be created (it is possible to create empty grids). Typically, they are perpendicular to baseline station, but can be crated skewed or graphically edited. Sample Lines there have five options for creating:

K By rage of stations: most common option. It's followed by a dialog box to set parameters

K At a Station: default option, users can type in station value or pick location on screen.

IFrom corridors stations: Opens dialog box to set parameters.

Pick points on screen: pick single or multiple points on screen.

Relect existing polylines: will crates sample lines from existing polylines.





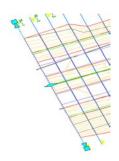


Sample Line Properties

Each Sample line can be edited individually and has its own set of properties for edits

- Tabular: Adjust Name, Style, Data included in Sample Line
- Graphical: Use Grips to adjust location and length of Sample Line

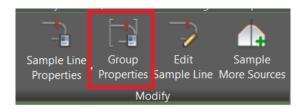
				mple Li		Group		dit .	Sam	
			P	ropertie	es Pro	operties	s Samp	le Line	More S	ources
						M	odify			
			<u>⊢</u> *							
										X
Sample Lii	ne Propertie	es - SL-2								~
			iona Castion	Views				1		~
	ne Propertie Sample Line		ions Section	Views						
			ions Section	Views			Offsets		Elevations	
		Data Sect		Views Update M	Layer	Style	Offsets Left	Right		M
formation	Sample Line	Data Sect	Data Sou	Update M	Layer C-ROAD			Right 30.0000'	Elevations	
formation	Sample Line	Data Sect Type	Data Sou	Update M Dynamic		Standard	Left		Elevations	M
formation Name SLG-1	Sample Line	Data Sect	Data Sou	Update M Dynamic Dynamic	C-ROAD	Standard All Codes	Left -30.0000'	30.0000'	Elevations Minimum 638.261'	M 640.
Name SLG-1 SLG-1	Sample Line	Data Sect	Data Sou EG Corridor	Update M Dynamic Dynamic Dynamic	C-ROAD C-ROAD	Standard All Codes Standard	Left -30.0000' -111.9940'	30.0000' 30.0000'	Elevations Minimum 638.261' 622.080'	M 640. 647.
Name SLG-1 SLG-1 SLG-1	Sample Line	Data Sect	Data Sou EG Corridor Corridor	Update M Dynamic Dynamic Dynamic Dynamic	C-ROAD C-ROAD C-ROAD	Standard All Codes Standard Standard	Left -30.0000' -111.9940' -30.0000'	30.0000' 30.0000' 30.0000'	Elevations Minimum 638.261' 622.080' 623.124'	M 640. 647. 627.

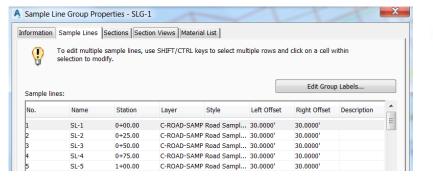


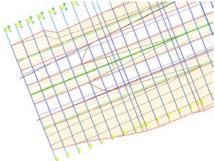
Sample Line Group Properties

Group Properties allow you to adjust settings for all Sample Lines at once

- Modify style
- Left/Right Offsets
- Sampled data included
- Materials List (volumes)











Section View Styles

Section View styles work very much like Profile View styles. Section Views styles control spacing, interval and vertical exaggeration and layers.

Section View
🖶 🗁 Section View Styles
C_GIRD_Majr_Only_H5V2_x1 (USACE)
C_GIRD_Majr_Only_H10V10_x1 (USACE)
- 🖾 C_GIRD_Majr_Only_H100V10_x2 (USACE)
C_GRID_Majr_Minr_H10 5V10 5_x1 (USACE)
C_GRID_Majr_Minr_H20 10_V2 1_x2 (USACE)
- 🧰 C_GRID_Majr_Minr_H50 5V10 2-5_x2 (USACE)

Group Plot Styles

Control how Section Views are spaced out and position when created. There is a single style created: *C_GRID_Plot_Style (USACE)*

Group Plot Style - C_GRID_Plot_Style (USACE)	– 🗆 X	🔥 Group Plot Style - C_GRID_Plot_Style (USACE) — 🗆 >	(
Information Array Plot Area Display Summary		Information Array Plot Area Display Summary	
Plot rules		Plot area grid details Horizontal major: 0.1000* 0.1000*	
	OK Cancel Apply Help	OK Cancel Apply Help	





EXERCISE: Creating Sample Lines

This section will begin by creating a new drawing and base drawings will be inserted as External References (Xrefs). Civil 3D can leverage some design data (Corridors & Surfaces) from base AutoCAD Xrefs to show data in cross sections. The base Alignment that will host cross section data will be brought in via Data References (Drefs) as data shortcuts. Additionally, Strom and Sewer Pipe Networks will be pulled in via Drefs.

- 1. Start a new drawing > use USACE Civil 3D 2016 Template v3.1.dwt
- Start by setting the coordinate system. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...
- 3. From the Units and Zone tab > Selected coordinate system code: MS83-WF
- 4. Save as > USACE Sections.dwg
- 5. Create two External References (xref) to:
 - TopoBase.dwg
 - Corridor.dwg

Attach External Reference		×	Attach External Reference		;
Name TopoBase	v [Browse	Name: Corridors	~ B	rowse
Previow	Scale Spacify On-screen S 100	Path type Full path Rotation Specify On-screen Angle: 0.00	Proview	Scale □ Spgcify On screen X 1 00 Y 1.00 Z 1.00	Path type Full path Rotation Specify On-screen Angle: 0.00
Reference Type Attachment @Qverlay Locate using @eographic Data Show Details	Specify On-screen X 0.00 Y 0.00 Z 0.00	Block Unit Unit Unitiess Factor 1.00	Reference Type Attachment Cotate using Geographic Data Show Details	Specify On-screen X 0.00 Y 0.00 Z 0.00	Block Unit Unit Feet Factor 1.00 Cancel Help

- a. \Box Scale unchecked
- b. \Box Insertion point unchecked
- c.
 D Specify On screen unchecked
- d. Reference Type: Overlay
- From TOOLSPACE > Prospector tab > browse to Data Shortcut collection > right click select > Set Working Folder...
- 7. From dialog box > Set path to class path: <Project Path Here>
- Expand Alignments collection > expand Centerline Alignments > Right on Boulevard > select Create <u>R</u>eference...
 - a. Accept the defaults
 - b. Click **OK** button





TOOLSPACE		[-	🔥 Create Alignment Reference 🛛 🗙
Active Drawing View	5 B I	? V	Source alignment: Boulevard
➡ → Alignments ➡ → Centerline Alignments	ents	Prospector	Site:
Boulevard Columbia Rc ⇒ Fire Lane - ⇒ Missouri Roa - ⇒ Ohio	Create <u>R</u> eference Open <u>S</u> ource Drawing <u>P</u> romote Remove		Name: Boulevard Description:
	ty Sewer - Network 2 nents	Survey Se	Alignment style: C_ALGN_CL (USACE) V V V Alignment layer: HM-ALGN-Boulevard Ø Alignment label set:
Pressure Networks View Frame Groups	>	~	Image: C_ALGN_PARA_LT_Maj Image: C_ALGN_PARA_LT_Maj OK Cancel

9. Expand **Pipe Networks** collection > Right on **Proposed Storm Group North** > select Create <u>R</u>eference...

- a. Network parts list: C_STRM_List (USACE)
- b. Leave the other options as default
- c. Click **OK** button

10. Expand **Pipe Networks** collection > Right on **Proposed Storm Group South** > select Create <u>R</u>eference...

- a. Network parts list: C_STRM_List (USACE)
- b. Leave the other options as default
- c. Click **OK** button
- 11. Expand Pipe Networks collection > Right on PROPOSED GRAVITY SEWER > select Create <u>R</u>eference...
 - a. Network parts list: **C_SSWR_List (USACE)**
 - b. Leave the other options as default
 - c. Click **OK** button





🔥 Create Pipe Network Reference 🛛 🗙	🛕 Create Pipe Network Reference 🛛 🗙	🔥 Create Pipe Network Reference 🛛 🗙
Source pipe network: Proposed Storm Group North Network name: Proposed Storm Group North Network description:	Source pipe network: Proposed Storm Group South Network name: Proposed Storm Group South Network description:	Source pipe network: PROPOSED GRAVITY SEWER Network name: PROPOSED GRAVITY SEWER Network description:
Network parts list:	Network parts list:	Network parts list:
<none></none>	<none></none>	<none></none>
Override reference alignment:	Override reference alignment:	Override reference alignment:
Include source labels Structure label style: <pre> </pre> Pipe label style: </td <td>Include source labels Structure label style: <none> Image: Im</none></td> <td>Include source labels Structure label style: Image: Structure label style: Pipe label style: Image: Structure label style: Image: Struc</td>	Include source labels Structure label style: <none> Image: Im</none>	Include source labels Structure label style: Image: Structure label style: Pipe label style: Image: Structure label style: Image: Struc
OK Cancel Help	OK Cancel Help	OK Cancel Help

12. From Ribbon > *Home* tab > *Profile & Section Views* panel > *Sample Lines* button

	∎ ← · → · ⊀	🕽 Civil 3D		- -		Autodes	sk Auto	CAD Civil	3D 2016	USACE_S	ections_1	.dwg		Þ
C3D Home Ir	nsert Annotate	Modify A	nalyze Vie	ew Manage	Output	Survey	Autod	lesk 360	Help	Add-ins	Expres	s Tools	Featured	i Apps 🛛
🔆 🖻 🕅	🔎 Import Survey	Data 🚮 Pa	rcel 🝷	📫 Alignment	🔹 👭 Int	ersections	- 1	🕈 Profile	View 🔹			2	+++ Move	💍 Rot
Toolspace 🚮 🖻	-🔆 Points 🔹	칻 Fe	ature Line 🝷	🖬 Profile 🝷	📫 As	sembly 🝷	-	🔥 Sampl	e Lines		🥑 🔹	- 1	诸 Сору	🔺 Mir
	🛃 Surfaces 🔹	💕 Gr	ading 🔹	👫 Corridor	Jî Pir	be Network	- 1	<u>.</u>		+	.8		. .	— -
Palettes 👻	Create Ground Da	ita 👻		Create Design	1 -		Pro	Sample						,
Start									sample li n alignme		ts section	ns at use	er specified	stations
[-][Top][2D Wireframe]								🔜 Crea	ateSample	eLines				
								Press F	1 for mor	e help				

- **13.** Select *Boulevard* Alignment from screen or press enter to select from screen
- **14.** From Select data sourced widow > set Styles for Data Sources

Туре	Data Source	Sample	Style	Section layer	Update Mode
Æ	PROPOSED GRAVITY SEWER	~		HM-PIPE-SEC	Dynamic
R	Proposed Storm Group North	~		HM-PIPE-SEC	Dynamic
1	Proposed Storm Group South	~		HM-PIPE-SEC	Dynamic
æ	HQ	~	V_SECT_Existing (USACE)	HM-SECT	Dynamic
>	Fire Lane	~	C_CORR_Proposed (USACE)	HM-CORR-SE	Dynamic
<u>م</u>	Fire Lane Fire Lane Surface	~	C_SECT_Design (USACE)	HM-SECT	Dynamic
>	Boulevard	~	C_CORR_Proposed (USACE)	HM-CORR-SE	Dynamic
et al la	Boulevard Boulevard Top Su	~	C_SECT_Design (USACE)	HM-SECT	Dynamic

15. From the Sample Line Tools dialog bar > *Sample line creation method* drop down button > select *By range of stations*... button







16. From *Crate Sample Lines* dialog box > Set dialog box values to match like below:

Prop	perty	Value
🗉 G	eneral	
	Alignment	Boulevard
🗉 S	tation Range	
	From alignment start	True
	Start Station	-0+00.45'
	To alignment end	True
	End Station	61+43.72'
🗆 L	eft Swath Width	
	Snap to an alignment	False
	Alignment	Boulevard
	Width	50.000'
🗉 R	light Swath Width	
	Snap to an alignment	False
	Alignment	Boulevard
	Width	50.000'
🗉 S	ampling Increments	
	Use Sampling Increments	True
	Increment Relative To	Absolute Station
	Increment Along Tangents	50.000'
	Increment Along Curves	50.000'
	Increment Along Spirals	50.000'
B A	dditional Sample Controls	
	At Range Start	False
	At Range End	False
	At Horizontal Geometry Points	
	At Superelevation Critical Sta	False

17. Sample lines are created along centerline at specified interval. Command is still active to allow to create more sample lines. Hit *ENTER* once to finish command, labels will then automatically appear.

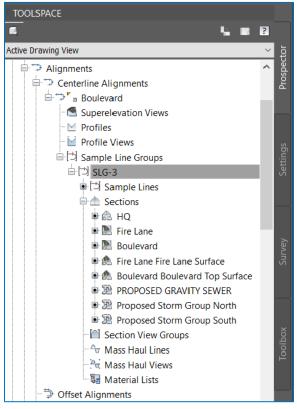






18. From the TOOLSPACE > **Prospector** tab > **Alignments** collection > **Centerline Alignments** collection

> Boulevard > Sample Line Groups collection > SLG-3 collection > review collections there



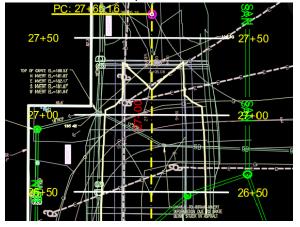




EXERCISE: Creating Single Section View

With Sample Lines created, it is possible to create a single section view at any sampled station.

- 1. Open USACE_Sections_2.dwg
- 2. Select any Sample Line on screen > in this example line on station **27+00** is selected.



 From Contextual Ribbon > Launch Pad panel > Create Section View drop down > Create Section View button

🛕 - 🗅 🖻 🖥	≣ +5 + ∂ + 3	🗘 Civil 3D		- -	Autodesk	AutoCAE	0 Civil 3D 2016	USACE_Section	ns_2.dwg [USACE	Demo Pr	roject]
Home	Insert Annotate	Modify Ana	yze View	Manage	Output	Survey	Sample Line	: 27+00.00 (55)	Autodesk 360	Help	Add
Edit Add	 Properties Object Viewer Isolate Objects 	Sample Line Properties	Group Properties Sa	Edit	Sample Nore Source		reate	Compute Materi Generate Volume Create Mass Hau	e Report		
Labels & Tables Start	General Tools - Drawing1*	× USA	Modi E_Sections_2				Create Sectio	n View		-	
[+][Top][2D Wireframe]						Cre	ate Section V	iew			- F
							ates a section each sample l	1 2	xisting and propo	osed sect	tions
							CreateSection				

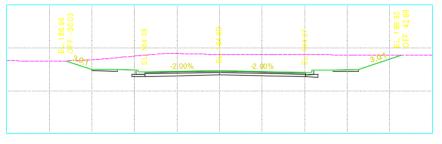
 Step through the wizard and Accept ALL defaults. From *Create Section View* dialog box > pick the *Create Section View* button





See Create Section View - Elevation Ra			3	×
See Offs Data Create Section View - D See Offset Bange See Section Display Options Set Section Display Options Section Display Options Section Display Options Section View - D	Select band set Use CLSACE The section view(s) include data ban omotation. List of bands Location: Boltom of section view	ds. Please select the source so	urface(s) for the data band	
	Set band properties: Band Type Style	Surface1	Surface2	

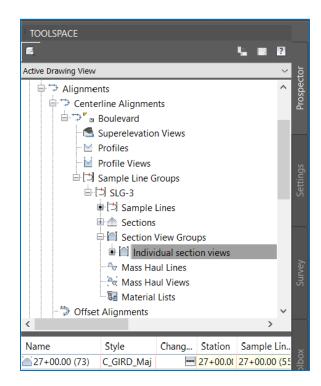
5. Pick point on right view port to insert Section View



Crated views can be tracked from within TOOLSPACE > Prospector tab > Alignments collection > Centerline Alignments collection > Sample Line Groups collection > select Individual section views







This process supports the need to create single-sections views when needed.



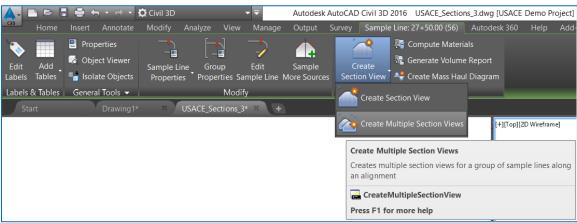


EXERCISE: Creating Multiple Section Views – "Draft Mode"

As easy as it is to create single views, when the need to create a range of sections use the Create Multiple Sections Views command. Civil 3D presents two Placement Options for users:

- **Production mode:** will be shown in a later section. Specifies a drawing template to use for creating production-ready section sheets. Use this option if you intend to use the Create Section Sheets command to generate paper space layouts that contain section views.
- **Draft mode**: method shown below in exercise. Specifies that section views will be created in a grid in model space without using a template. Use this option during draft stages. A section view group created with this option cannot be used with the Create Section Sheets command.
- 1. Continue working from previous drawing or Open USACE_Sections_3.dwg
- 2. Select any Sample Line on screen
- **3.** From Contextual Ribbon > *Launch Pad* panel > *Create Section View* drop down > *Create Multiple*

Section Views button



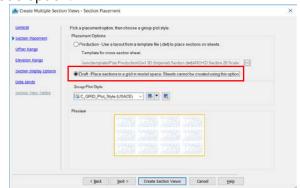
- **4.** Step through the Create Multiple Section Views wizard:
 - a. *General*: Use this page to specify basic information about the section views, including the parent alignment and sample line group name, range of stations, description, style, and layer.

	Select alignment:			e group name	
on Placement	To Boulevard	~ ed	11SL0-3		~ E
et Range	Station range	Sat		End	
stor Kange	Automatic	-0+00.45*		61+43.72	
sen Display Options	OUser specified	-0+00.45	100	61+43.72	100
Lisenda	O the philit		0.00		
aan Yww. Tabas	Section view name: [<[Section View Station]> (<[N Description:	ext Counter(CP) >			
	Section view layer HM-SECT-VIEW				





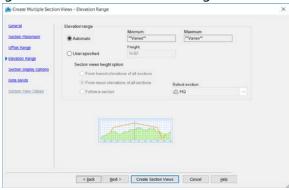
b. *Section Placement*: Use this page to control the placement of the sections in model space. Select the *Draft* mode option.



c. **Offset Range**: Use this page to specify the offset range to which the section views are drawn. Should default to left/right swaths width value when creating sample lines. If set to "Automatic" grid will resize itself if sample line is edited.

General	Offsetrange	Lett	Right	
Section Placement	Automatic	-50.00*	50.00'	
Offset Kange	OUserspecified	60.007	50.007	
Elevation Kange				
100000000000000000000000000000000000000				
Section Display Options				
Section Display Options				
Section Display Options Data Sends			ŧ.	
Section Display Options Data: Sends			ei.	
Section Display Options Data: Sends			A	
Section Display Options Data: Sends				
Section Display Options Data: Sends			ed.	
Section Display Options Data: Sends				

d. *Elevation Range*: Use this page to specify the elevation properties of the selected section view. If set to "Automatic" grid will resize itself to show highest and lowest sampled data.



e. **Section Display Options**: allows users to specify what sampled data to Draw, Style and Labels to use.





ecten Placement	Clip grid option will be ignored if the		and the state			in open
fast Range	Select sectors to draw.	Draw	Clip Grid	Label Set	Style	Override
evation Kange	- A HQ	Construction of the local division of the lo	(a)		V_SECT_E_	
CTOLOU NO 190	- IN Fire Lane	2			C CORR	
ectern Unsplay Castrons	- M Boulevard	3 3		Empty L	C.CORR_	<not< td=""></not<>
ita sands	A Fire Lane Fire Lane Surface		0	Empty L	C_SECT	<pre>>Not</pre>
	A Boulevard Boulevard Top Surt	2	0	Empty_L.	C_SECT_	<not< td=""></not<>
COST YNW, Tables	- SP PROPOSED GRAVITY SEWER	2				
	- Proposed Storm Group North	e				
	- 2 Proposed Storm Group South	2				
	6					

f. **Data Bands**: Use this page to specify the properties of the data bands associated with the section view.

General	Select band set				
Section Placement	_No_Bands (US4	AOE)			
Offset Range Elevation Range Section Display Options Option Range Section Youry Tables	Ust of bands Location Bottom of section	VIEW V	s Ploase selectific source s	urface(s) for the data band	
	Set band propertie Band Type	style	Surface1	Surfare?	
	nam rya		(Appendix)	. An an an a	

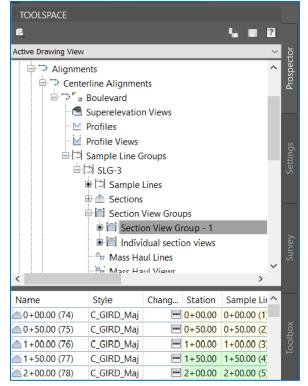
g. **Section View Tables**: Use this page to set volume table properties for the section view. <Only active if Materials have been Computed>

5. Once the above options are set > click the *Create Section Views* button to exit and create views.

6. Pick point on right view port to insert all Section Views. Selected point must be somewhere that has enough space for Section Views to stack from lower left to upper right.



Created views can be tracked from within TOOLSPACE > Prospector tab > Alignments collection >
 Centerline Alignments collection > Sample Line Groups collection > select Individual section views



A later exercise will explore the use of the "*Production*" mode to generate sheets





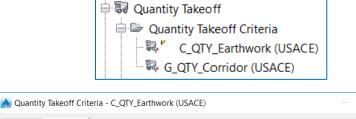
 \times

Working with Section Views: Quantity Takeoff Configuration

Once Sample Lines have been created sectional volumes can be computed. There are two main elements are used to calculate sectional volumes:

- TIN Surfaces (earthwork)
- Corridor Shapes (select material)

Configuration for this can be found from TOOLSPACE > **Settings** tab > **Quantity Takeoff** > **Quantity Takeoff** *Criteria*. There are two main Criteria set up in template:



Add new materia	al C	Define ma		Select sur	face:	
Add a subcriteri	3	🗁 Surfa	ice	< √ <type ne<="" th=""><th>ew or select></th><th>- + ></th></type>	ew or select>	- + >
Material Name	Condition	Quantity T	Cut Factor	Fill Factor	Refill Factor	Shape Style
Ground Remov		Cut	1.000		1.000	C_GRID_PA
- 🇁 EG	Below					
🗠 🇁 DATUM	Above					
🖃 🐻 Ground Fill		Fill		1.000		C_GRID_PA
- 🗁 EG	Above					

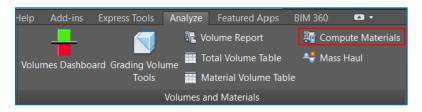
ormation Material List							
	have a large state of the state	Define m	naterial				
Add new ma	teriai	Data typ	be:	Select s	urface:		
Add a subcri	teria	🗁 Sur	face	√ <Туре	new or select>	~ 4	×
Material Name	Condition	Quantity T	Cut Factor	Fill Factor	Refill Factor	Shape Style	
	Condition	Quantity T Structures	Cut Factor	Fill Factor	Refill Factor	Shape Style C_GRID_PA	_
Material Name	Condition		Cut Factor	Fill Factor	Refill Factor	- · · ·	
Material Name	Condition	Structures	Cut Factor	Fill Factor	Refill Factor	C_GRID_PA	•
Material Name	Condition	Structures Structures	Cut Factor	Fill Factor	Refill Factor	C_GRID_PA C_GRID_PA	





Working with Section Views: Computing Materials

Sectional Volumes are calculated from Ribbons **Analyze** tab > **Volumes and Materials** panel



After Materials are calculated sectional volumes can be displayed three ways:

- Automatically in section views •
- Imported into screen full table or appended to their matching station in each section view.
- Exported to a report as XML or XLS file.

EXERCISE: Computing Materials - Earthwork

1. Open USACE_Sections_5.dwg

2.



From the Ribbon **Analyze** tab > **Compute Materials** button Dialog box will default to the only Alignment and Sample Line Group in drawing. Only Alignments with 3. created Sample Lines will be available from drop down.

🔥 Select a Sample Line Group	×
Select alignment:	
Boulevard	\sim
Select sample line group:	
(=_) SLG-3	~
OK Cancel	Help

- From the Compute Materials dialog box 4.
 - a. Quantity takeoff criteria > C_QTY_Earthwork (USACE)
 - b. Set Surfaces:
 - i. EG: **HQ**
 - ii. DATUM: Boulevard Top Surface
 - c. Click **OK** when done.

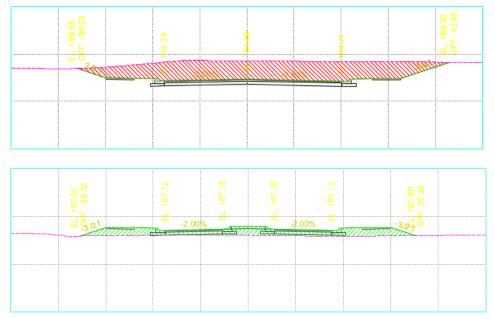






uantity takeoff criteria:		ne calculation method:
C_QTY_Earthwork (USACE)	✓ Sector Average	age End Area 🗸 🗸
Curve correction tolerance	001.0000 (d)	Map objects with same name
Name in Criteria	Object Name	Material Name
📮 🌧 🍢 Surfaces		
🖕 🗁 📕 EG	<click al<="" here="" set="" td="" to=""><td>I> *VARIES*</td></click>	I> *VARIES*
🗁 📕 EG	HQ	Ground Removed
	HQ	Ground Fill
⊡-@ [™] DATUM	<click al<="" here="" set="" td="" to=""><td>I> *VARIES*</td></click>	I> *VARIES*
- 🗁 🗖 DATUM	Boulevard Boulevard	d Top Surf Ground Removed
A DATUM	Reulayard Reulayar	d Top Surf Ground Fill

5. Once the dialog box is closed, pan around model space to view hatch patterns that were automatically created to showing cut and fill.







EXERCISE: Computing Materials – Corridor Materials

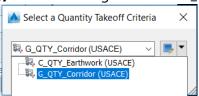
- 1. Open USACE_Sections_6.dwg
- 2. From the Ribbon *Analyze* tab > *Compute Materials* button



Dialog box will be different from the initial box as a Material List already exists > select the Import another criteria button

📥 Edit Material List - SLG-3								\times
Add new material	Ŧ	Define r Data ty 🔗 Su	pe:		Select surfac HQ	e:	 ۲ ۲ 	×
Material Name	Conditi	Quantit	Cut Fac	Fill Fact	Refill F	Shape	Curve T	Gap
🖃 🔚 Material List - (5)							☑ 001.0	
🕀 🐻 Ground Removed		Cut	1.000		1.000	C_GRID		
🗄 🐻 Ground Fill		Fill		1.000		C_GRID		
<								>
Volume calculation method:					Imp	ort another o	riteria	
Average End Area	~		ОК	Ca	ncel	Apply	Help	

4. From the Select a **Quantity Takeoff Criteria** dialog box > use **G_QTY_Corridor (USACE)**



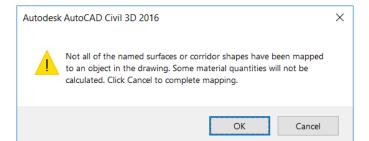
5. From the **Compute Materials** dialog box > select **Map objects with same name** button.

		5
🛕 Compute Materials - SLG-3		×
Quantity takeoff criteria:		calculation method: End Area \checkmark
Curve correction tolerance	001.0000 (d)	Map objects with same name
Name in Criteria	Object Name	Material Name
🗁 Surfaces		
🖨 🛃 Corridor Shapes		
-🛃 Pave1	Boulevard Pave1	Pave1
-🛃 Pave2	Boulevard Pave2	Pave2
- 🔚 Base	Boulevard Base	Base
- 🚠 SubBase	Boulevard SubBase	SubBase
-🚠 Sidewalk	Boulevard Sidewalk	Sidewalk
🚽 🔒 Curb	Boulevard Curb	Curb

6. A message might pop up, because of the lengthy list not all materials will be assigned.



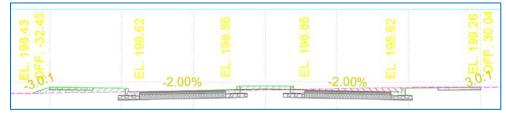




7. The added material will be seen in the *Edit Material List* dialog box

Add new material	R	Define r Data ty			Select surfac	e:		
Add a subcriteria		🖂 Su		~	HQ		\sim	[
Material Name	Conditi	Quantit	Cut Fac	Fill Fact.	Refill F	Shape	Curve T	G
📑 🌆 Material List - (5)							001.0	
🕀 🐻 Ground Removed		Cut	1.000		1.000	C_GRID		
🕀 🐻 Ground Fill		Fill		1.000		C_GRID		
🖃 🌆 Material List - (6)							V 001.0	
🕀 😡 Pave1		Structur				C_GRID		
🕀 🐻 Pave2		Structur				C_GRID		
🗄 🐻 Base		Structur				C_GRID		
🕀 🐻 SubBase		Structur				C_GRID		
🗄 🐻 Sidewalk		Structur				C_GRID		
🕀 🐻 Curb		Structur				C_GRID		
<								
olume calculation method:								
verage End Area	~				Imp	ort another o	riteria	

- 8. Rename Material List to be more descriptive of materials: *Earthwork* and *Corridor*
- 9. Once done, exit dialog box by clicking the **OK** button.
- **10.** Like before, hatch patterns will be added to Section Views automatically







Working with Section Views: Creating Tables & Reports

There are 2 main options for creating tables:

- Total Volume Table: best suited for Cut and Fill comparison of Surface Earthwork materials
- Material Volume Table: will create single material tables

Configuration for this can be found from TOOLSAPCE > **Settings** tab > **Quantity Takeoff** > **Table Styles**. There are two main Tables Styles set up in template:

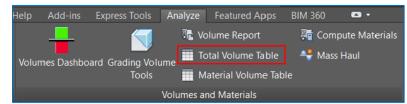
🖻 🗁 Material	
Table Style - G_SCHD_QTY_Total (USACE)	— 🗆
formation Data Properties Display Summary	
Table settings	Text settings
Wrap text	Title style: Height:
Maintain view orientation	Arial ~ 0.2000"
Repeat title in split tables	Header style: Height:
Repeat column headers in split tables	Arial ~ 0.1250"
	Data style: Height:
✓ Sort data Sorting column: 1	Arial ~ 0.1000"
Column Width	REA CUT VOL FILL VOL CUMULA CUMULA m ZAutom Autom Autom Autom Autom Autom Autom Cumul
Table Style - G_SCHD_QTY_Corridor (USACE)	—
formation Data Properties Display Summary	
Table settings	Text settings
Wrap text	Title style: Height:
Maintain view orientation	Arial ~ 0.2000"
Repeat title in split tables	Header style: Height:
	Arial ~ 0.1250"
Repeat column headers in split tables	Data style: Height:
Sort data	Arial ~ 0.1000"
Sorting column: 1 🖨 Order: Ascending 🗸	
Structure	
STATION AI Column Width 🖉 Automatic 🖉 Aut	VOLUME: <[Material Name(CP)]> REA VOLUME CUMULATIVE VOL tomatic Automatic Automatic Automatic Automatic I Area(Us <[Incremental Mat <[Cumulative Mate]





EXERCISE: Create Total Volume Table (earthwork)

- 1. Open USACE_Sections_7.dwg
- From the Ribbon > Home tab> Analyze tab > Volumes and Materials panel > Total Volume Table button



3. From *Create Total Volume Table* dialog box > Select material list > *Earthwork*

🛕 Create Total Volume Table	×
Table style:	
G_SCHD_QTY_Total (USACE)	~ 📑 🗖 📃
Table layer:	
HM-MATL-LABL	Ð
Select alignment:	
Boulevard	× 🔍
Select sample line group:	
(*) SLG-3	~
-	
Select material list:	
Earthwork	\sim
Earthwork	
	20
Maximum rows per table :	20 👻
Maximum tables per stack:	3
Offset:	0.5000"
Tile tables	
Across Own	
Behavior	
Reactivity mode:	
◯ Static	
OK Cancel	Help
Calleer	Theip

- 4. Pick the **OK** button
- 5. From model space select point on model space to insert table





			ΤΟΤΑ	L VOLU	JME: Earthwork		
STATION	CUT AREA	FILL AREA	CUT VOL	FILL VOL	CUMULATIVE CUT VOL	CUMULATIVE FILL VOL	NET VOL
0+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2+00.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2+50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.22	2.22	2.22	5.55			
59+00.00	0.00	0.00	0.00	0.00	2863.19	7630.64	-4787.48
59+50.00	0.00	0.00	0.00	0.00	2863.19	7630.64	-4787.48
80+00.00	0.00	0.00	0.00	0.00	2863.19	7630.64	-4787.48
80+50.00	0.00	0.00	0.00	0.00	2863.19	7630.64	-4787.48
61+00.00	0.00	0.00	0.00	0.00	2863.19	7630.64	-4767.48

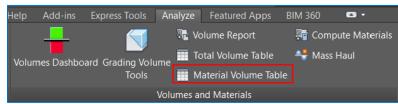
6. Review table on screen





EXERCISE: Create Material Volume Table (corridor)

- 1. Continue working from previous file or OPEN USACE_Sections_7.dwg
- 2. From the Ribbon > Home tab > Analyze tab > Volumes and Materials panel > Material Volume Table button



3. From *Create Total Volume Table dialog* box > Select material list > *Corridor* and a Material

ঌ Create Material Volur	ne Table	\times
Table style:		
G_SCHD_QTY_Corrido	or (USACE)	✓ ■
Table layer:		
HM-MATL-LABL		<i>₫</i>
Select alignment:		
Doulevard		~
Select sample line group:		
🔁 SLG-3		~
Select material list:		
Corridor		\sim
Select a material:		
Pave1 Pave1		~
Pave2		
Base SubBase		
Sidewalk		
Curb		
Offset;		0.5000"
Tile tables		
Across	Down	
Behavior		
Reactivity mode:		
🔾 Static	Dynamic	
ОК	Cancel	Help
OK	Cuncer	neip

- 4. Pick the **OK** button
- 5. From model space select point on model space to insert table





MATERIAL VOLUME: Pave1					
STATION	AREA	VOLUME	CUMULATIVE VOLUME		
0+00.00	0.00	0.00	0.00		
0+50.00	0.00	0.00	0.00		
1+00.00	0.00	0.00	0.00		
1+50.00	0.00	0.00	0.00		
60+00.00	0.00	0.00	246.05		
60+50.00	0.00	0.00	246.05		
61+00.00	0.00	0.00	246.05		

6. Review table on screen.





EXERCISE: Creating Reports

Creating reports for Earthwork and Corridor materials requires users to make sure the appropriate sheet styles are selected.

	🛕 Select Style She	eet								\times
🔥 Report Quantities	×°	k <u>i</u> n:] xsl		\sim	€ 📮	Q X	<u>V</u> iews •	Too <u>l</u> s	•
Select alignment: Select sample line group: [::] SLG-3 Select material list: Earthwork Select a style sheet: C:\ProgramData\Autodesk\C31	 ✓ € ✓ € ✓ 2016\ent 	^	Name earthwork Mass Hau Select Ma	ıl - Multiple Materials.xs		4/28/20	odified 10 12:15 PM 10 12:15 PM 10 12:15 PM	Type XSL Stylesheet XSL Stylesheet XSL Stylesheet		Size
Display XML report	Help		<							>
										>
			File <u>n</u> ame:					~ _	<u>)</u> pen	•
		~	Files of type:	*.xsl				~	Cancel	

- 1. Continue working from previous drawing or Open USACE_Sections_7.dwg
- 2. From the Ribbon *Analyze* tab > *Volumes and Materials* panel > *Volume Report* button
- 3. From Report Quantities dialog box
 - a. Select material list > *Earthwork*
 - b. Select a style sheet > *earthwork.xsl*
 - c. Pick **OK** button
- **4.** A web browser page will open showing static Report

0.00

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Volume Report Project: C:\Users\llavayen\appdata\local\temp\USACE Sections 7 1 1 5582.sv\$ Alignment: Boulevard Sample Line Group: SLG-3 Start Sta: 0+00.000 End Sta: 61+00.000 Cum. Cut <u>Cut</u> Reusable Fill <u>Fill</u> Cum. Cum. Cum. Reusable <u>Station</u> <u>Volume</u> <u>Volume</u> Cut Vol. <u>Fill Vol.</u> Net Vol. <u>Area</u> <u>Volume</u> Area Vol. <u>(Sq.ft.)</u> <u>(Cu.yd.)</u> (Cu.yd.) (Sq.ft.) (Cu.yd.) (Cu.yd.) (Cu.yd.) (Cu.yd.) (Cu.yd.) 0+00.0000.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

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Plan Production

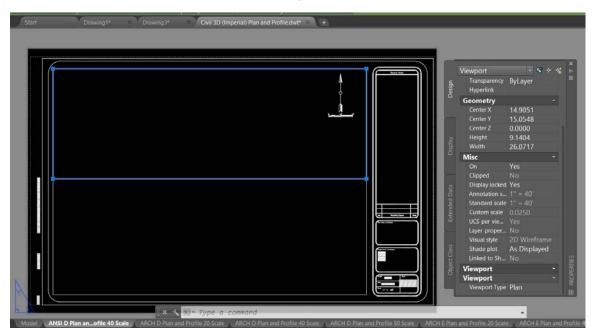
USACE does not have currently developed a Plan Production Template Configured. The out of the box templates will be used found at C:\Users\llavayen\AppData\Local\Autodesk\C3D 2016\enu\Template\Plan Production. There are a total of 8 templates (4 Imperial and 4 Metric):

- 🔮 Civil 3D (Imperial) Plan and Profile.dwt
- Civil 3D (Imperial) Plan only.dwt
- 🛕 Civil 3D (Imperial) Profile only.dwt
- Civil 3D (Imperial) Section.dwt
- 🛕 Civil 3D (Metric) Plan and Profile.dwt
- 🛕 Civil 3D (Metric) Plan only.dwt
- 🛕 Civil 3D (Metric) Profile only.dwt
- Civil 3D (Metric) Section.dwt

Plan and Section Production Templates are typically are and additional configured .dwt file. Templates do not typically store any Civil 3D configurations. Only the most basic AutoCAD items are contained in theses templates. Mainly Layers, Text and Dimensions Styles and Blocks that reside on a Paper Space Layout tab.

Plan Production Template

Templates that drive Plan Production are typically configured external and host settings in layout tabs. Basic AutoCAD details can paper space times can be preconfigured here:







EXERCISE: Creating View Frames

Plan Production has 2 phases:

- View Frames Creation: requires an Alignment to be in drawing and using configured template
- Sheet Creation: the automated development of sheets (layouts) from View Frames
- 1. Start a new drawing > use USACE Civil 3D 2016 Template v3.1.dwt
- Set the coordinate system. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...
- 3. From the Units and Zone tab > Selected coordinate system code: MS83-WF
- 4. Save as > USACE Plan_Sheets.dwg
- 5. Create two External References (xref) to :
 - TopoBase.dwg
 - Corridor.dwg
- From TOOLSPACE > Prospector tab > browse to Data Shortcut collection > right click select > Set Working Folder...
- 7. From dialog box > Set path to class path: <a> <
- Expand Alignments collection > expand Centerline Alignments > Right on Boulevard > select Create <u>R</u>eference...
 - c. Accept the defaults
 - d. Click **OK** button
- Expand Pipe Networks collection > Right on Proposed Storm Group North > select Create <u>R</u>eference...
 - d. Network parts list: **C_STRM_List (USACE)**
 - e. Leave the other options as default
 - f. Click **OK** button
- **10.** Expand **Pipe Networks** collection > Right on **Proposed Storm Group South** > select Create <u>R</u>eference...
 - d. Network parts list: C_STRM_List (USACE)
 - e. Leave the other options as default
 - f. Click **OK** button
- 11. Expand Pipe Networks collection > Right on PROPOSED GRAVITY SEWER > select Create <u>R</u>eference...
 - d. Network parts list: C_SSWR_List (USACE)
 - e. Leave the other options as default
 - f. Click **OK** button
- 12. From the Ribbon > *Output* tab > *Plan Production* panel > pick on the *Create View Frames* button 13. Step through the *Create View Frames* Wizard:
 - a. Alignment





🛕 Create View Fran	nes - Alignment			×
Alignment	Choose the alignment and stat	tion range to use for creating sheets.		
<u>View Frame Group</u> <u>Match Lines</u>	Alignment	<u> </u>	€.	
Profile Views	Station Range	Start	End:	
	Automatic	-0+00.45'	61+43.72'	
	OUser specified:	-0+00.45'	61+43.72'	
	< <u>B</u> ack	Next > Create View Frames	Cancel <u>H</u> elp	

b. Sheets

🛕 Create View Fram	es - Sheets		×
Alignment Sheets		t type and make settings for the view frames. To use a template, the DWT file must contain viewports xtended Data Properties, according to your desired sheet type.	
View Frame Group	Sheet Settings		
Match Lines	Choose the sl	neet type you want to generate:	
Profile Views			
	(impenal) Pla		10
	View Frame P Along al Rotate tr Set the fi 100.000	Select Layout as Sheet Template ? X Drawing template file name: C:\Users\layout to create new sheets ANSI D Plan and Profile 20 Scale ARCH E Plan and Profile 20 Scale ARCH E Plan and Profile 50 Scale ARCH E Plan ARCH E Plan ARCH E Plan ARCH E PlaN E Pl	
		OK Cancel Help	1

c. View Frame Group





fy object creation criteria for the view frame gr Frame Group e: M <[View Frame Group Alignment Name(CP		
e:		
)]> (<[Next Counter(CP)]>)	
cription:		
Frame		
r.		
VIEW-FRAM	4	
e:		
	L	
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G_ANNO_NPLT_FRAM (USACE)	✓ ■ ▼ ■	
I location:		
	Frame ar: VIEW-FRAM Ne: IM (<[Next Counter(CP)]>) 2: G_ANNO_NPLT_FRAM (USACE) al style: G_ANNO_NPLT_FRAM (USACE) al location:	Frame ar: -VIEW-FRAM be: RM (<[Next Counter(CP)]>) as: G_ANNO_NPLT_FRAM (USACE) al style: G_ANNO_NPLT_FRAM (USACE)

d. Match Lines

🛕 Create View Fran	nes - Match Lines	×
<u>Alignment</u> <u>Sheets</u>	You can choose to insert match lines automatically and define how they are placed.	
View Frame Group	Positioning Snap station value down to the nearest Interpretation value down t	
Profile Views	Match line	
	Layer. Name: HM-MLIN Image: Marture (CP)]>) Style: Image: G_ANNO_MTCH_Line (US. V)	
	Labels Left label style: Left label style: Image: C_ANNO_MTCH_Left_PRE view Image: C_ANNO_MTCH_Left_PRE view Image: C_ANNO_MTCH_Right_NE view Left label location: Right label location: End V	
	< Back Next > Create View Frames Cancel	//

e. Profile Views





🛕 Create View Frame	s - Profile Views	×
<u>Alignment</u> <u>Sheets</u>	The following profile view information is required to determine the distances available in viewports.	
View Frame Group Match Lines Profile Views	Profile View Style Select profile view style: C_GRID [L-R] Majr_Minr_H100_25_V5_2-5_F V F	
	Band Set Select band set style: C_BAND_STA_Ex[Pr_Majr_Minr_BELOW (US)	
	< <u>B</u> ack <u>N</u> ext > Create View Frames Cancel <u>H</u> elp	

14. When done pick on the *Create View Frames* button

and the second se
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<u>.</u>





EXERCISE: Creating Sheets

- 1. Continue working from drawing or OPEN USACE_Plan_Sheets_1.dwg
- 2. From the Ribbon > **Output** tab > **Plan Production** panel > pick on the **Create Sheets** button
- **3.** Step through the *Create Sheets* Wizard:
 - a. View frame Group and Layouts

	Choose the View Frame Group and output settings for layout creation. View Frame Group	
Sheet Set		
Profile Views	Sheet type: Plan and Profile	
Data References	View frame range:	
	All O Selection: Choose View Frames	
	Layout Creation	
	O Number of layouts per new drawing:	
	1	
	All layouts in one new drawing	
	All layouts in the current drawing	
	Layout name:	
	SHET (<[Next Counter(CP)]>)	
	Choose the north arrow block to align in layouts: North	
	eet Set	
	eet Set	
Create Sheets - Sh View Frame Group and Layouts	eet Set	
Create Sheets - Sh View Frame Group and Layouts		
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set	
Create Sheets - Sh View Frame Group and Layouts		
View Frame Group and Layouts Sheet Set Profile Views	Sheet Set	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set New sheet set	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set New sheet set	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	SheetSet New sheet set VFRM Boulevard (1) Add to existing sheet set	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	SheetSet New sheet set VFRM Boulevard (1) Add to existing sheet set Sheet set storage location: C\SOW\USACE\Template Training)5_Sheet Sets\	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set New sheet set VFRM Boulevard (1) Add to existing sheet set Sheet set storage location:	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set Image: Sheet set Image: Sheet set storage location: C\SOW\USACE\Template Training\5_Sheet Sets\ Sheets Sheet files storage location: C\SOW\USACE\Template Training\5_Sheet Sets\ Sheets Sheet files storage location: C\SOW\USACE\Template Training\5_Sheet Sets\ Sheet files storage location: C\SOW\USACE\Template Training\5_Sheet Sets\	
Create Sheets - Sh View Frame Group and Layouts Sheet Set Profile Views	Sheet Set Image: Sheet set storage location: C:\SOW\USACE\Template Training\5_Sheet Sets\	

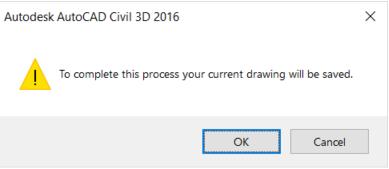
c. Profile Views



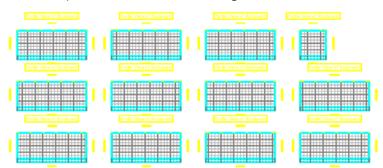


🛕 Create Sheets - Pro	ofile Views	×
View Frame Group and Layouts	The profile view and band set can only be changed during view frame creation. You can choose other profile view settings.	
Sheet Set	Profile view settings Profile view style to be used:	
Profile Views	10m2 V0arbi, v0 00 00 0000 10m2 V0arbi, v0 00 00 0000000000000000000000000000	
Data References	Band set to be used:	
	[□] C_BAND_STA_Ex Pr_Majr_Minr_BELOW (USACE)	
	Other profile view options	
	Get other settings from an existing profile view:	
	◯ Choose settings:	
	Profile View Wizard	
	Align views	
	Align profile and plan view at start	
	Align profile and plan view at center	
	Align profile and plan view at end	
	< Back Next > Create Sheets Cancel Help	

- d. Data References
- <Only Available if Creating External Sheets>
- 4. A message to Save might appear



5. Select a point on screen where profiles for sheets will be generated



6. View data on newly created layout tabs Layout Tabs.

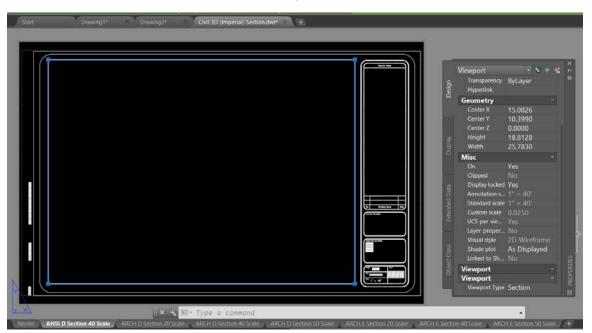




Section Production

Second Production Template

Templates that drive Section Production are typically configured external and host settings in layout tabs. Basic AutoCAD details can paper space times can be preconfigured here:



EXERCISE: Creating Section View via Production Mode

- 1. From the Sections folder open the **USACE_Section_7.dwg**
- 2. From the Ribbon > Home tab > Plan & Section Views panel > Section Views flyout > Crate Multiple Views button
- 3. Step through the Create Multiple Views Wizard
 - a. General





General	Select alignment:		Sample lin	e group name:		
Section Placement	Doulevard	~	[⁺] SLG-3		~	
Offset Range	Station range	Start		End:		
levation Range	Automatic	-0+00.45'		61+43.72'		
Section Display Options	O User specified:	-0+00.45'	-900 -100	61+43.72'		
<u>Data Bands</u>						
Section View Tables	Section view name:					
ection view rables	<[Section View Station]> (<[N	ext Counter(CP)]>				
	<[Section View Station]> (<[N	ext Counter(CP)]>				
		ext Counter(CP)]>				
		ext Counter(CP))>				
		ext Counter(CP))>				
	Description:	ext Counter(CP))>				
	Description:					

b. Section Placements

	Pick a placem	ent option, then choose a group plot style.
Section Placement	Placement Op	btions
Offset Range	Ŭ	n - Use a layout from a template file (.dwt) to place sections on sheets. te for cross section sheet.
Elevation Range	i\enu\ter	mplate\Plan Production\Civil 3D (Imperial) Section.dwt ARCH D Section 20 Scale
Section Display Options	ODraft - Pla	as asstions is a grid is model anosa. Chasta connet he areated using this antian
<u>Data Bands</u>		▲ Select Layout as Sheet Template ? ≻
Section View Tables	Group Plot S	
	Preview	Select a layout to create new sheets
		ANSI D Section 40 Scale
		ARCH D Section 20 Scale ARCH D Section 40 Scale
		ARCH D Section 50 Scale ARCH E Section 20 Scale
		ARCH E Section 40 Scale
		ARCH E Section 50 Scale

c. Offset Range





Seneral Section Placement	Offset range	Left -50.00'	Right 50.00'	
Offset Range	O User specified	-50.00'	50.00'	
Section Display Options				
Data Bands Section View Tables				
	4		4	

d. Elevation Range

ieneral	Elevation range	Minimum:	Maximum:	
Section Placement	Automatic	**Varies**	**Varies**	
Affset Range		Height		
levation Range	OUser specified	15.00'		
ection Display Options	Section views height of	option:		
	From lowest ele	evations of all sections		
lata Bands	(e) From mean ele	vations of all sections	Select section:	
ection View Tables	Follow a section	n	🖾 HQ	
			7	

e. Section Display Options

	Clip grid option will be ignored if the	selected se	cuon view style	is set clip to	nignesi secut	
Section Placement	•					
Offset Range	Select sections to draw: Name	Draw	Clip Grid	Label Set	Style	Override
Elevation Range	HQ HQ		 One 		V_SECT_E	Not ^
<u>clevation Kange</u>	- M Fire Lane				C_CORR	
Section Display Options	- Boulevard		-	_Empty_L	C_CORR	□ <not< td=""></not<>
Data Bands	- 🌨 Fire Lane Fire Lane Surface	~	0	_Empty_L	C_SECT	🗌 <not< td=""></not<>
	🛛 🐣 Boulevard Boulevard Top Surf	✓	0	_Empty_L	C_SECT	🗌 <not< td=""></not<>
Section View Tables	- 🕦 PROPOSED GRAVITY SEWER					
	- 🕞 Proposed Storm Group North	V				
	- 👚 Proposed Storm Group South	v				
	- 🐻 Ground Removed	✓			C_GRID_P	🔲 <not< td=""></not<>
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	Pave2				C_GRID_P	
	- 🛃 Base		_		C_GRID_P	
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	Sidewalk				C GRID P	□ <not td="" ×<=""></not>

f. Data Bands



eral	Selectband set	
tion Placement	v C_BAND_Ex Pr_CL (USACE) ✓ S C_BAND_Ex Pr_CL (USACE)	
f <u>set Range</u>	The section view(s) include data bands. Please select the source surface(s) for the data band annotation.	ł
vation Range	List of bands	
ction Display Options		
a Bands	Bottom of section view	
tion View Tables		
	Set band properties: Band Type Style Surface1 Surface2	
	Bection Data C_GRID_Ex/Pr_CL (USAHQ Boulevard Boule	vard To
	< Paula Next > Counts Castian Visuum Council Units	
	< <u>Back</u> <u>Next</u> > Create Section Views Cancel <u>H</u> elp	
ion View		
eate Multiple Secti	Tables	
reate Multiple Secti	Tables	
reate Multiple Secti	Tables ion Views - Section View Tables Image: Control of the section view(s) include volume tables. Please select volume table type(s) to draw.	
eate Multiple Secti ral on Placement	Tables ion Views - Section View Tables Image: The section view(s) include volume tables. Please select volume table type(s) to draw. Type: Select table style:	ld>>
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Create Multiple Secti tion Placement set Range vation Range tion Display Options a Bands	Tables ion Views - Section View Tables Image: Section view(s) include volume tables. Please select volume table type(s) to draw. Type: Select table style: Total Volume Image: G_SCHD_SECT_Total (USACE) List of volume tables Image: G_SCHD_SECT_Total (USACE) Table type Style Material list Materials Layer Split Gap Reference Position of table(s) relative to section view Section view anchor: Table layout	e:

4. After picking the Create Section Views button, pick a point on scree to generate Section Views within Sheets.



g.

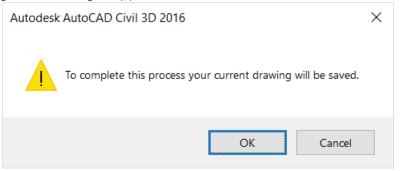


EXERCISE: Creating Section Sheets

- 5. Continue working or open USACE_Sections_8.dwg
- 6. From Ribbon > Output tab > Plan Production panel > Create Section Sheets button
- **7.** From the Create Section Sheets dialog box

Create Section Sheets				×
Fo create section sheets, please choose a ilter and find the section view group.	section view group directly or	use the lists of ali	gnments and sam	ple line groups to
Select alignment:	Sample line group name:	5	Select section viev	v group:
🎲 Boulevard 🗸 🔣	[⁺] SLG-3	✓ 🚅	Section View	Group - 2 🗸
Layout Settings Note: All layouts will go into the current Layout name:	drawing			
Section Sheet - (<[Next Counter(CP)]>)	2		
Sheet Set New sheet set: New Sheet Set 1				
Add to existing sheet set:				
VFRM Boulevard (1)			11	
Sheet set storage location:				
C:\SOW\USACE\Template Training\5_	Sheet Sets\		14	
		Create Sheet	ts Cance	l <u>H</u> elp

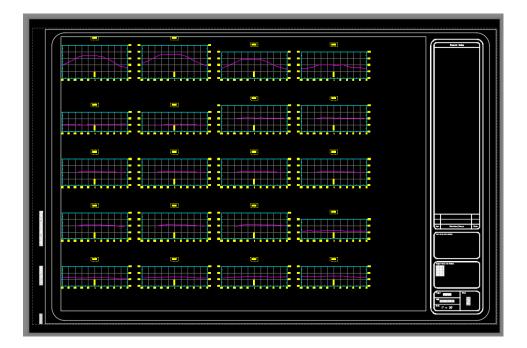
8. An AutoCAD message to save might appear



9. Switch to Layout Tab to see created sheets











Appendix A

Connecting to Aerial using BING Live Maps

The use of the BING Live mapping service is a free function accessed via the AutoCAD interface. For it to works requires a few things:

- 1. Create a FREE Autodesk 360 account. If you need help follow link below: <u>https://knowledge.autodesk.com/customer-service/account-management/account-profile/create-autodesk-account</u>
- 2. A coordinate system must be assigned to drawing to enable the Geolocation tab
- 3. Linework must be geographically positioned correctly in model space.
- 4. Recent updates from BING side cause a permissions connection error. To correct the error follow link below:

<u>https://knowledge.autodesk.com/support/autocad/downloads/caas/downloads/content/autodesk-C2-AE-autocad-C2-AE-2015-2018-geolocation-online-map-hotfix.html</u>

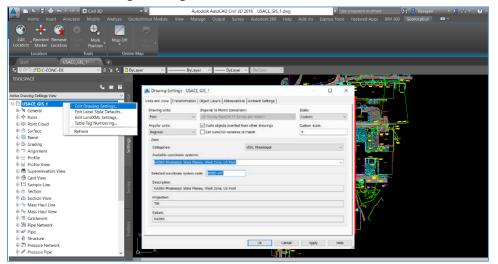
Using the Live Mapping Service

- 1. Open USACE_GIS_1.dwg
 - 2. Make sure you are signed into your Autodesk account (upper right of AutoCAD session).





 Start by setting the coordinate system. From TOOLSPACE palette > Settings Tab > right click on drawing name > Edit Drawing Settings...

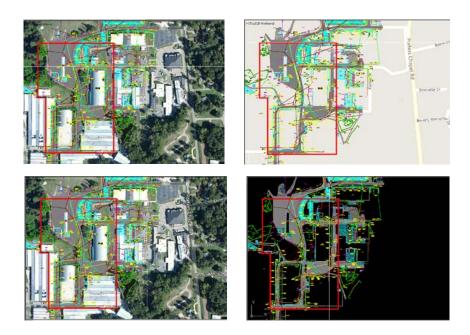


- From the Units and Zone tab > Selected coordinate system code: MS83-WF
 (Alternatively you can use the Categories & Available coordinate systems drop downs)
- **5.** Once the coordinate is set and exit out of the dialog box, the blue *Geolocation* tab will become available.

- 6. Another visual queue will be a NON- plotting marker centered on screen that look like Dot/Star/Wheel
- **8**. This marker can be turned off by charging the system variable **GEOMARKERVISIBILITY** to 0.
- **7.** From the Geolocation tab > expand the *Map* button > use the different options:
- 8. Map Aerial
- 9. Map Road
- 10. Map Hybrid
- 11. Map Off







- **12.** To keep a portion of the image after turning the service off, use the Capture Area button. The options are to:
- 13. Capture Area: user is prompted to draw area to trim image
- 14. Capture Viewport: current view shape of screen area is used as cut off image





Appendix B

Associated Files for the Documentation

USACE_GIS_1.dwg USACE_GIS_2.dwg USACE_GIS_3.dwg USACE_GIS_4.dwg USACE_GIS_5.dwg USACE_GIS_6.dwg USACE_GIS_7.dwg erdc_701200_3576000_oct(5cm).laz USACE_Geotech_1.dwg USACE Geotech 2.dwg USACE_Geotech_3.dwg USACE_Contours.dwg USACE_Grading_1.dwg USACE_Grading_2A.dwg USACE_Grading_3.dwg USACE_Grading_4.dwg USACE_Grading_5.dwg USACE_Grading_6.dwg USACE_Grading_7.dwg USACE_Grading_8.dwg USACE_Grading_9.dwg USACE_Grading_Site_1.dwg USACE_Grading_Site_2.dwg USACE_Grading_Site_3.dwg

Found in the Working Folder: SurfaceFRomXML.dwg ProposedLignmentObjects.dwg ProposedAlignments.dwg ProposedAlignments.dwg Profiles.dwg BaseLIne_and_Alignments.dwg PropLineWork.dwg TopoBase.dwg UtilBase.dwg Corridors.dwg CompositeSurface.dwg







