

CES473668

Supercharge your Dynamo Graph with Civil 3D Toolkit

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Learning Objectives

- Be familiarized and use Civil 3D Toolkit.
- Create simple and re-usable routine.
- Navigate and debug your Dynamo graph.
- Create your own automation routine.

Description

This class will provide basic to intermediate understanding of Civil 3D Toolkit package in Dynamo for Civil 3D. Learn how to leverage Civil 3D Toolkit in solving basic to complex Dynamo graph.

Speaker



Jowenn is an Implementation Consultant at Autodesk. He holds a B.S. Civil Engineering degree from De La Salle University and MBA degree from Ateneo De Manila University. He has over 16 years industry experience in design and construction. He is highly skilled in Civil 3D, Dynamo and Subassembly composer. He provides technical workflow solutions, mentoring and consulting. Major projects he handled previously includes Sydney Metro TSE, SVC and OTS, Ballina Bypass Pacific Highway, Brisbane Airport Link Northern Busway Tender Design, Gerringong Upgrade Princess Highway and

Rozelle Interchange WestConnex. | Autodesk Expert Elite Alumni | 2016 Autodesk Gunslinger Sydney, Australia | 2018 Civil Infrastructure Inside the Factory Potsdam, Germany | 2020 Land Development Inside the Factory New Hampshire, USA

Introduction to Civil 3D Toolkit package in Civil 3D

Civil 3D Toolkit is a package created inside Dynamo for Civil 3D (D4C3D). Dynamo is a visual programming application that can automate tasks in Civil 3D. It is an open sourced graphical tool for design and documentation. It is a visual interface used to create logical flow of routines and used to manipulate data and generate geometry. Civil 3D Toolkit was developed to supplement the out of the box nodes and provided enhancement capability that is not available in the current version.

Where to get Civil 3D Toolkit?

Step 1

For C3D 2020, download D4C3D in [Manage.autodesk.com](https://manage.autodesk.com). Open Dynamo in Manage tab.

For C3D 2021, Open Dynamo in Manage tab.

Alternatively, in Commandline: **AeccLaunchDynamo**

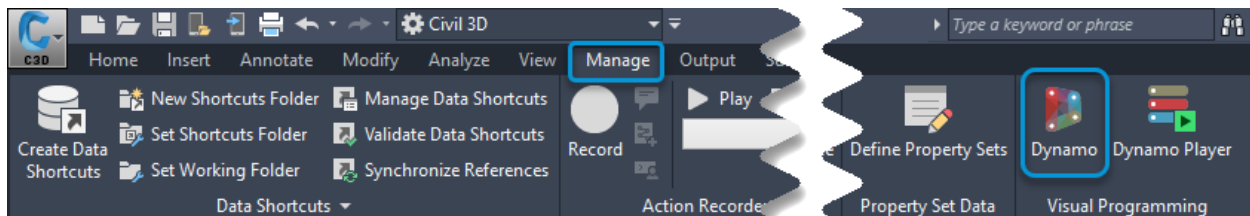


Figure 1.1: Dynamo for Civil 3D via manage tab in the Ribbon

Step 2

In Dynamo, go to Packages tab and search for Civil3DToolkit

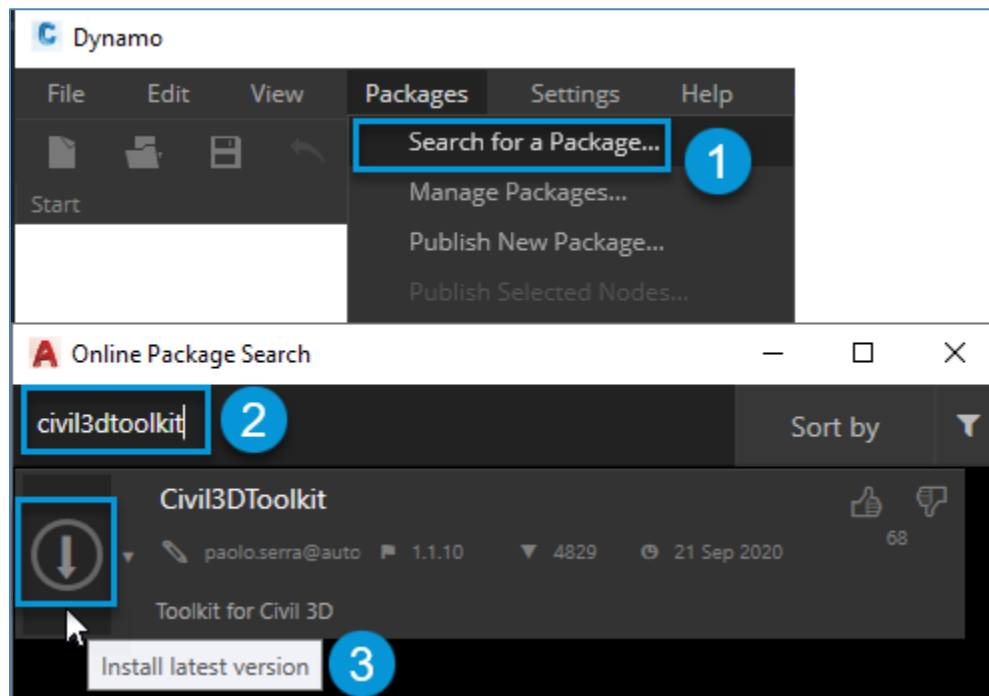


Figure 1.2: Installing Civil 3D Toolkit via Dynamo Package Manager

Where to find Civil 3D Toolkit?

Once you downloaded and install the latest Civil 3D toolkit, you can see the package in the library side below Add-Ons and will have the name Autodesk. In the drop down, you can see Civil3DToolkit.

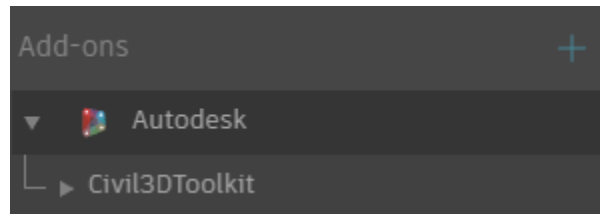


Figure 1.3: Civil 3D Toolkit in Dynamo Library via Add-ons

Who developed this package?

Paolo Serra | Principal Implementation Consultant and Safi Hage | Sr. Designated Support Specialist both from Autodesk worked together to develop the Civil 3D Toolkit package and published the first version on 20th of November 2019.



Figure 1.4: Brains behind the Civil 3D Toolkit Package

Why do I need to use this package?

This package offers at least 500+ additional nodes when it was first released and it keeps on improving and adding more functionality. It is widely used in the Civil 3D community and is being enhanced with the help of our Dynamo community that provides valuable feedbacks to our developers.

Where do I start?

It is ideal to use Civil 3D Toolkit if you already understand the basic principle of Dynamo and know how to use this. If you need some Dynamo refresher, visit <https://primer.Dynamobim.org/> to give you a strong foundation on Dynamo basics. After that, you can visit the Civil 3D Toolkit feedback thread and start reading from community feedbacks and learn from sample routine provided by the community. <https://forum.Dynamobim.com/t/civil-3d-toolkit-feedback-thread/43570>

It is also important to know the basic functionality of Civil 3D for you to be able to leverage the power of Dynamo and the enhancement that comes with the toolkit. Start with small routines like selecting an object or converting geometry from Dynamo to Civil 3D and vice versa. Once you are comfortable with the tool start making simple re-usable routine.

How to check your Civil 3D Toolkit version?

If you already have installed the Civil 3D Toolkit and want to check what is your current toolkit version, go to Packages tab and select Manage Packages then you will see beside the package name the current version installed in your Dynamo.

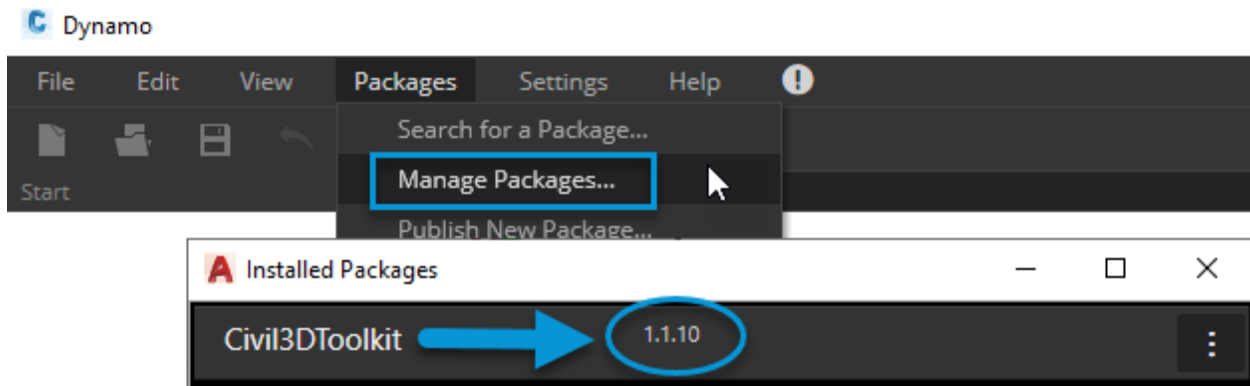


Figure 1.5: Checking current package version installed

Current categories in Civil 3D Toolkit

As this package continuously evolves, we can see that major categories are being used to properly place each new nodes. To date, we have nodes inside 8 major categories.

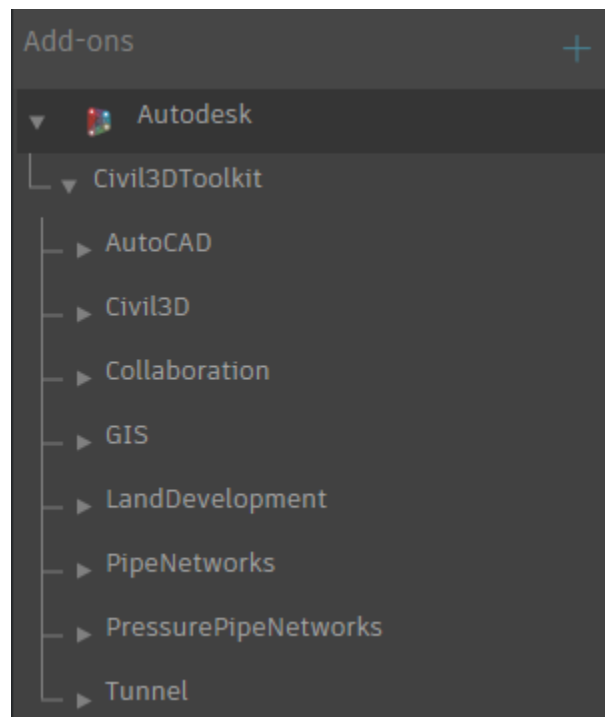


Figure 1.6: Major categories in Civil 3D Toolkit as of version 1.1.10

AutoCAD & Civil 3D Categories

Civil 3D Toolkit offers a wide range of subcategories. The two most commonly used categories in the toolkit would be AutoCAD and Civil 3D. Although we will not tackle each nodes available, we will use some of the nodes here to create our simple and re-usable routines later on.

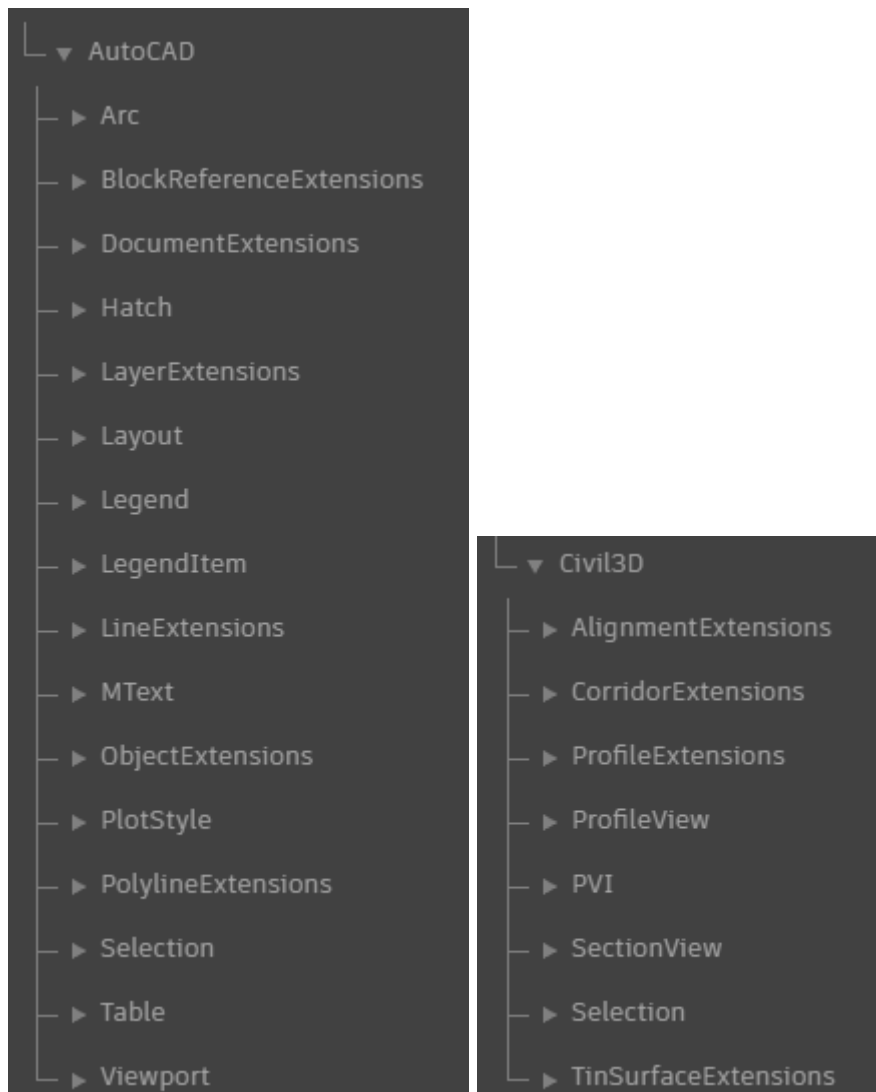


Figure 1.7: AutoCAD & Civil 3D subcategories in Civil 3D Toolkit as of version 1.1.10

Other Task Specific Categories

Civil 3D Toolkit have other major categories such as Collaboration, GIS, LandDevelopment, PipeNetworks, PressurePipeNetworks and Tunnel.

For Collaboration, you can find nodes related to BIM360, Forge and Photo.

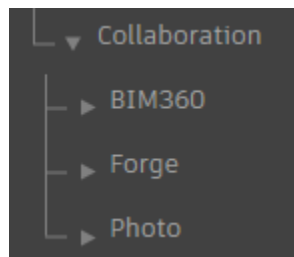


Figure 1.8: Collaboration subcategories in Civil 3D Toolkit as of version 1.1.10

For GIS, you can find nodes related to Map and Object data.

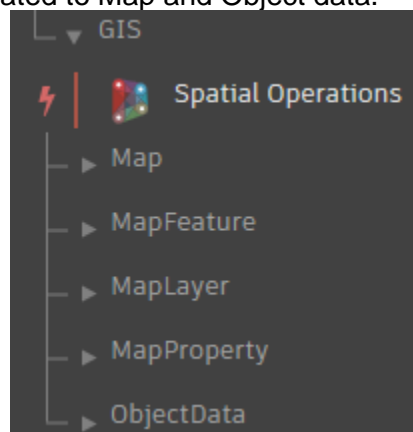


Figure 1.9: GIS subcategories in Civil 3D Toolkit as of version 1.1.10

For LandDevelopment, you can find nodes related to Site, Parcel, Featurelines and Cogo pts.

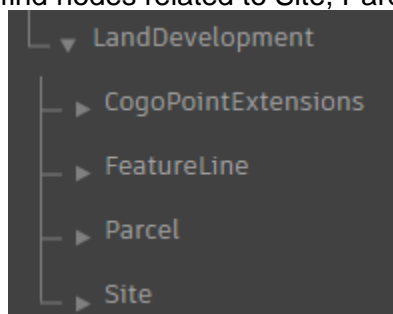


Figure 1.10: LandDevelopment subcategories in Civil 3D Toolkit as of version 1.1.10

For PipeNetworks, you can find nodes related to Network, Pipe, Part and Structure.

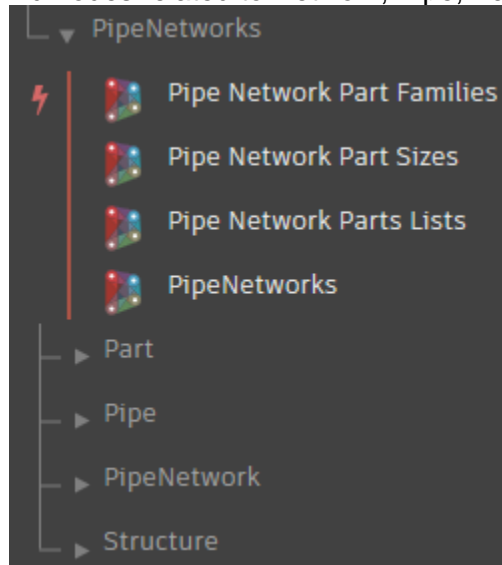


Figure 1.11: PipeNetworks subcategories in Civil 3D Toolkit as of version 1.1.10

For PressurePipeNetworks, you can find nodes related to Pipe, Fitting, Appurtenance and Networks.

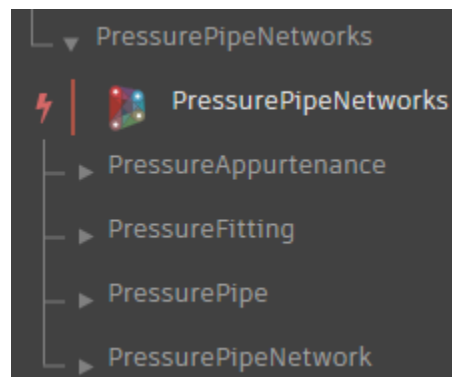


Figure 1.12: PressurePipeNetworks subcategories in Civil 3D Toolkit as of version 1.1.10

For Tunnel, you can find nodes related to Ring, RingType and RingSegment.

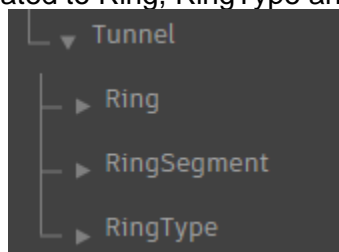


Figure 1.13: Tunnel subcategories in Civil 3D Toolkit as of version 1.1.10

Create simple and re-usable routine

When building your Dynamo graph archives, it is very important to focus on making graphs that is scalable and reusable. Making smaller graphs that you can share with team members to learn and re-use will make Dynamo learning a lot easier.

Autocad > Selection > Objects Types

This is one of the most common nodes that new users will want to try. On the current out of the box installation, you will be able to find list of objects there. Using the Civil 3D Toolkit, you will be given more choices in the selection list.

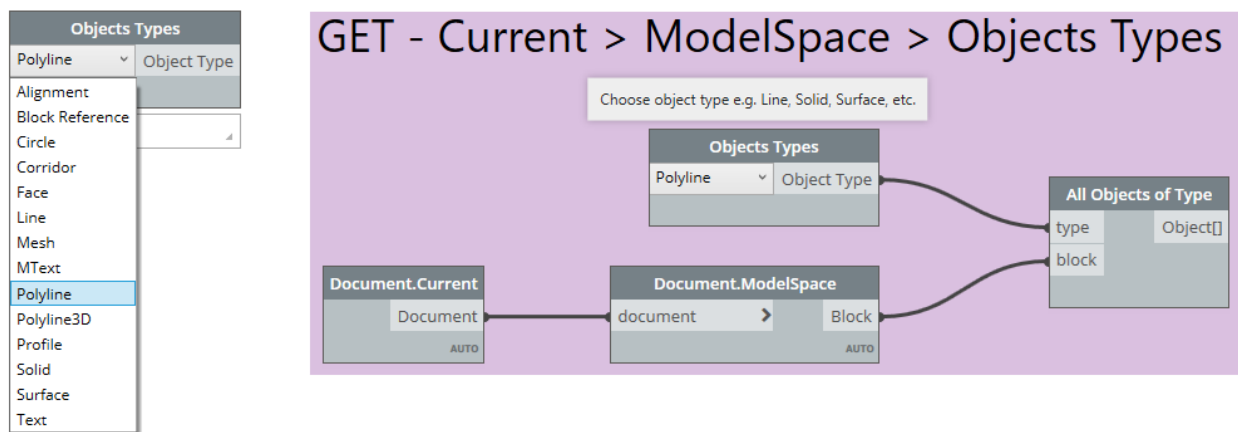


Figure 2.1.A: Objects Types before Civil 3D Toolkit enhancement

Civil 3D Toolkit > AutoCAD > DocumentExtensions

Using DocumentExtensions.AddNewTypes you can now leverage selecting more objects like Arc, CogoPoint, Featureline, Hatch and MLeader to name a few.

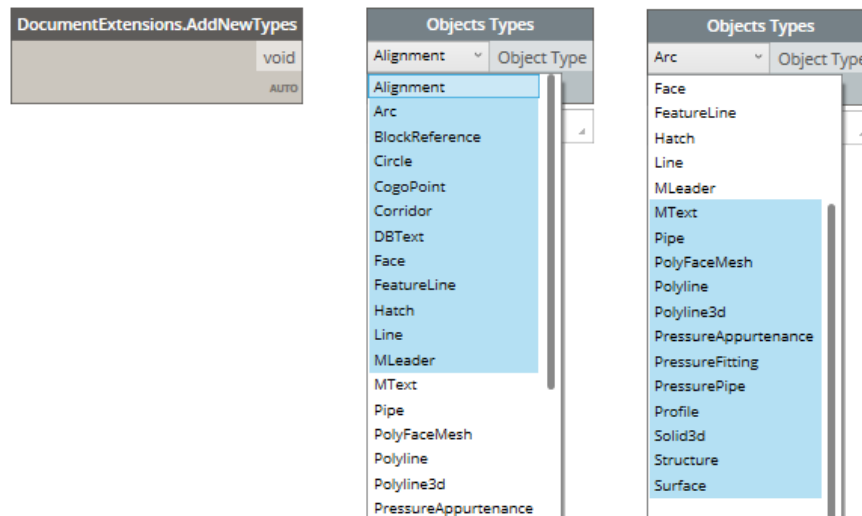


Figure 2.1.B: Objects Types after adding DocumentExtensions.AddNewTypes

Civil 3D Toolkit > AutoCAD > Arc

Converting Dynamo Arc geometry to Civil 3D geometry has been a challenge for many Dynamo users in the past. Using the Civil 3D Toolkit, you will be able to convert the Dynamo arc geometry to Civil 3D.

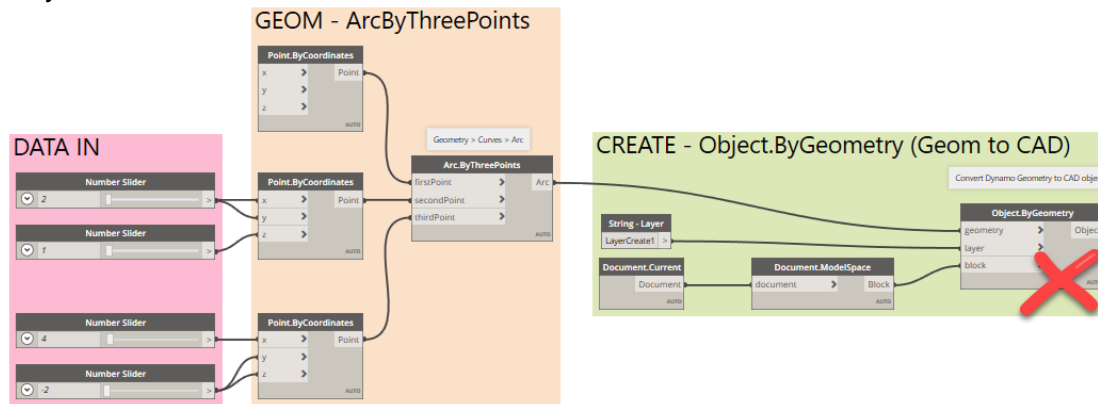


Figure 2.2.A: Sample Arc geometry not converting to CAD using Object.ByGeometry

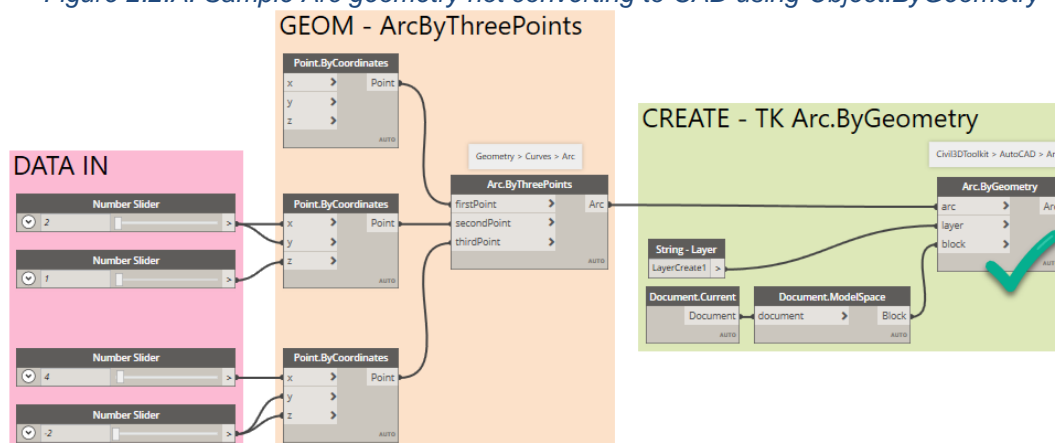


Figure 2.2.B: Arc geometry convert to CAD using Arc.ByGeometry (Option1)

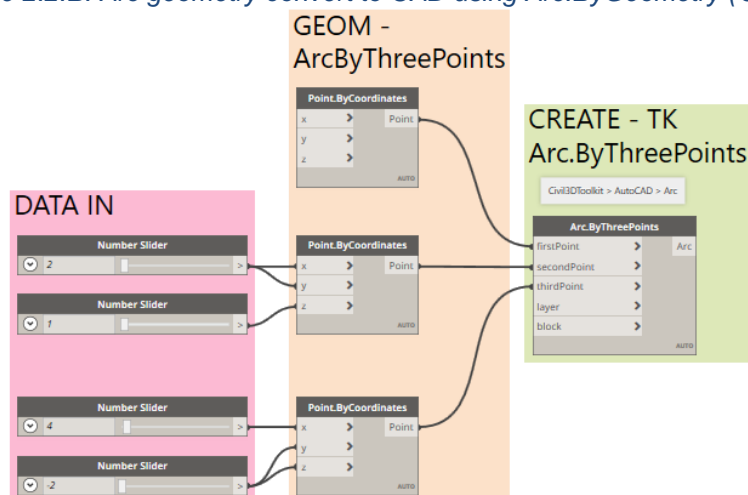


Figure 2.2.C: Create Arc directly to CAD using Arc.ByThreePoints (Option2)

In Figure 2.2.C Instead of creating ArcByThreePoints inside Dynamo, the toolkit will allow you to build the geometry directly to CAD.

Converting Arc from CAD to Dynamo using Object.Geometry is not implemented. Using the toolkit will allow you to convert the CAD object and convert it to Arc before the Object.Geometry will be able to recognize the object. Alternatively, you can also use the Arc.Geometry which will create the arc in Dynamo.

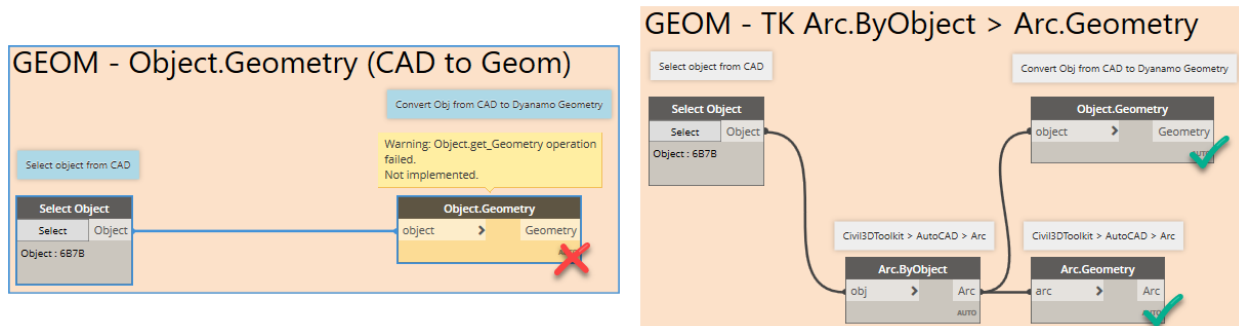


Figure 2.2.D: Converting CAD Arc to Dynamo Geometry

Civil 3D Toolkit > AutoCAD > Selection

Selecting an object from Civil 3D is available but only limited to selecting one object at a time. Using the toolkit, you can choose multiple objects all at once or specify more objects to add to the current selection set.

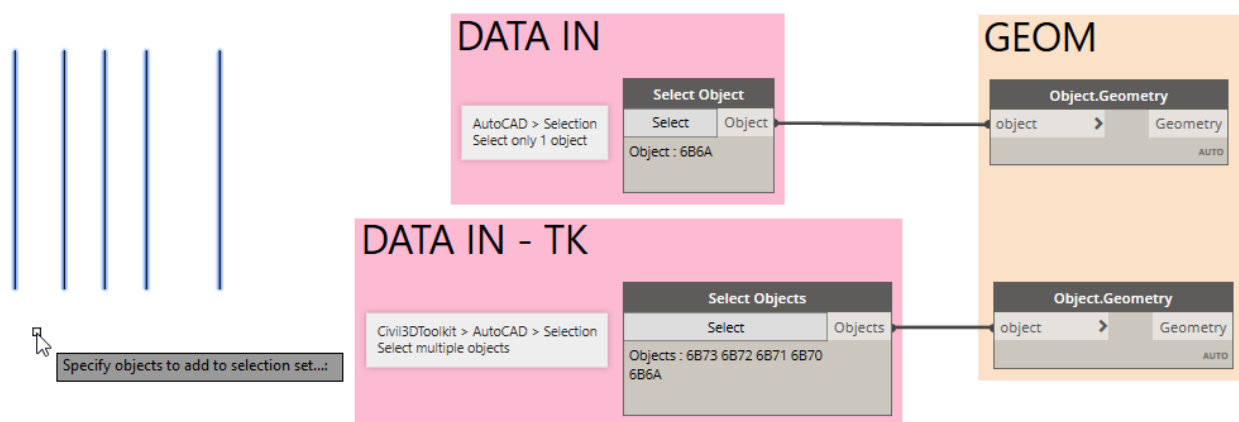


Figure 2.3: Select object and Select objects that allows multiple selections in Civil 3D

Civil 3D Toolkit > AutoCAD > Hatch

The toolkit also provides some enhancement with hatch. The Hatch.ByObject returns a hatch from an autocad hatch object which allows us to get information like rotation, scale, pattern and even geometry as polycurve boundary of the hatch.

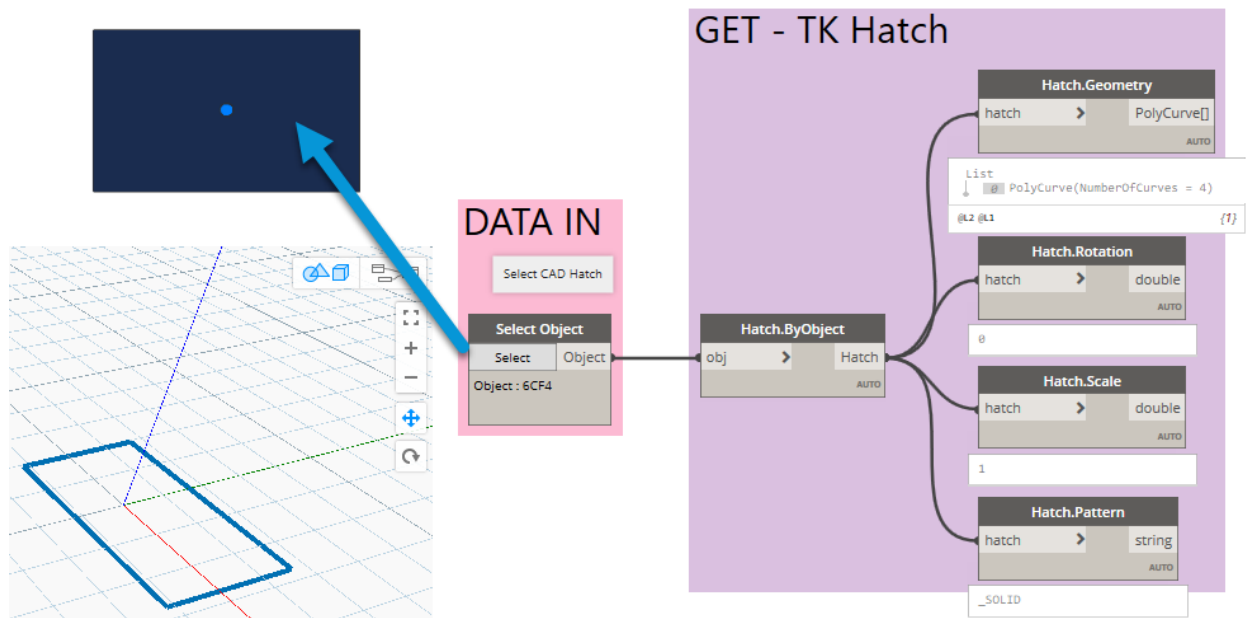


Figure 2.4.A: Selecting CAD hatch and using Hatch.ByObject to get the hatch information

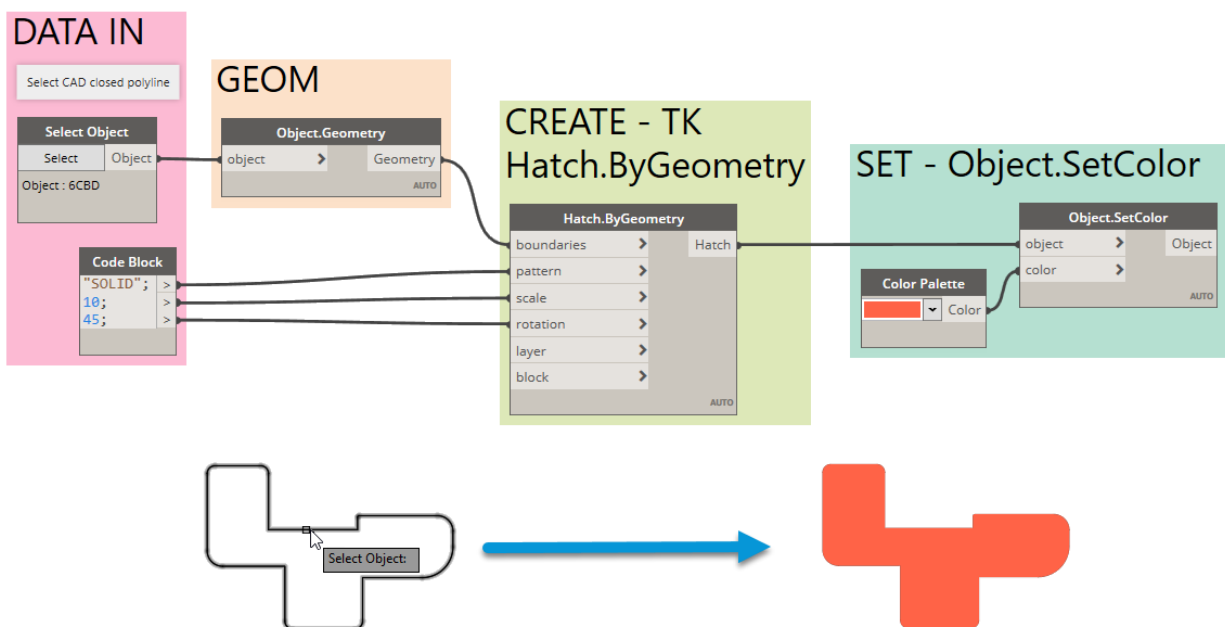


Figure 2.4.B: Selecting CAD closed region & using Hatch.ByGeometry to assign hatch then set the color

Civil 3D Toolkit > AutoCAD > BlockReferenceExtensions

Ability to add block reference has been part of our day to day CAD work in the past. Inserting the block to the exact location using Dynamo in a very efficient way is ground breaking. It eliminates human error and provides fast and accurate way of inserting a block. Toolkit enhancement provides user to create block reference in CAD using Dynamo geometry.

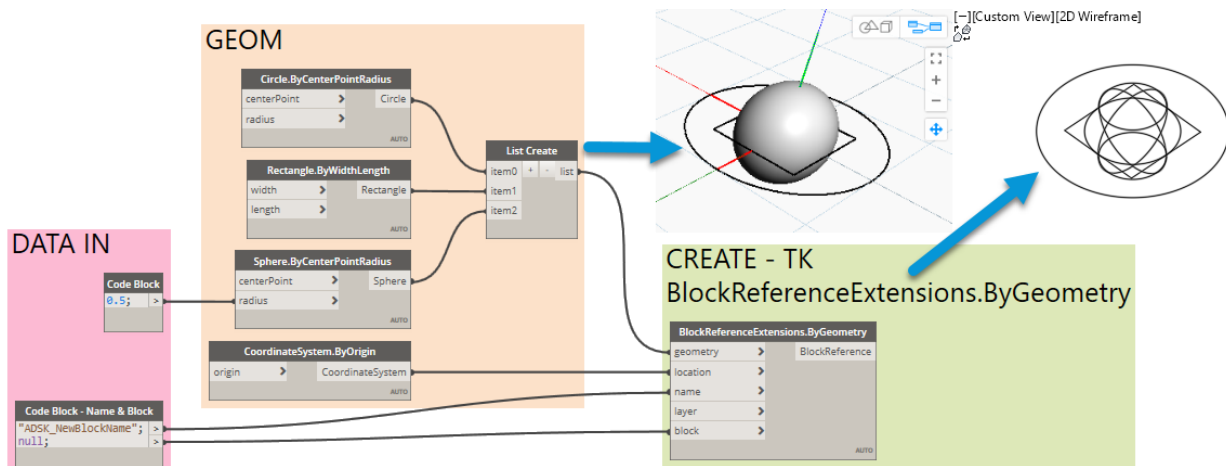


Figure 2.5.A: BlockReferenceExtensions.ByGeometry creates a block reference from a list of geometries

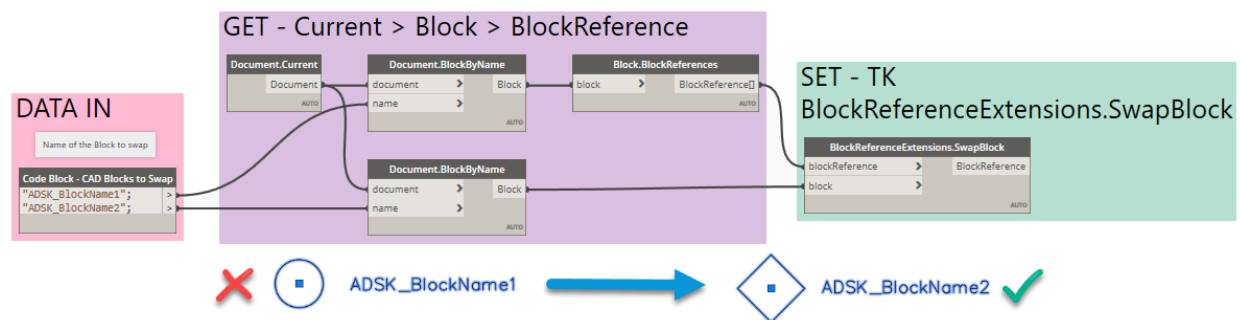


Figure 2.5.B: Swaps the block definition of a block reference

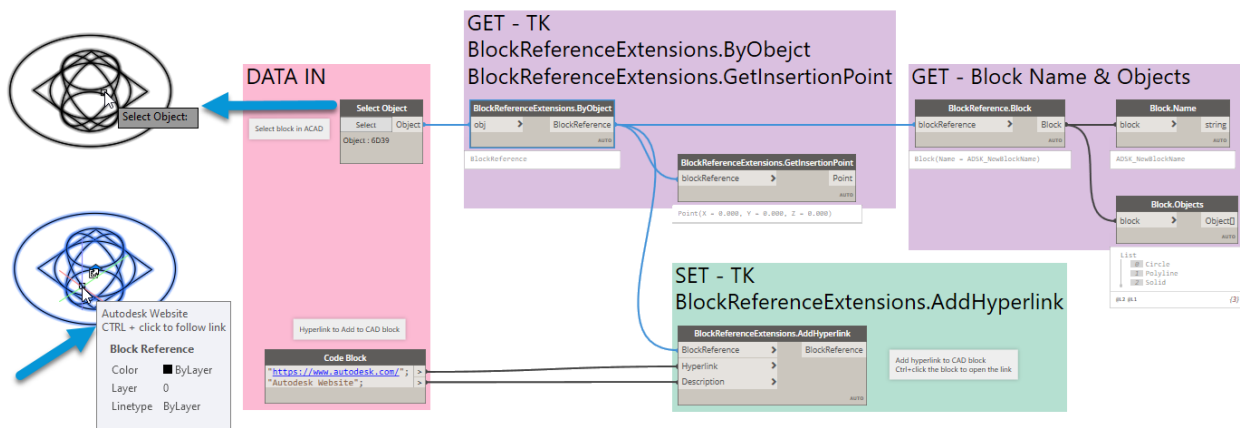


Figure 2.5.C: Assign hyperlink to a block reference and Get the insertion point, name and block objects

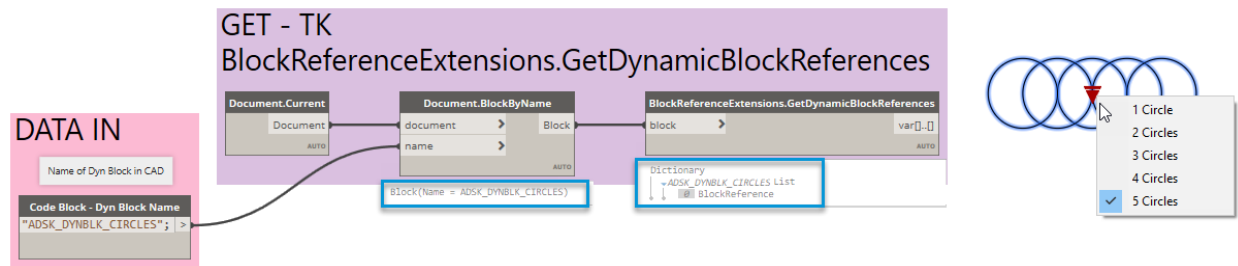


Figure 2.5.D: Gets the block reference of the dynamic block

Civil 3D Toolkit > AutoCAD > LayerExtensions

Toolkit allows you to create a new Layer by defining the input name and color.

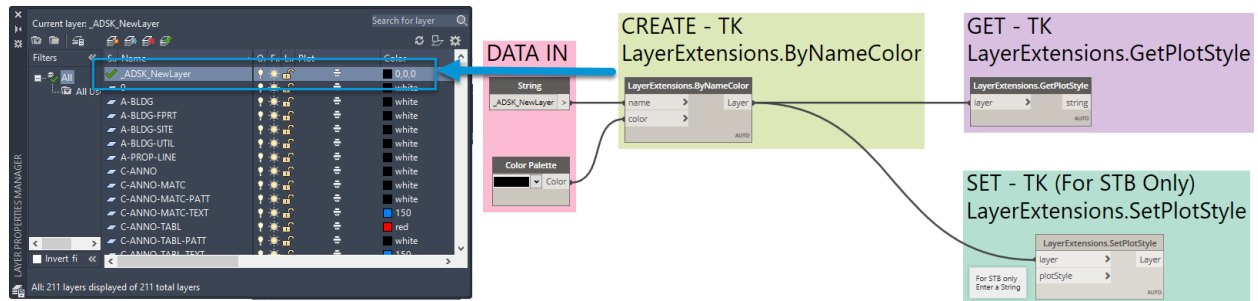


Figure 2.6: Creates a layer in CAD if layer exists it assign the color

Civil 3D Toolkit > AutoCAD > MText

Toolkit adds more function about MText and has the ability to create an Mtext by specifying insertion point, text, rotation, and height of the Mtext. By default, it will use Layer 0 and Model space.

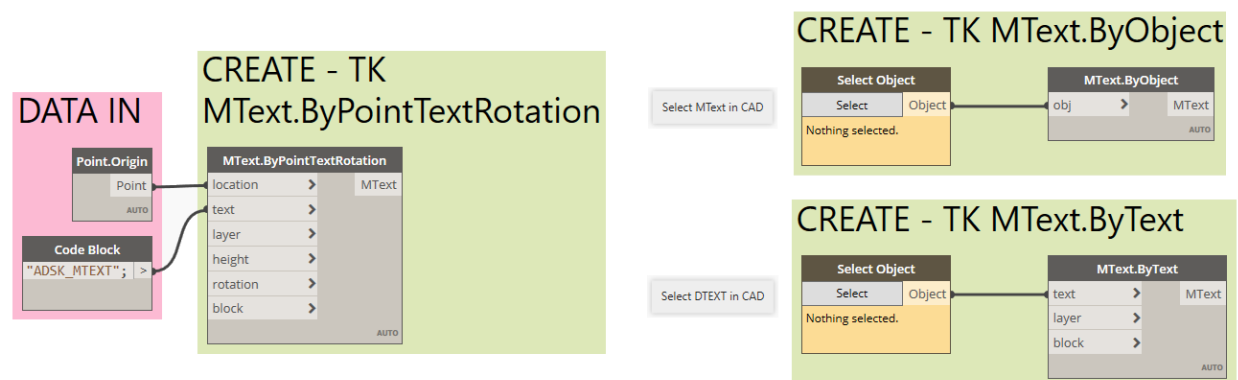


Figure 2.7: Create MText ByPointTextRotation, ByObject and ByText

Civil 3D Toolkit > AutoCAD > LineExtensions

Toolkit has LineExtensions.ByGeometry. This can be used to convert Dynamo line to CAD line instead of the using Object.ByGeometry that requires layer and block as input.

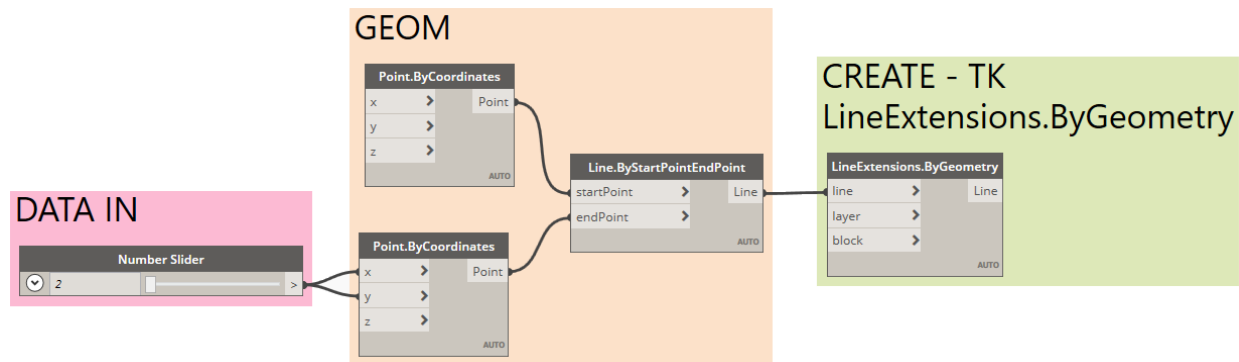


Figure 2.8: Convert Dynamo line to CAD line using LineExtensions.ByGeometry

Civil 3D Toolkit > AutoCAD > PolylineExtensions

PolylineExtensions.ObjectByGeometry can convert Dynamo geometry that includes Arc to CAD polyline. Using Object.ByGeometry, you will get Null if your curve includes Arc.

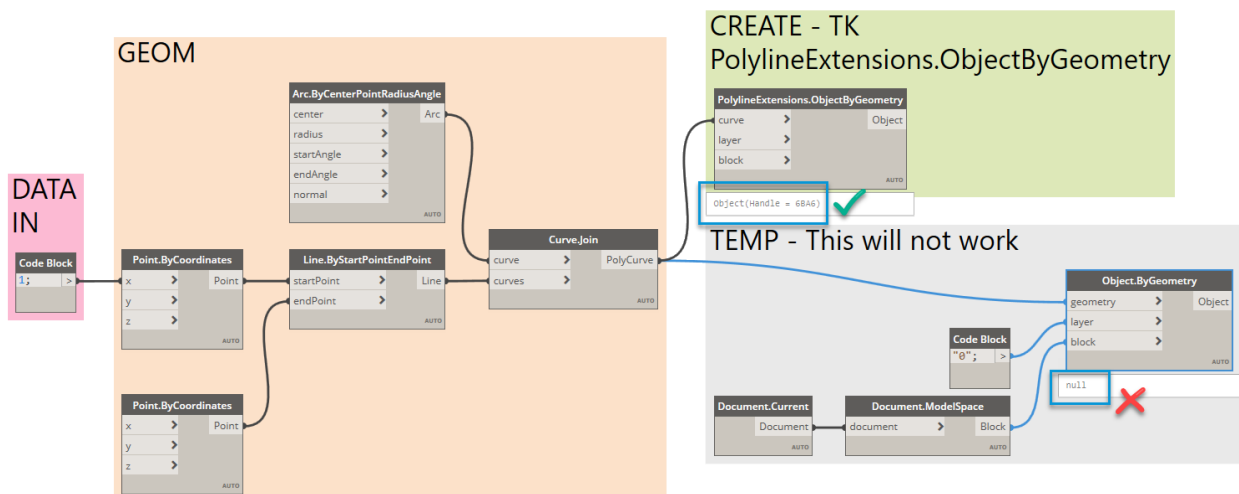


Figure 2.9: Convert Dynamo curve to CAD polyline with Arc using PolylineExtensions.ByGeometry

Civil 3D Toolkit > AutoCAD > ObjectExtensions

Object extensions can add extra information to AutoCAD objects. In Civil 3D, you can select an object and press Ctrl+1 to see the properties. In the Extended Data tab of your properties, you can see Documentation with Hyperlink, Notes and Reference documents. You can use the object extensions to add those information to AutoCAD objects.

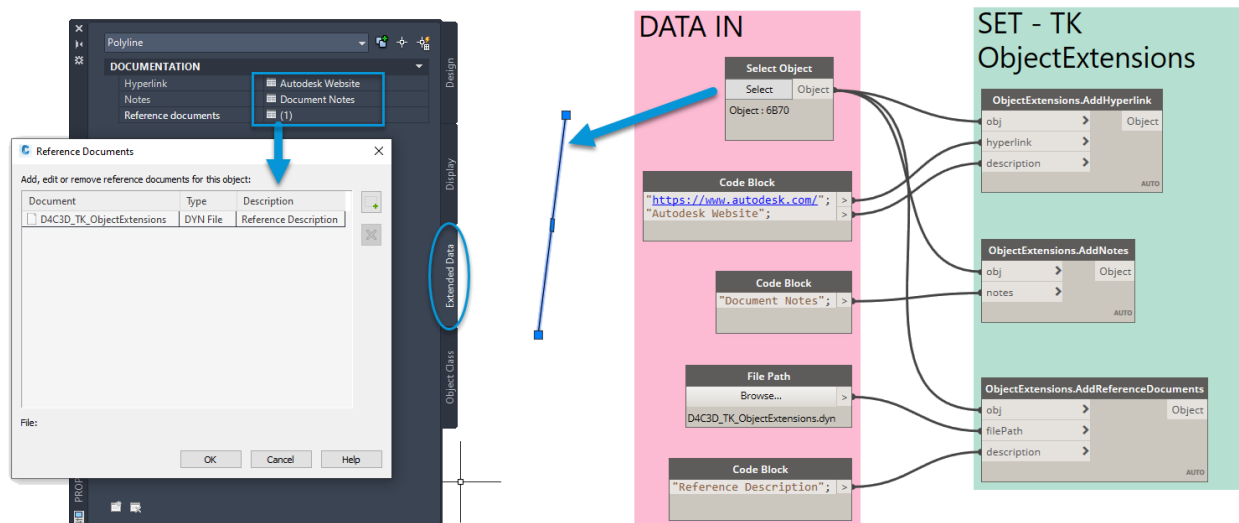


Figure 2.10.A: ObjectExtensions.AddHyperlink, AddNotes and AddReferenceDocuments

You can also add XData to AutoCAD object. If you select an AutoCAD and type XDLIST, you can see if there are data associated with the object you selected. You can use object extension to add and remove XData to AutoCAD object.

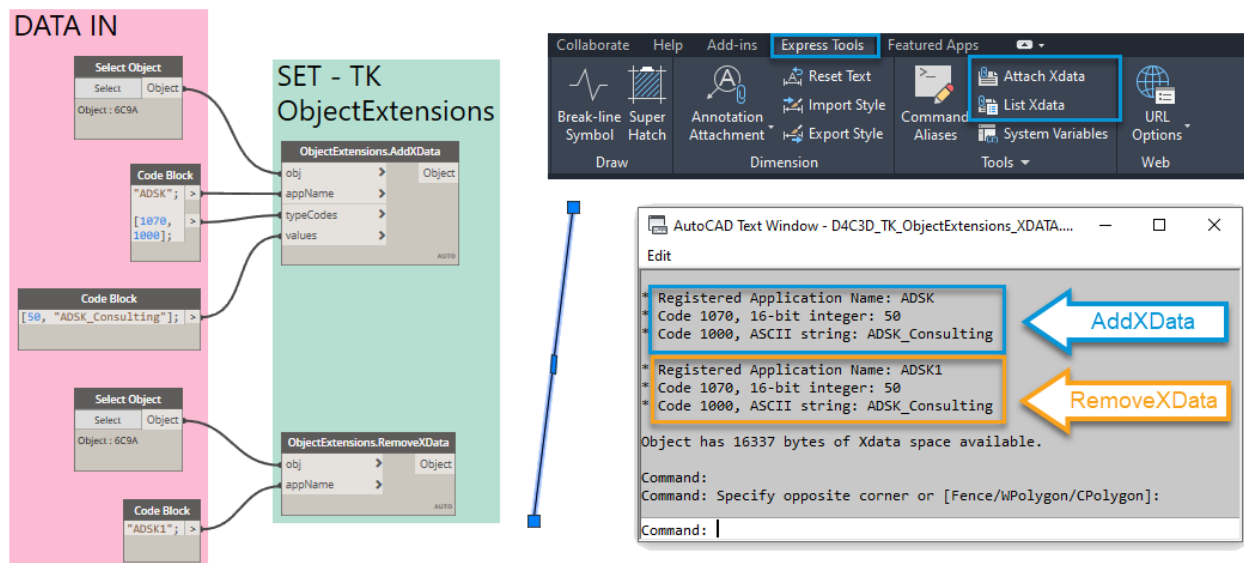


Figure 2.10.B: ObjectExtensions.AddXData and RemoveXData

You can get and set the parameters of Civil Object that have parameters assigned like pipes and structures.

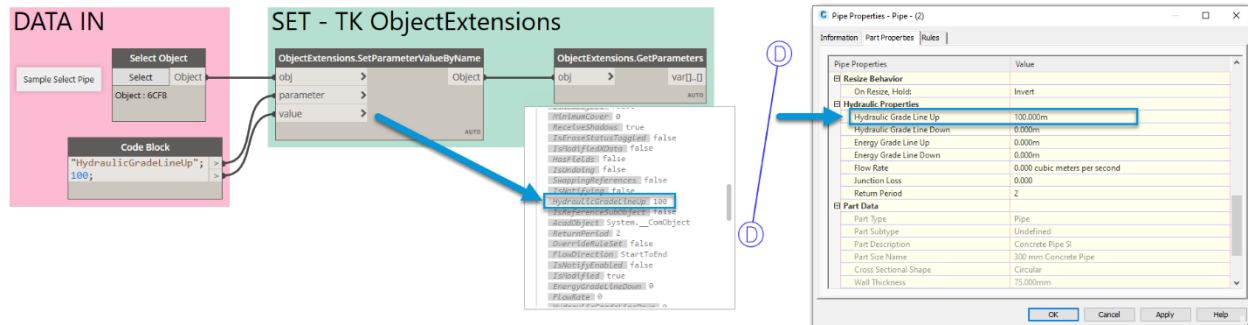


Figure 2.10.C: ObjectExtensions.SetParameterValueByName and GetParameters

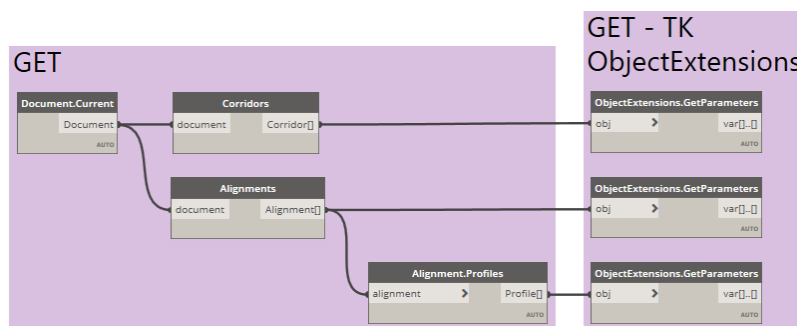


Figure 2.10.D: ObjectExtensions.GetParameters for all Corridors, Alignments and Profiles

Civil 3D Toolkit > AutoCAD > Legend

The Legend Auto and Legend ToAutoCAD can quickly create AutoCAD legend of all the layers currently being used in the model space.

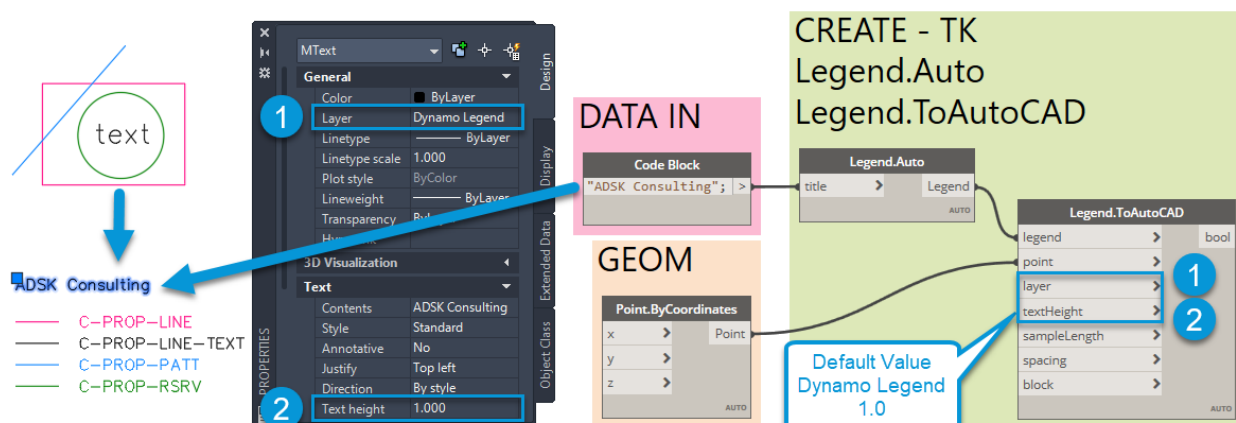


Figure 2.11.A: Legend.Auto and Legend.ToAutoCAD

Civil 3D Toolkit > AutoCAD > LegendItem

LegendItem nodes are needed for you to create Items inside a Legend.

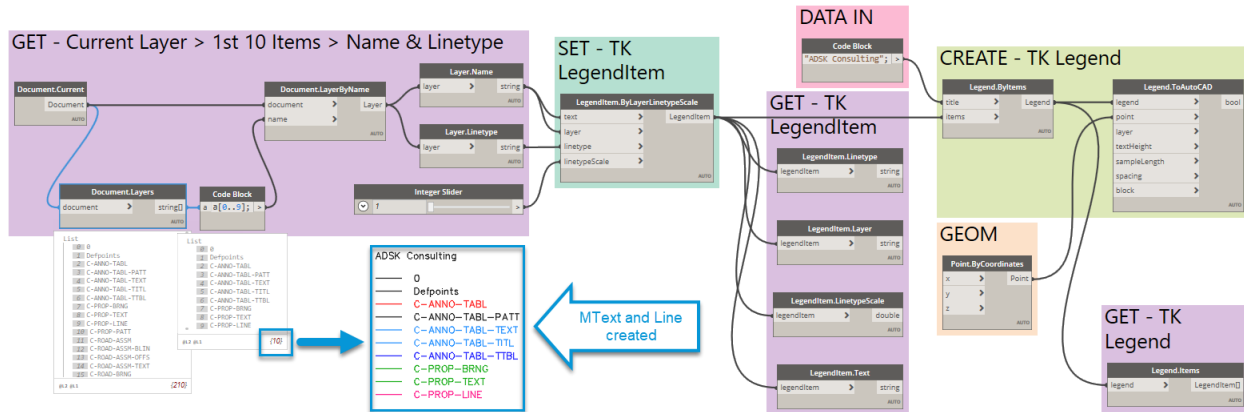


Figure 2.11.B: Adding the 1st 10 layers as LegendItem inside a Legend in a blank drawing

Civil 3D Toolkit > AutoCAD > Layout

When dealing with production drawings, Layout keeps everything organized. You can use the paper space of the layout to insert your drawing title block, scale bar, legend and all other drawing related informations. This is where you create the viewports of your drawing which is a scaled view of the model.

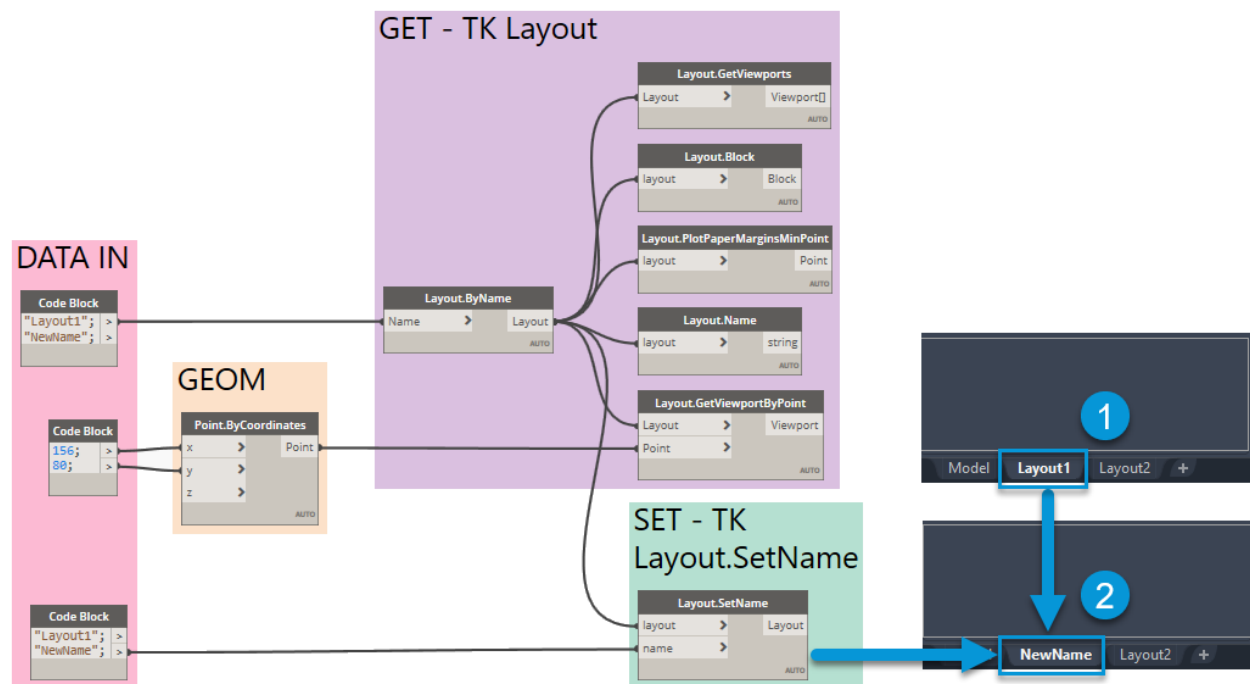


Figure 2.12.A: Renaming Layout1 to NewName using Layout.SetName

Civil 3D Toolkit > AutoCAD > Viewport

Viewport are object that display views of the model space. You create, scale and place them in paper space on a layout. In Viewport, you can switch between model space (MSPACE) and paper space (PSPACE). Alternatively, you can use tilemode 1 and 0 to switch between Model and Layout.

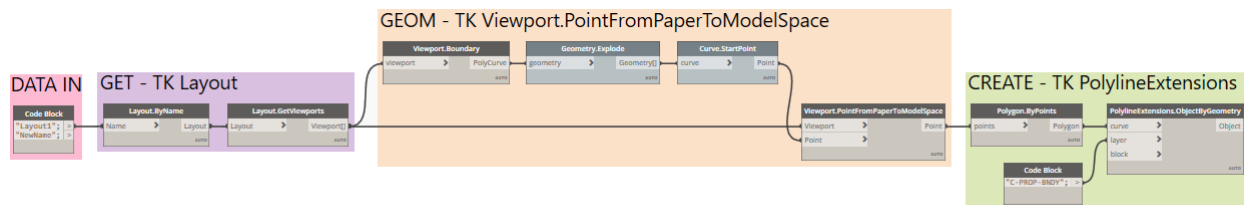


Figure 2.12.B: Viewport.PointFromPaperToModelSpace (Create CAD object Option 1)

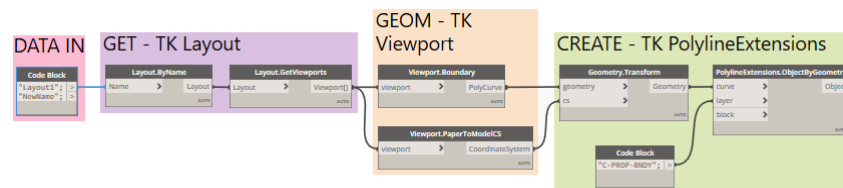


Figure 2.12.C: Viewport.Boundary & PaperToModelCS (Create CAD object Option 2)

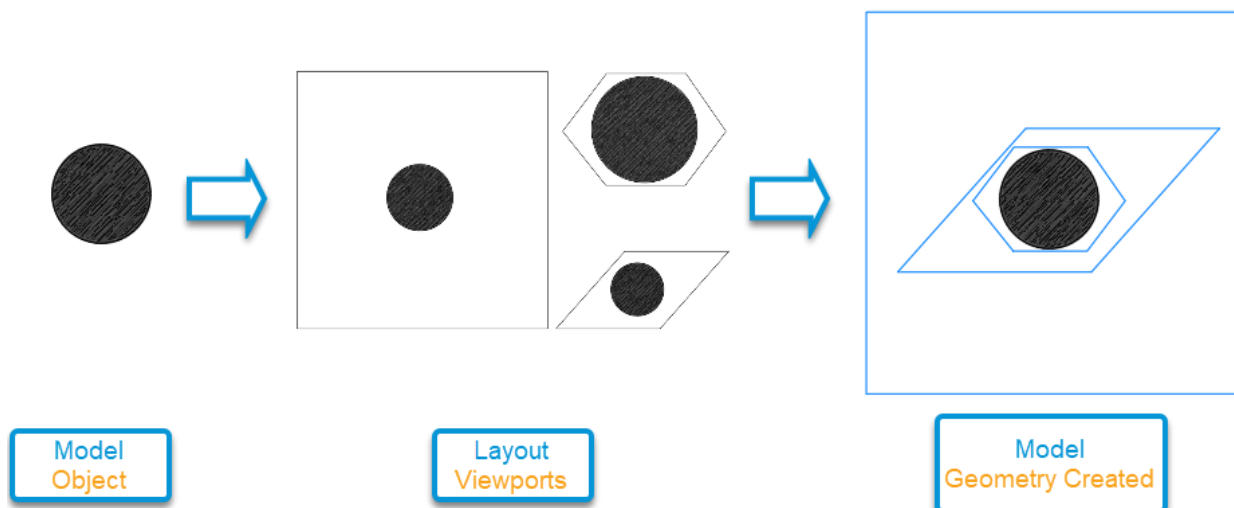


Figure 2.12.D: Converting viewport boundary to model space geometry using Option 1 & 2

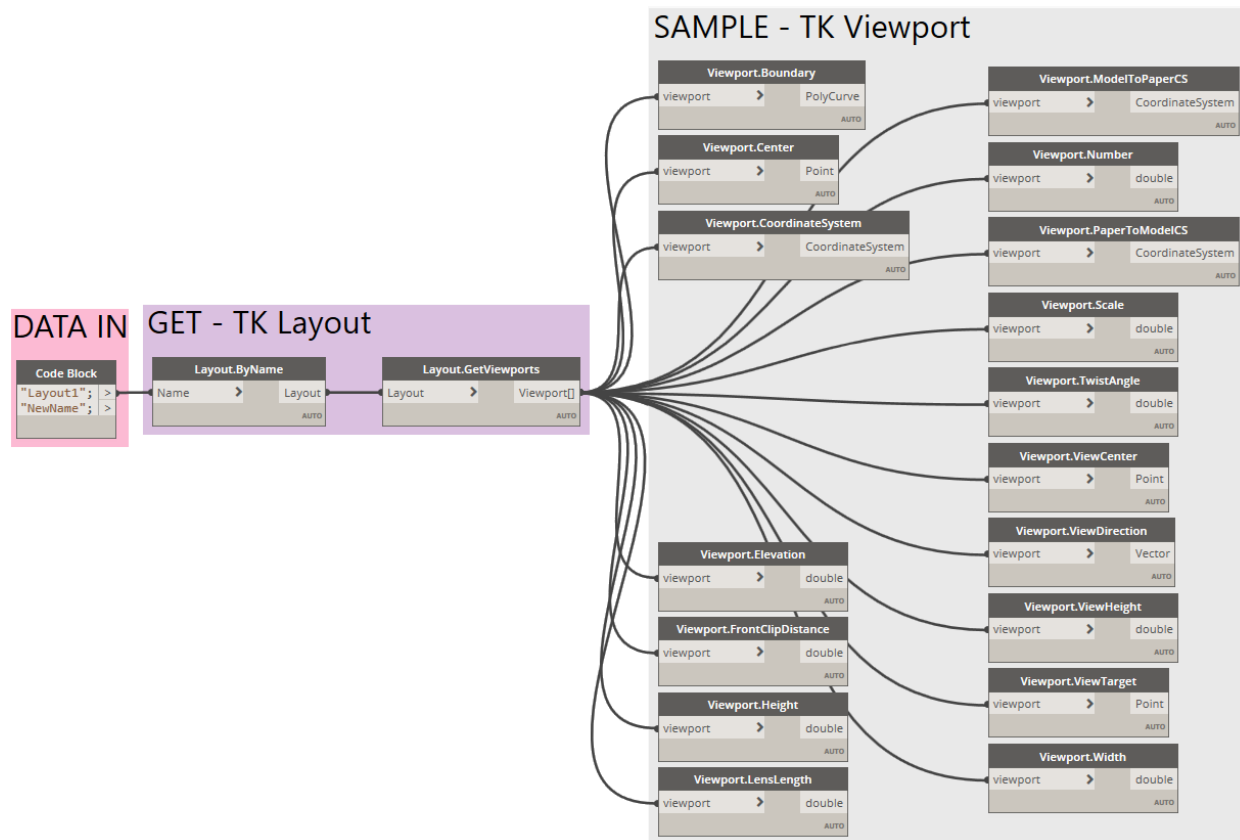


Figure 2.12.E: Viewport nodes available

Civil 3D Toolkit > AutoCAD > Plotstyle

Toolkit provides some nodes for plotstyle. SetPlotStyle only works for drawings set up as STB.

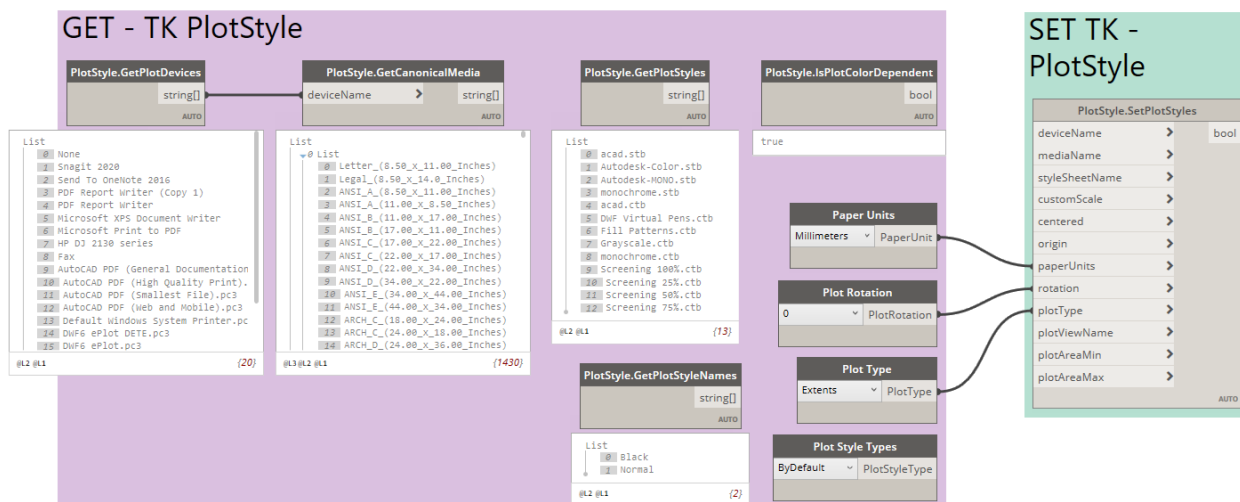


Figure 2.13: PlotStyle nodes available

Civil 3D Toolkit > AutoCAD > Table

AutoCAD table is an object that contains information arranged in rows and columns. Table styles control the default settings and definition of each table cells.

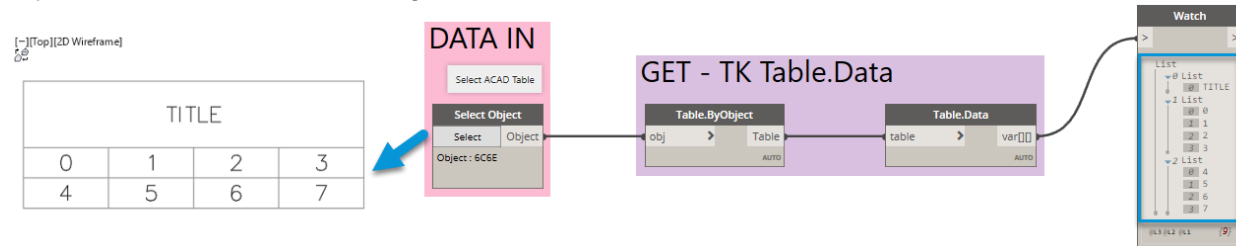


Figure 2.14.A: Get the data of the selected ACAD table using *Table.ByObject* and *Table.Data*

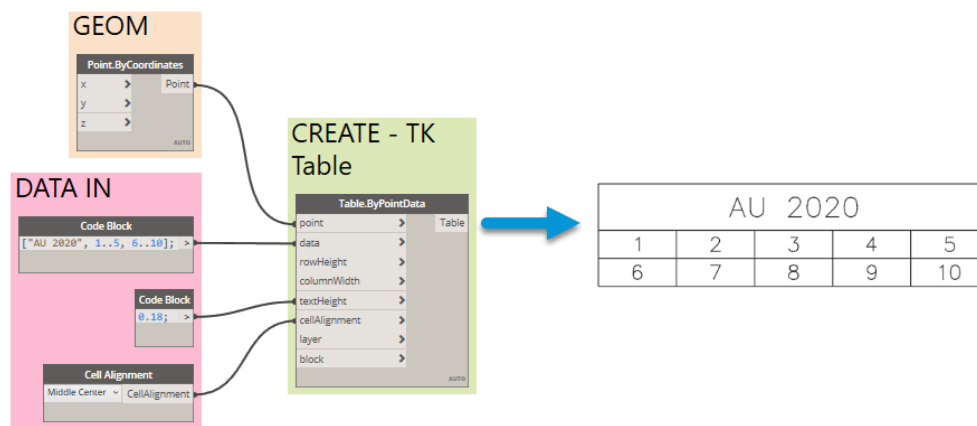


Figure 2.14.B: *Table.ByPointData* creates ACAD Table from list of data and insertion point

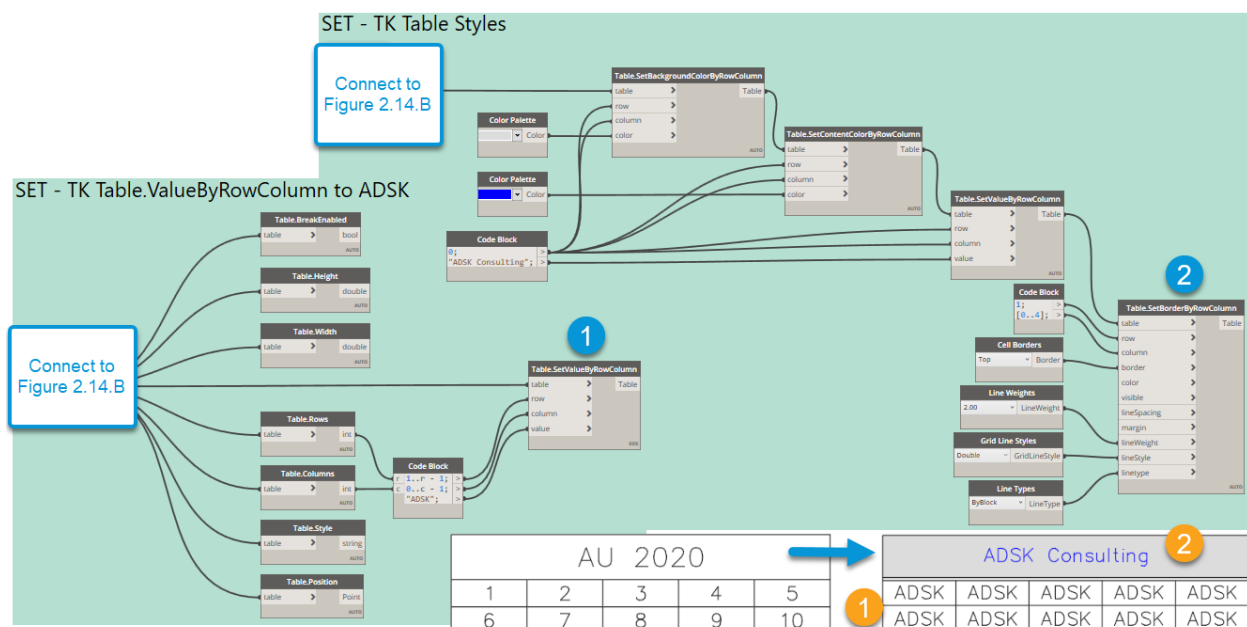


Figure 2.14.C: Change value & style using *Table.SetValueByRowColumn*, and other *Table.Set* nodes

Civil 3D Toolkit > Civil3D > AlignmentExtensions

Alignment is one of the most important parts of your design and having the ability to create an alignment in Dynamo will open so many possibilities.

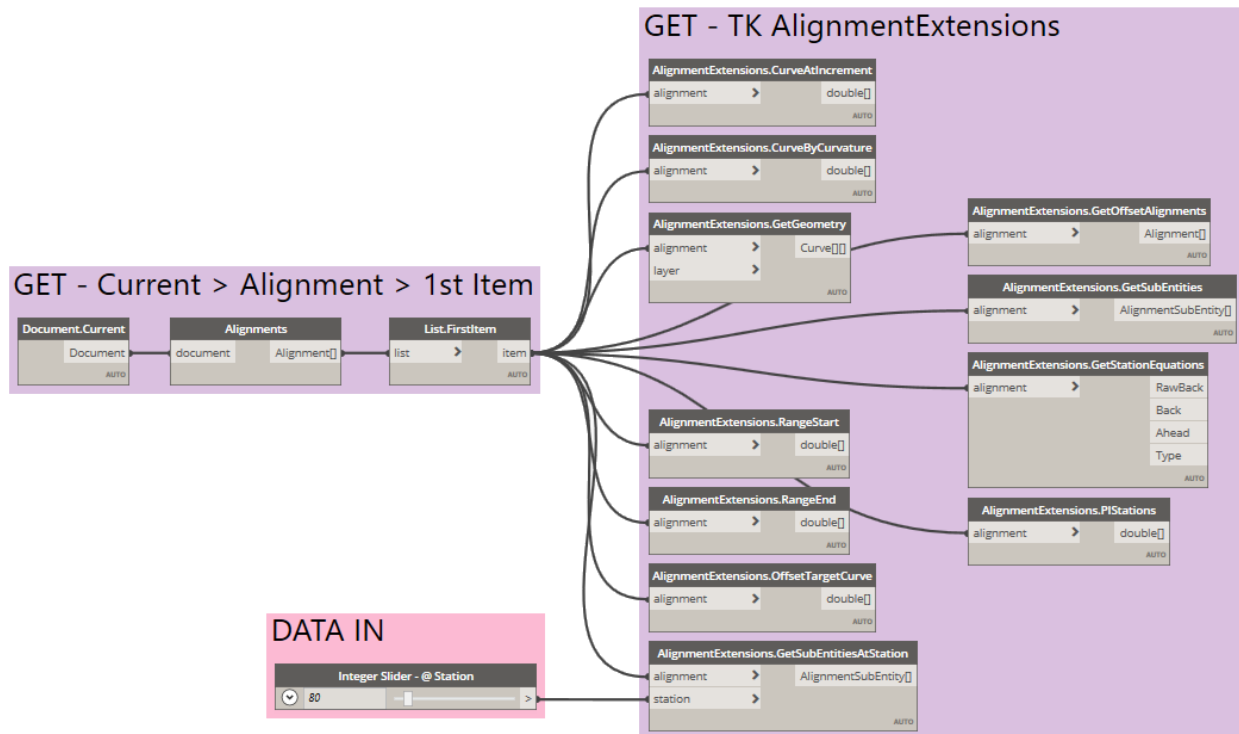
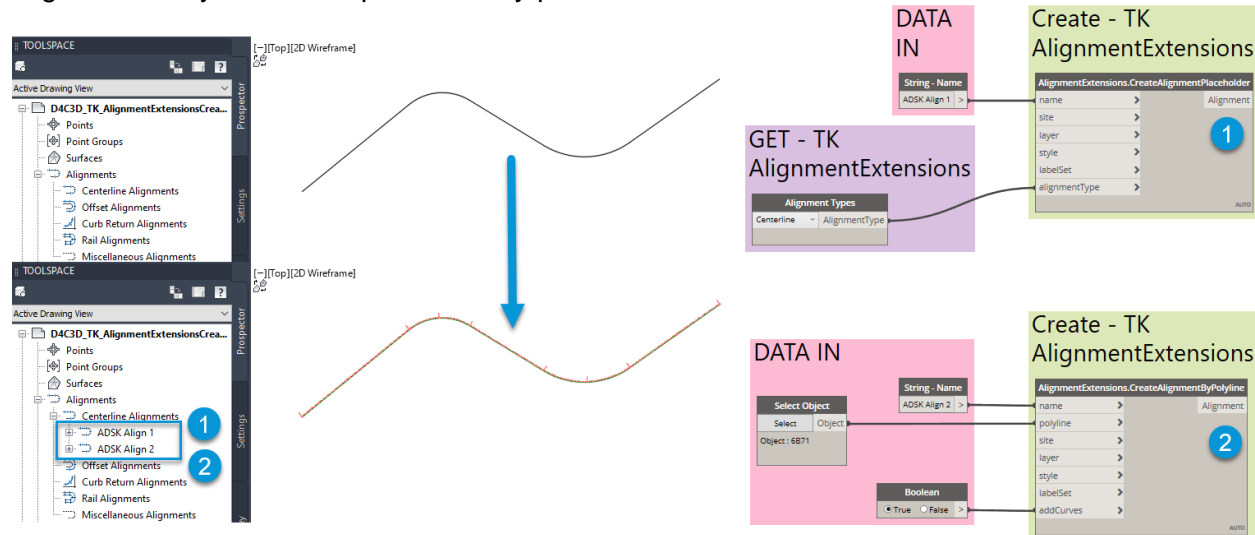


Figure 3.1.B: Sample nodes from AlignmentExtensions

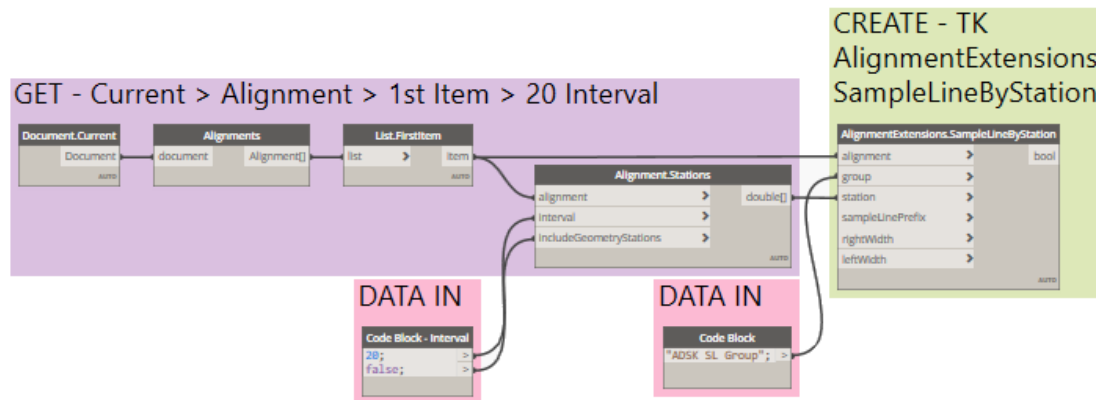


Figure 3.1.C: AlignmentExtensions.SampleLineByStation

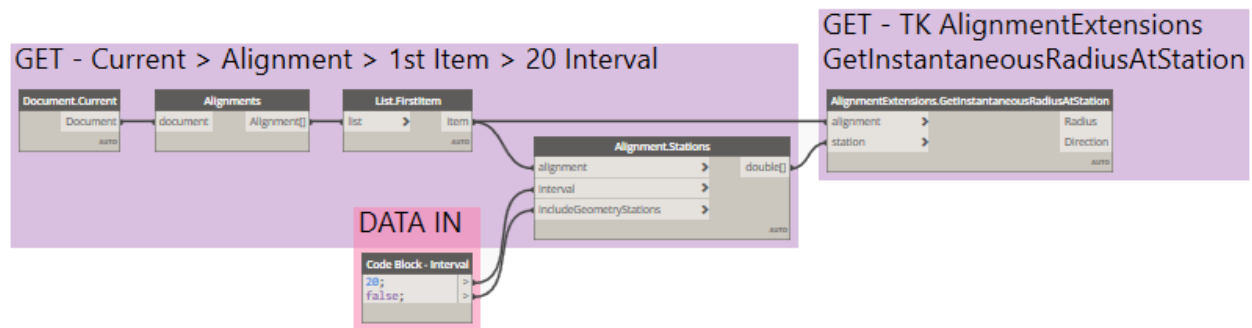


Figure 3.1.D: AlignmentExtensions.GetInstantaneousRadiusAtStation

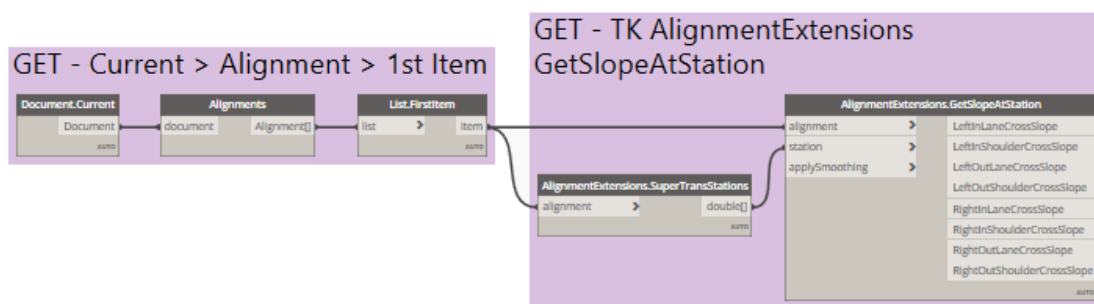


Figure 3.1.E: AlignmentExtensions.GetSlopeAtStation

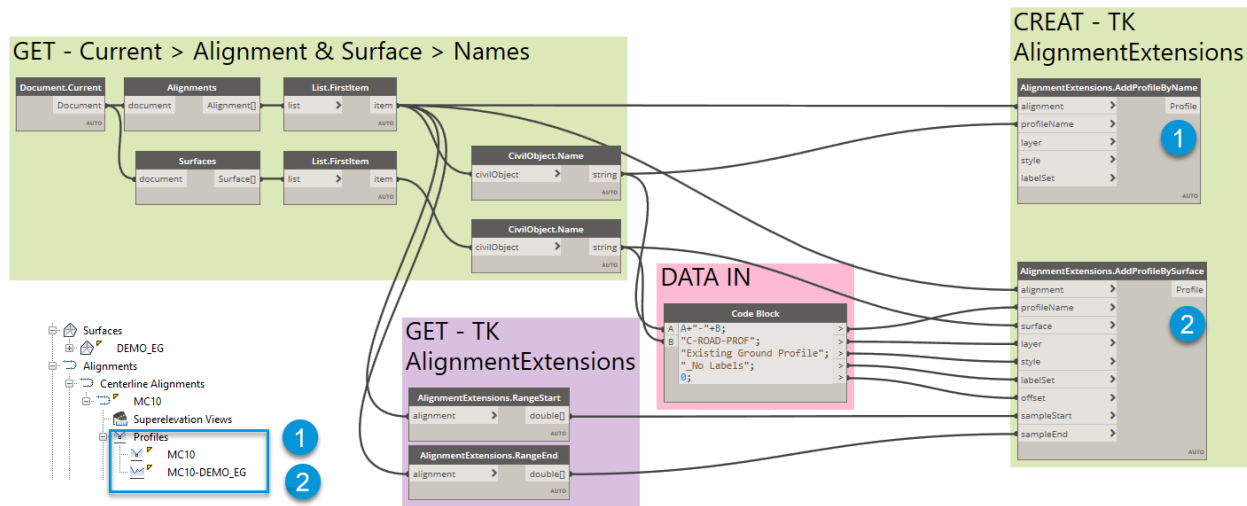


Figure 3.1.F: AlignmentExtensions.AddProfileByName and AddProfileBySurface

Civil 3D Toolkit > Civil3D > AlignmentExtensions > AlignmentEntities

Start adding fixed, float and free geometry to your alignment by using the alignment entities.

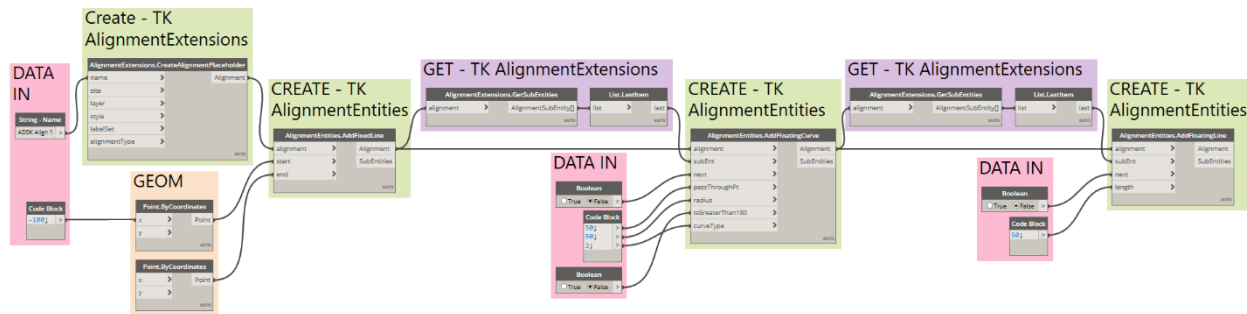


Figure 3.1.G: Leveraging AlignmentEntities to add Fixed line, Float curve and Float line

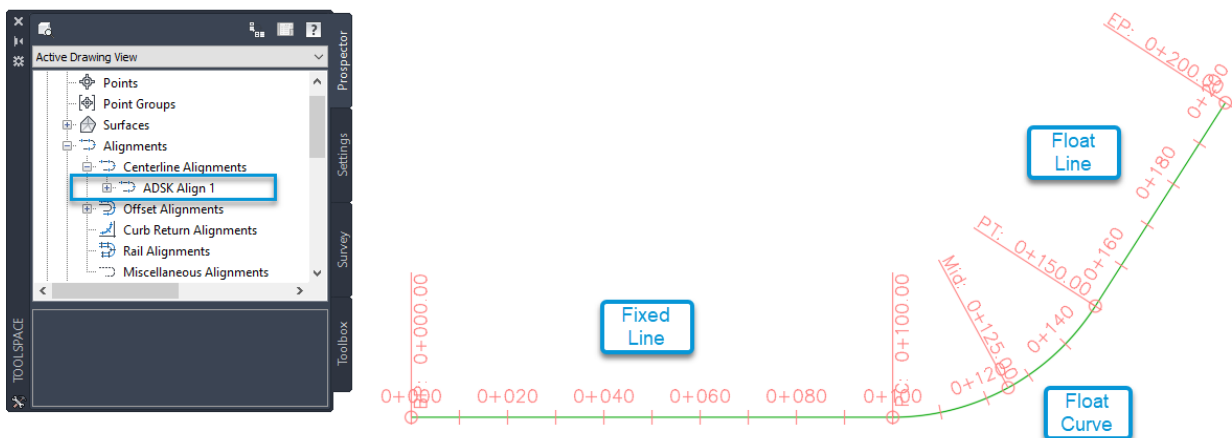


Figure 3.1.H: Alignment geometry created from AlignmentEntities

Civil 3D Toolkit > Civil3D > AlignmentExtensions > AlignmentSubEntity

You can leverage the AlignmentSubEntity and use the toolkit nodes to mine the data available in each sub-entity.

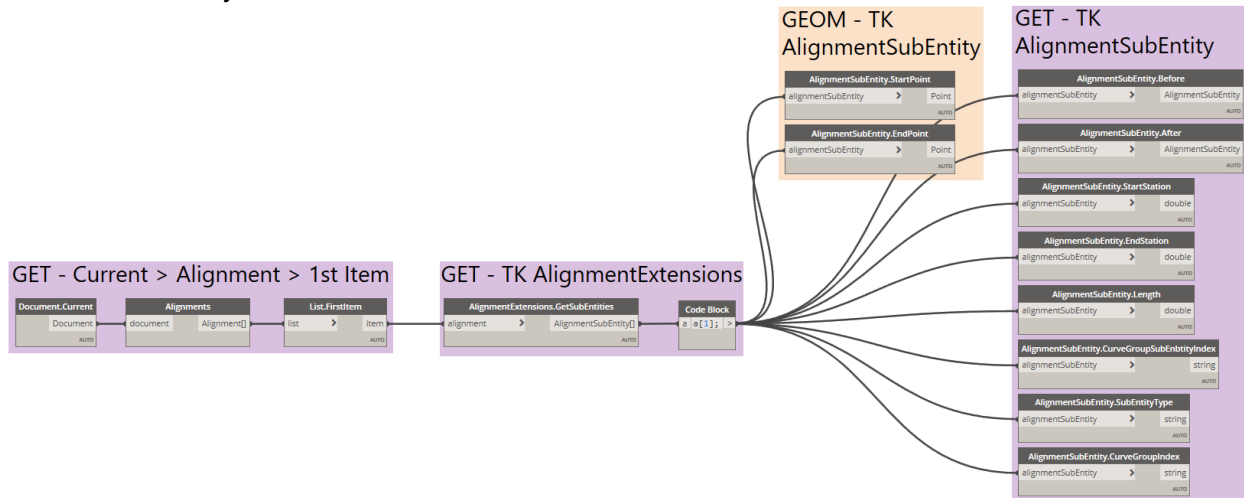


Figure 3.1.I: Nodes available from AlignmentSubEntity

Civil 3D Toolkit > Civil3D > CorridorExtensions

Corridors are available for data mining using CorridorExtensions and TkCorridorFeatureLine. There are two types of Corridor extensions, GetTkFeatureLines and GetTkFeatureLinesByCode.

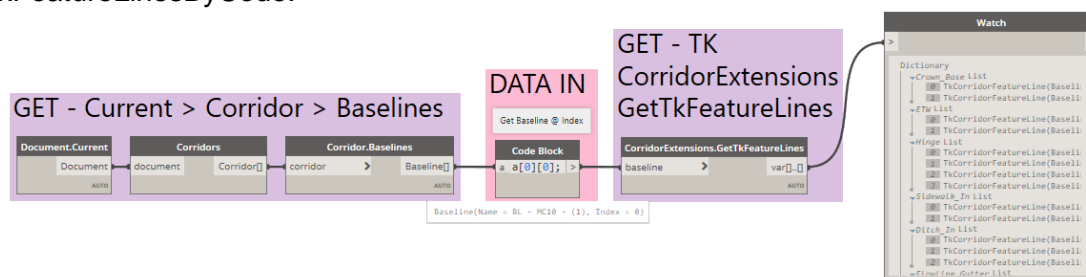


Figure 3.2.A: CorridorExtensions.GetTkFeatureLines

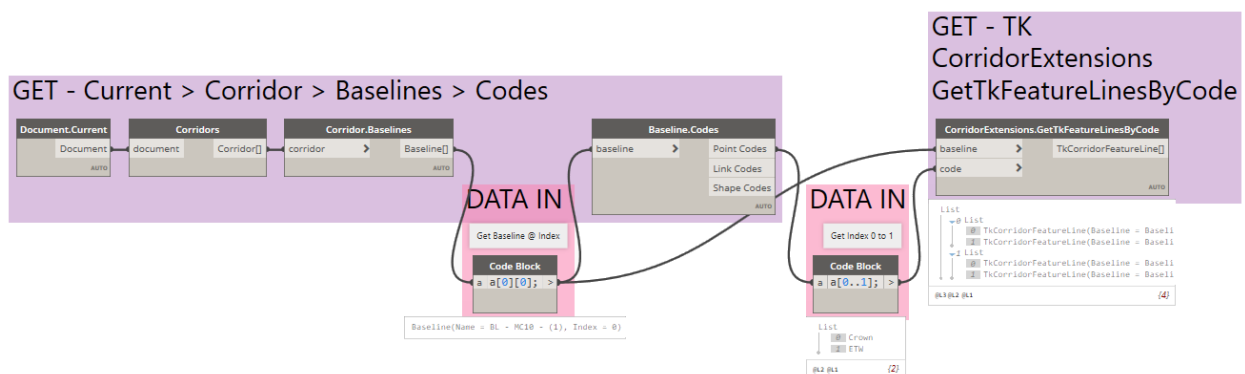


Figure 3.2.B: CorridorExtensionsGetTkFeatureLinesByCode

Civil 3D Toolkit > Civil3D > CorridorExtensions > TkCorridorFeatureLine

After using CorridorExtensions nodes, we can connect it to TkFeatureLine nodes to get data or to create geometry.

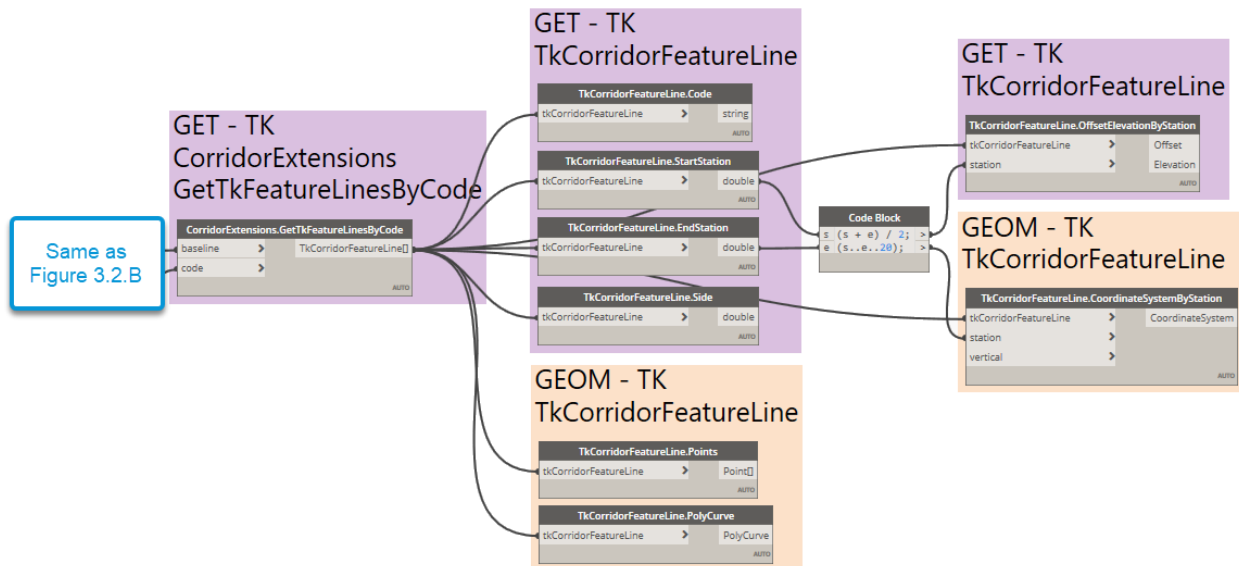


Figure 3.2.C: TkCorridorFeatureLine nodes

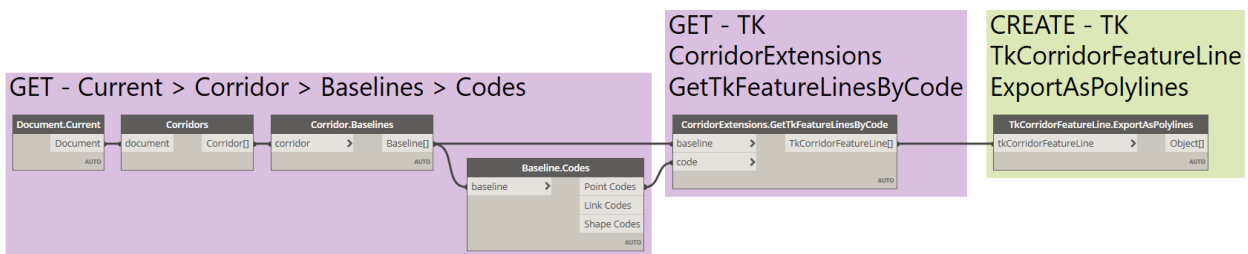


Figure 3.2.D: TkCorridorFeatureLine.ExportAsPolyline

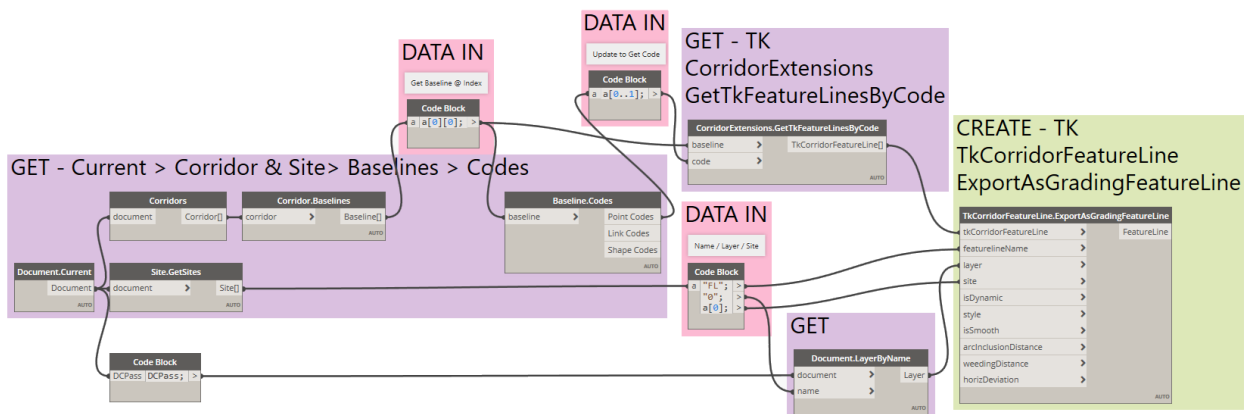


Figure 3.2.E: TkCorridorFeatureLine.ExportAsGradingFeatureLine

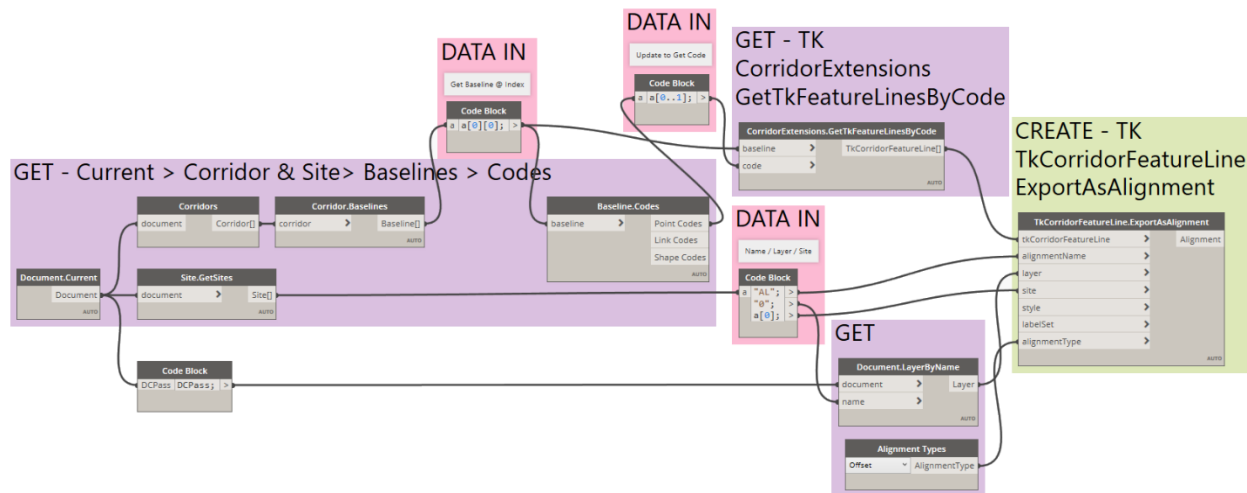


Figure 3.2.F: *TkCorridorFeatureLine.ExportAsAlignment*

The *TkCorridorFeatureLine* Export nodes can export the point code of a baseline. You need to be careful in exporting which point code to choose. In Figure 3.2.D, you can export all polylines without an issue as it will create all individual corridor featureline in correct 3D polylines. In Figure 3.2.E, it is recommended to choose only specific point code to export. Keep in mind that Featureline in the same site will overwrite the same Featureline if they have the same easting and northing even if they have different elevation. Figure 3.2.F requires specific point codes as you don't want to have alignments on the same location multiple times.

Civil 3D Toolkit > Civil3D > ProfileExtensions

ProfileExtensions provides nodes such as Adding PVI, Asymmetric and Symmetric Parabola, Circular curve, free tangent, checking the min & max elevation, getting high & low points or getting the profile entities and PVIs.

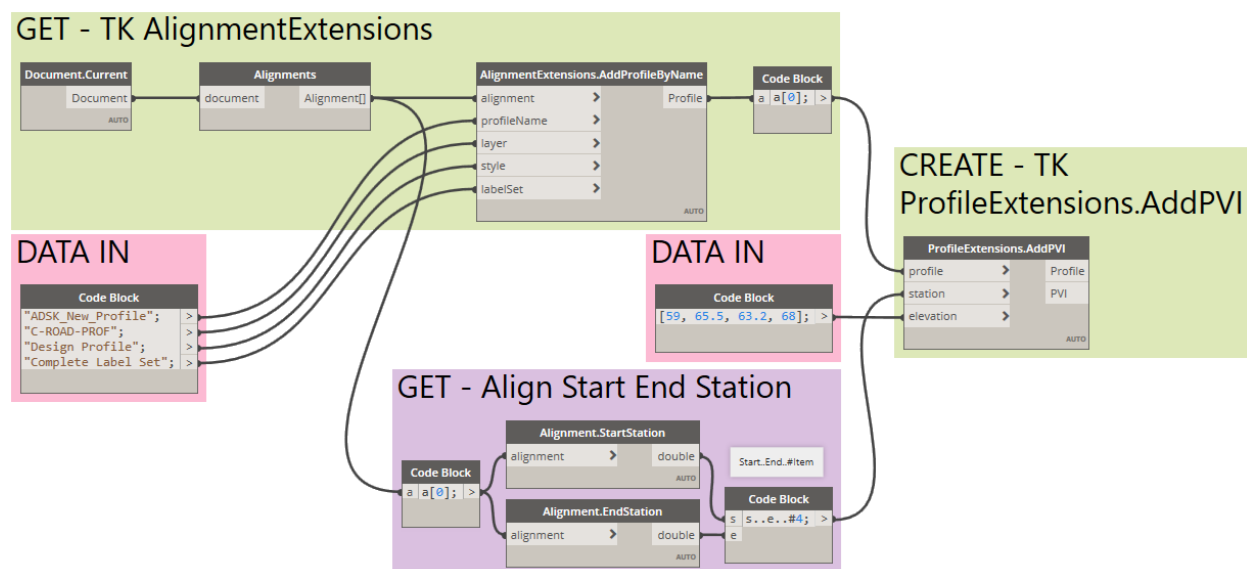


Figure 3.3.A: *Creating profile that have 4 PVIs using ProfileExtensions.AddPVI*



Figure 3.3.B: *ADSK_New_Profile* created using *ProfileExtensions.AddPVI*



Figure 3.3.C: Using Option 1 - `ProfileExtensions.AddFreeSymmetricParabolaByK`



Figure 3.3.D: Using Option 4 - `ProfileExtensions.AddFreeAsymmetricParabolaByPVIAndLengths`

It is important to note that in some cases, due to Civil 3D rounding, the alignment start and end stations may not show an exact whole number. Instead of seeing station 700, you may encounter it as station 699.999999999. Adjusting the increment and tolerance values will help find a better output. Increment is for horizontal station interval while tolerance is for the vertical elevation tolerance.

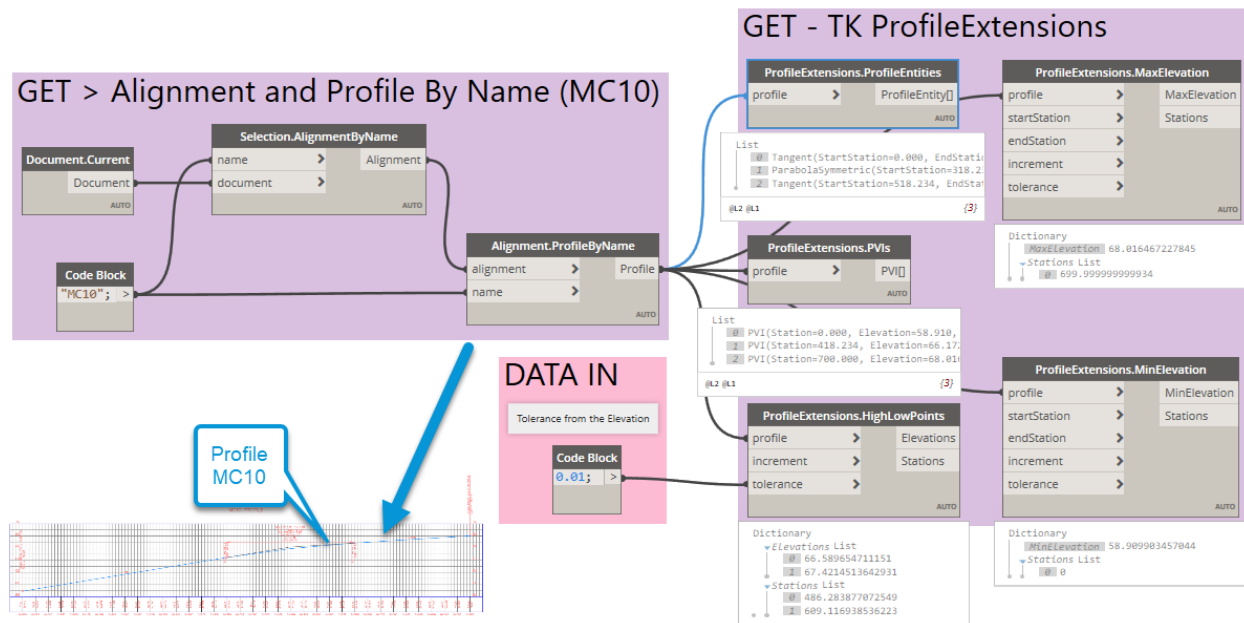


Figure 3.3.E: ProfileExtensions getting ProfileEntities, PVI, HighLowPoints, Min & Max Elevation

Civil 3D Toolkit > Civil3D > ProfileExtensions > ProfileEntity

Profile Entity nodes can get data from each profile entity. This is located as a subcategory of ProfileExtensions.

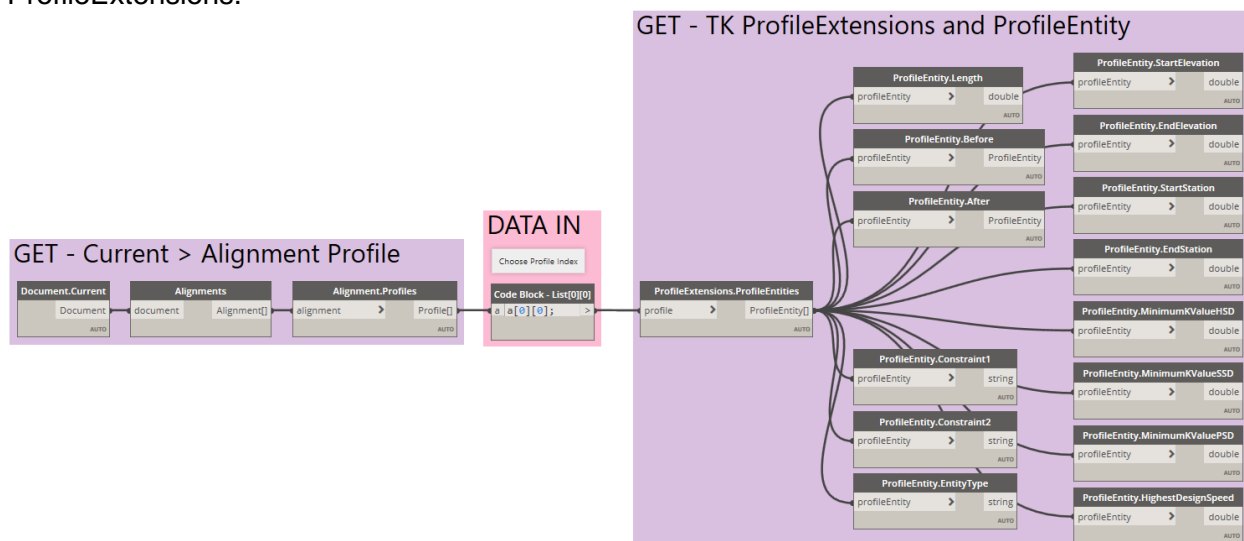


Figure 3.3.F: Get current alignment Profile Entities and Profile Entity data

Civil 3D Toolkit > Civil3D > ProfileView

If you have alignment and profile, next step is to create the profile view. Toolkit has nodes that can create profile view from alignment and insertion point.

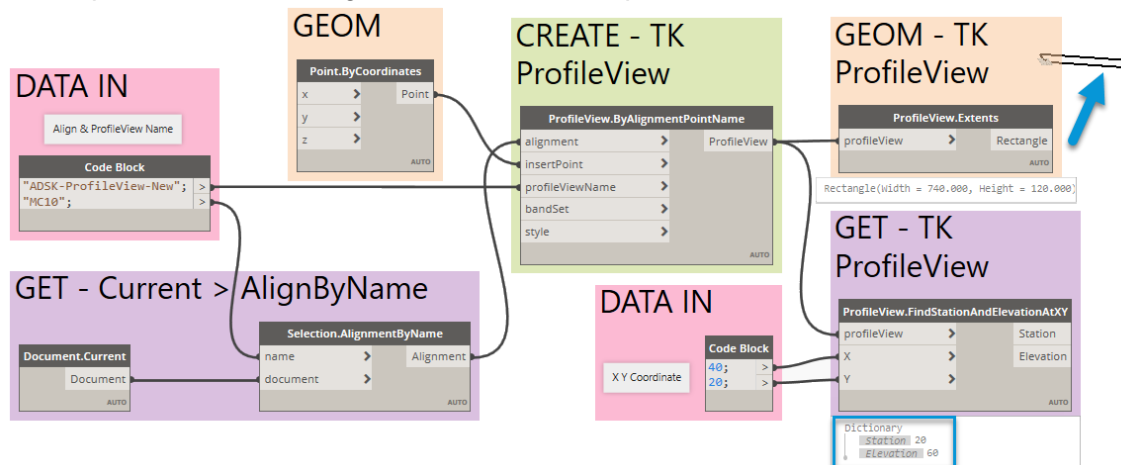


Figure 3.4.A: ProfileView.ByAlignmentPointName, Extends and FindStationAndElevationAtXY

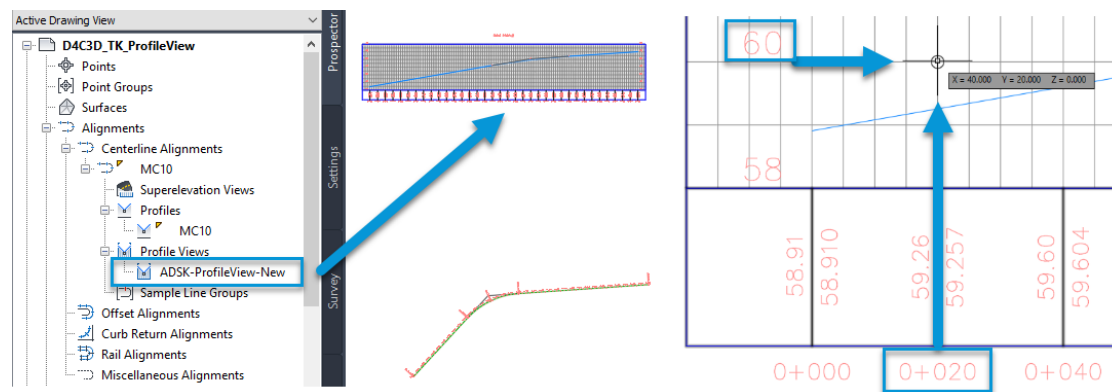


Figure 3.4.B: New profile created at Insertion Point 0,0,0 and Station Elevation 0+20 & 60 @ XY 40 & 20

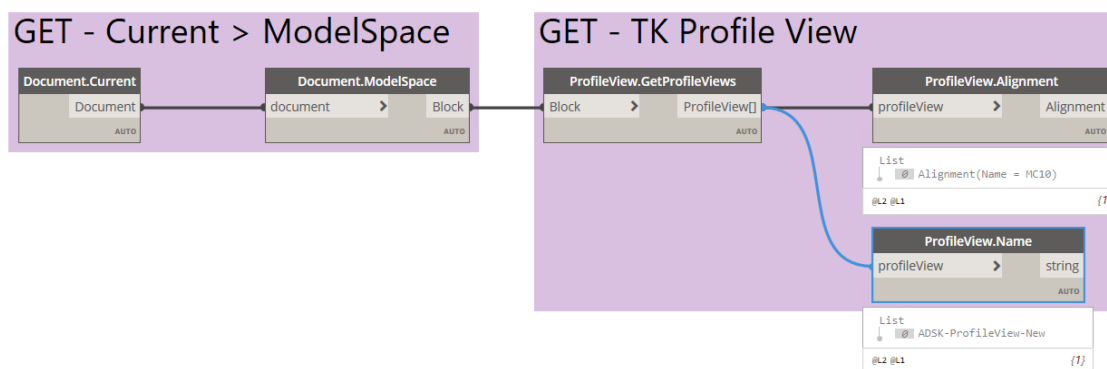


Figure 3.4.C: ProfileView.GetProfileView, Alignment and Name

Civil 3D Toolkit > Civil3D > PVI

Getting PVI's data such as Type, Station, Elevation, GradeIn and GradeOut are valuable information for your design. Toolkit also has nodes for getting PVI sight distance.

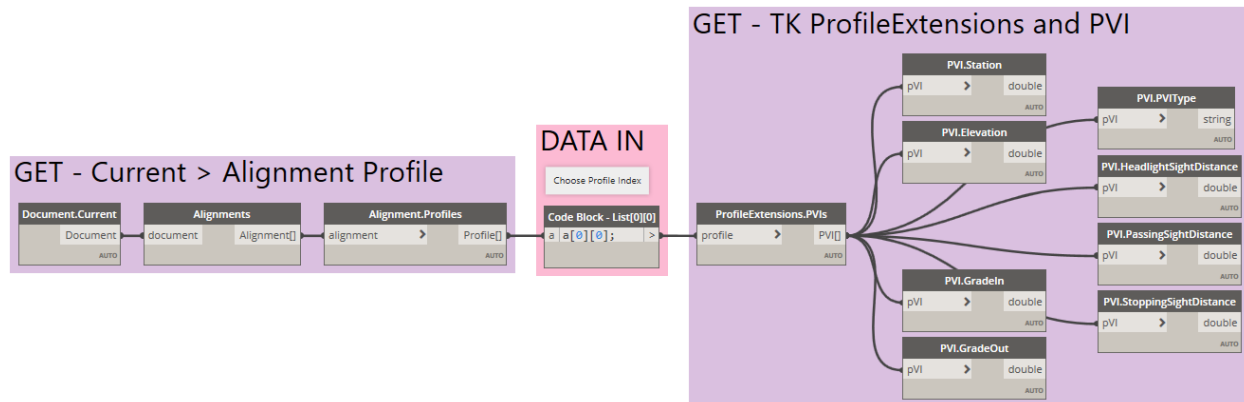


Figure 3.5: Get current alignment profile PVI's and PVI data

Civil 3D Toolkit > Civil3D > SectionView

Section view is very similar to Profile view. You can create section view object to display the sectional data in the drawing. Two most common data to display are surface TIN and corridor. Pipe network and other objects can also be displayed in the section view. Toolkit provides several useful nodes that you can leverage.

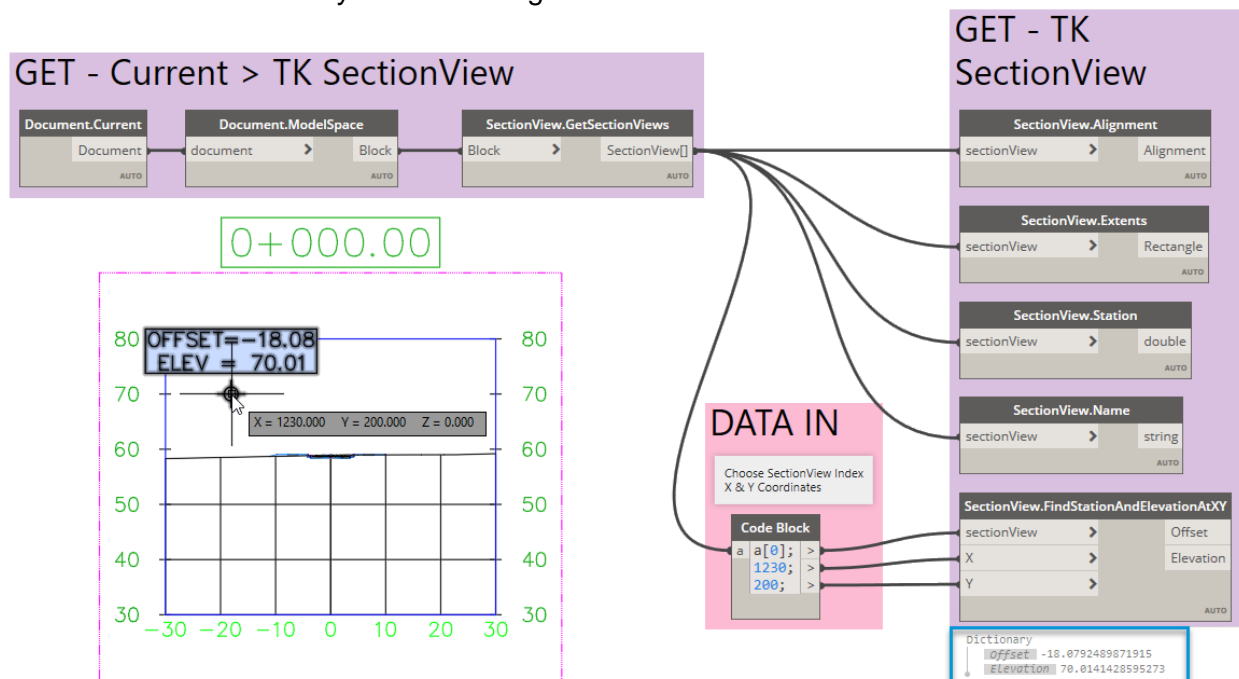


Figure 3.6: Get Current Section View data and Offset Elevation -18.08 & 70.01 @ XY 1230 & 200

Civil 3D Toolkit > Civil3D > Selection

Selecting Civil 3D object name using drop down option is available in the toolkit for Surface, Alignment and Corridor Names.

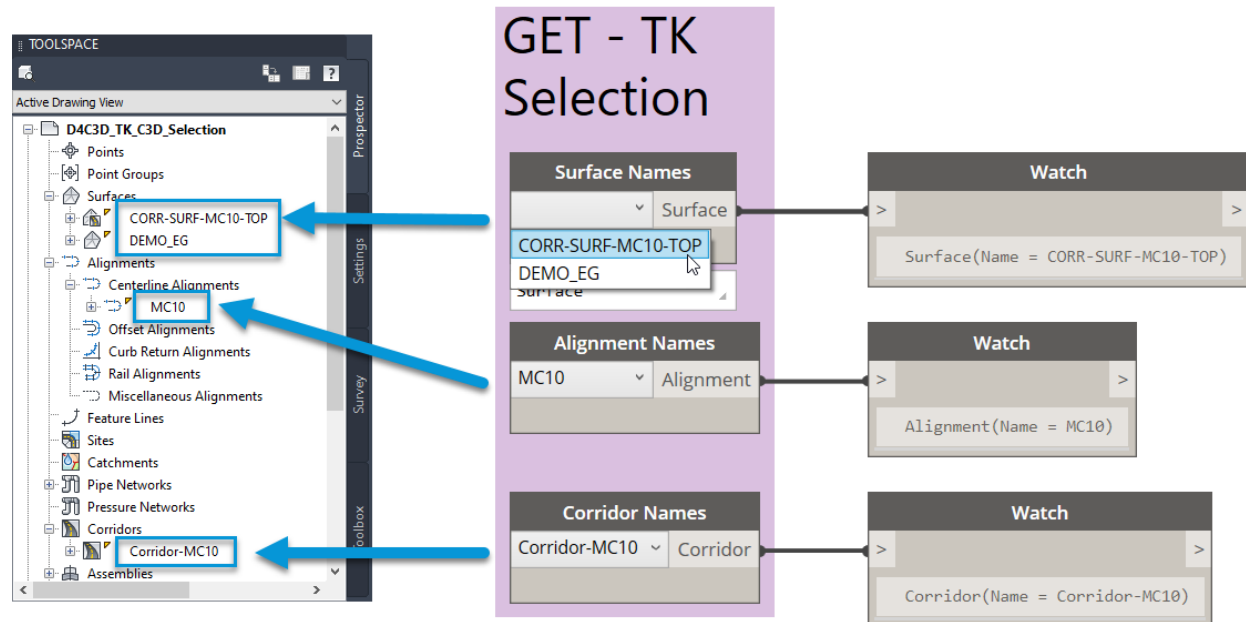


Figure 3.7: Selection to get Surface, Alignment and Corridor Names available in current drawing

Civil 3D Toolkit > Civil3D > TinSurfaceExtensions

Triangulated irregular network (TIN) surface came from the TIN lines from the triangle that make up the surface triangulation. Mostly used in design and survey drawings. The toolkit provides several new nodes that will allow you to add breaklines, create solids and extract data.

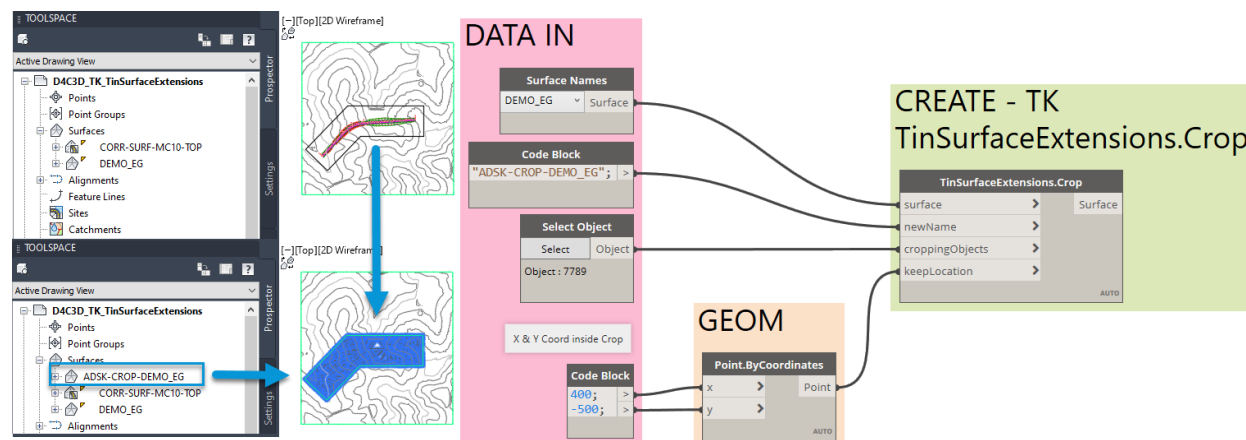


Figure 3.8.A: Create a new crop surface using TinSurfaceExtensions.Crop

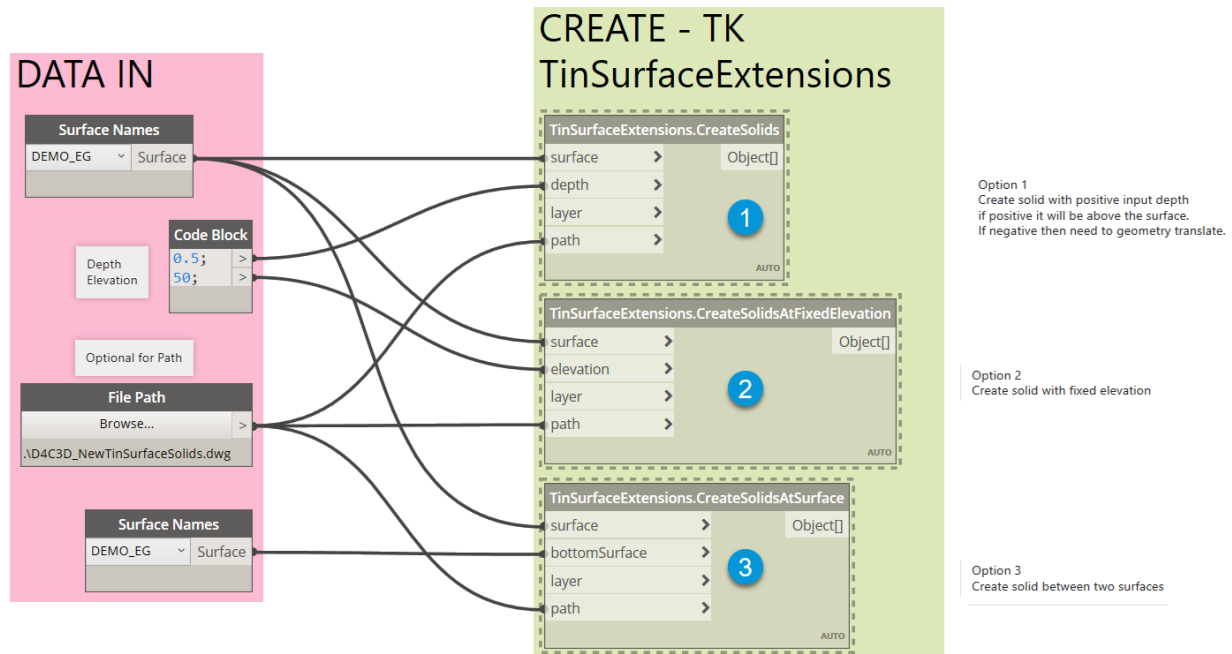


Figure 3.8.B: Options in creating solids from surface using *TinSurfaceExtensions.CreateSolids*

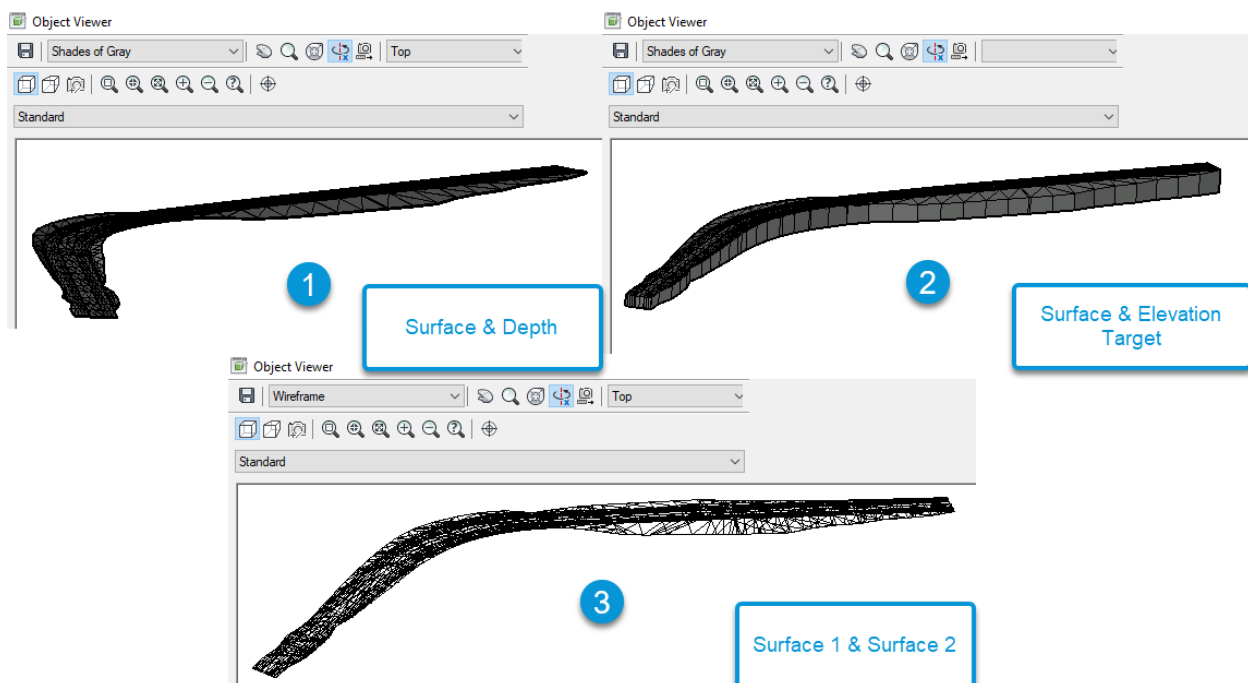


Figure 3.8.C: Solids from surface using *TinSurfaceExtensions.CreateSolids*

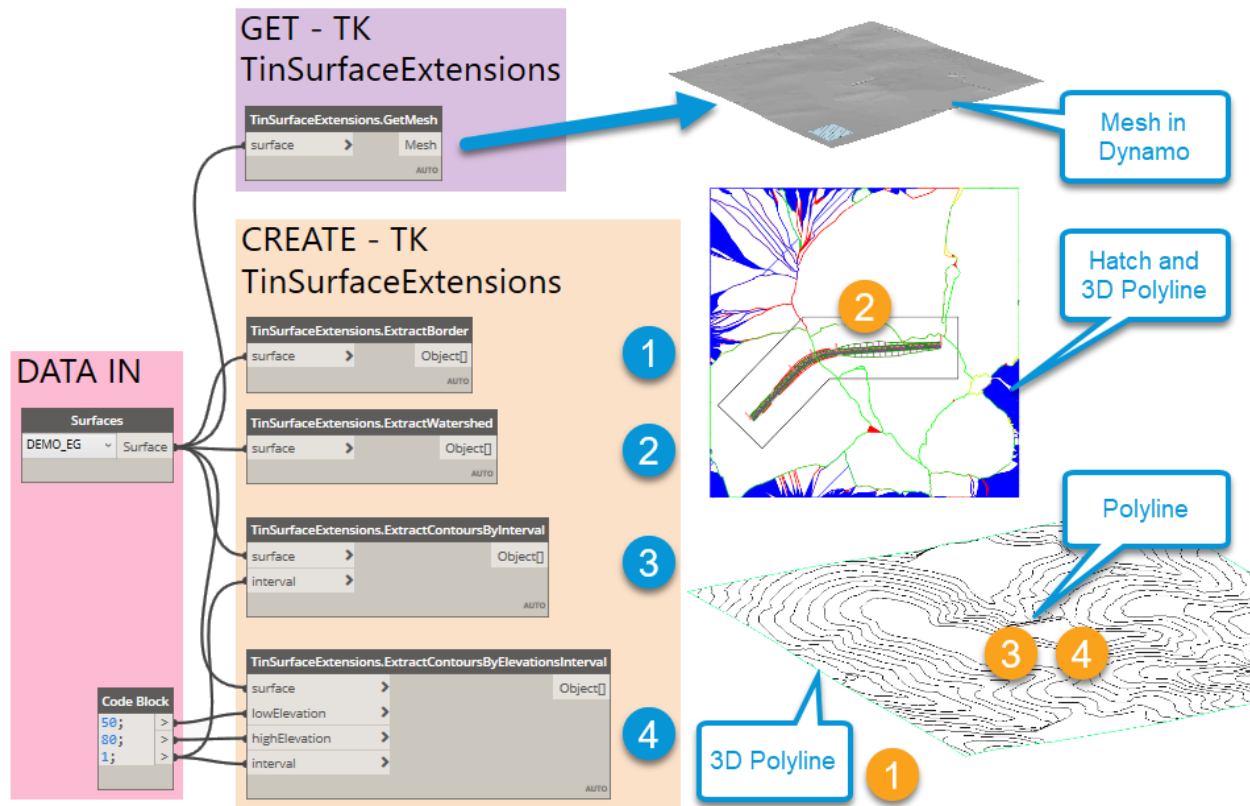


Figure 3.8.D: TinSurfaceExtensions.GetMesh & Extract nodes

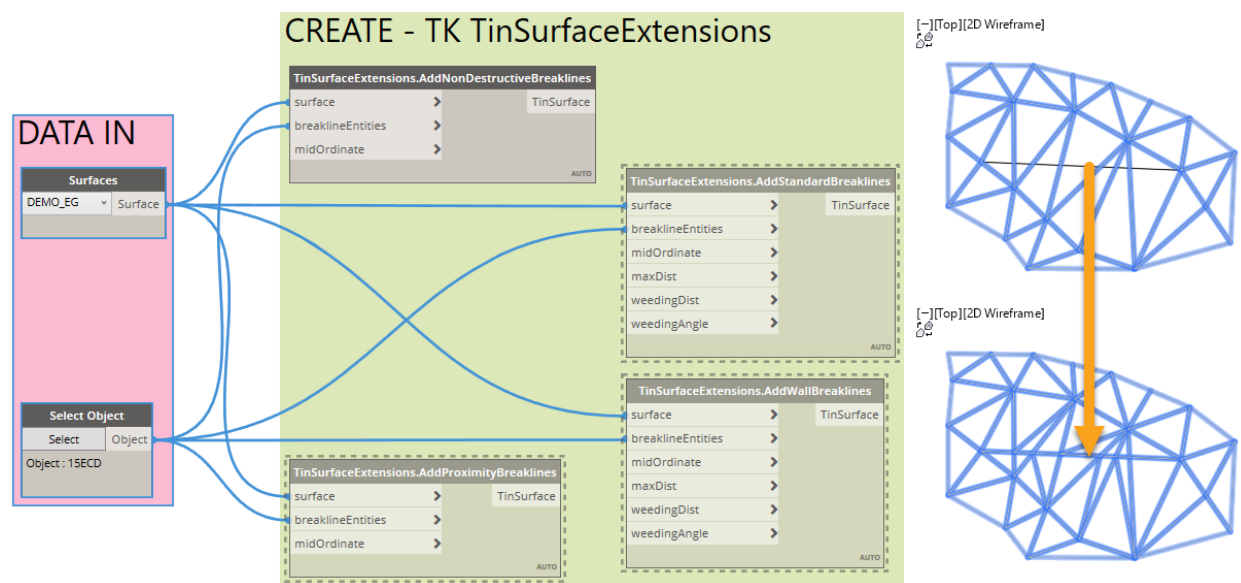


Figure 3.8.E: TinSurfaceExtensions.AddNonDestructiveBreaklines & other options

Tips to navigate and debug your Dynamo graph

It is important to know how to navigate and debug an existing graph. As the team develops their skills in Dynamo, they will start creating simple to complex routines. In some cases, you will encounter properly annotated graphs and sometimes there's no annotation or groupings at all. Whatever state you receive a graph, observe 3 simple steps to navigate and debug the graphs easily.

3 Steps in Navigating an existing graph

- Analyze
- Understand
- Modify

Analyze

When navigating an existing graph, always open the graph in manual execution mode. It is important to analyze what is the purpose of this graph, what are the inputs needed and what are the outputs.

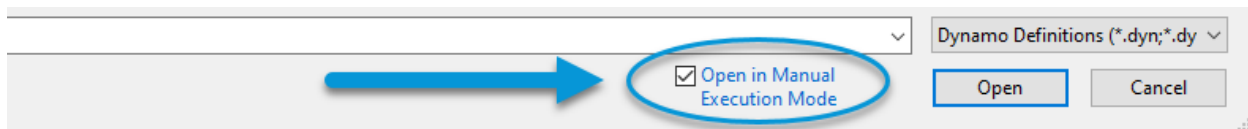


Figure 4.1: Open in Manual Execution Mode

Understand

After knowing the purpose of the existing graph, check if clustering and grouping is already available and if it's not available, then start by grouping them. Breaking the graph through freezing nodes is a good way to focus on portion of a graph at a time. After you understand what they do, start adding Dynamo notes (Ctrl+W) to make the graph more human readable. The key to the success of this process is to structure the nodes with groupings and run the graph step by step.

Modify

Understanding the goal of the graph will help you see what you need to modify. Checking the inputs and outputs, understanding the error messages and adding graph annotations are parts of modifying an existing graph. Learning each nodes that are being used and understanding what they do is important in modifying an existing graph. Look for ways to make the graph as efficient as possible. When you see your graph having so many groups of nodes and it is doing the same tasks, then chances are, proper list management will make this more efficient.

Tips in creating your own automation routine

The most challenging part is to find which tasks to automate. There are many repetitive design tasks and identifying what to automate and how to automate them will rely on how many re-usable routines you manage to learn and create. It is also important for you to learn which tasks are worth spending time with. Always ask yourself if making this automation routine will be measurable and scalable. Will it save you some time in the future? Will it be useful in my next projects? Those questions will help you decide on what to focus on.

I've seen so many people start with the most complex routines and ended up spending too much time trying to solve a long process. It is better to focus on a small task and then move to the next one. Creating and solving smaller routines are more useful and easy to manage. Having a strong software knowledge and understanding of Dynamo and Civil 3D are important.

I've also seen most automation routines leverage the List, Range, Import / Export to excel and use packages like Civil 3D Toolkit to supercharge their graphs. It is recommended to try and use those as well.

Dynamo Primer

In searching for a better way of learning Dynamo for Civil 3D, it is highly recommended for first time users to start reading the Dynamo primer <https://primer.Dynamobim.org/>. Then once you learn the basics, try and test it yourself by doing small routines like changing layers, adding property sets, adding object data, creating labels, and creating civil objects to changing parameters. Once you've successfully completed all the smaller tasks, it will be heaps easier to start combining those routines to do more useful automation with lesser effort.

Dynamo BIM Forum

Dynamo is constantly evolving and the current routines may be obsolete later on. Participating in Dynamo BIM forum <https://forum.Dynamobim.com/> will ensure that you are learning from the latest trend and that you are up-to-date with issues other users encounter. Learning from forum posts and understanding solutions will enhance your Dynamo skills.

Other Useful Packages

Dynamo for Civil 3D will always improve and evolve. We have a strong Dynamo community and there are a lot of super users that are willing to make their contributions. I encourage you to use the latest Civil 3D Toolkit and try other useful packages.

Automation Routine

You might find something useful from previously created routines that you can recycle. Try to learn simple to complex routines and from your learnings, create your own automation routine. Every automation you make is intended to help you save time and make your work more efficient.

Reference


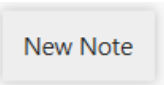


Recommended links for learning:

<https://DynamoBIM.org>
<https://DynamoPrimer.com>
<https://DynamoNodes.com>
<https://Dictionary.Dynamobim.com>

Autodesk Infrastructure You tube channel
Autodesk Knowledge Network
Autodesk University Classes

- a. CES319333 – Dynamo in Civil 3D Introduction – Unlocking the Mystery of Scripting
- b. CI225967 – Using Automation in Civil 3D for Construction Documentation and Exports
- c. CI123653 – AutoCAD Civil 3D and Subassembly Composer – Real-World-Practice Tips and Tricks
- d. CES322249 – Computational Design for Civil Engineers
- e. CES320124 – Civil 3D and Dynamo Culvert Design and Analysis
- f. CES226095 – Civil 3D Data Mining with Dynamo
- g. CI10903 – Ramp It Up – Advance Corridor Design in AutoCAD Civil 3D
- h. CI322842 – Accessorize Your Design – Dynamo for Civil 3D

Appendix 1 – Dynamo Shortcut Key

Shortcut Key	Description	Image
Ctrl+B	Swap background code blocks and 3d drawings (vice versa)	
Ctrl+W	Add new note	
Mouse left click 2x	Double clicking the accept button (Left click) of your mouse will create a Code Block	
Ctrl+Z Ctrl+Y Ctrl+C Ctrl+V Ctrl+A	Undo Redo Copy Paste Select All	Common Shortcut keys
Ctrl+G Ctrl+U Ctrl+D	Create Group nodes Ungroup nodes Create Custom Node	Grouping shortcut keys
Ctrl + Shift + Up	Show console	
Ctrl + L	Clean up Node layout	
Ctrl + = (Mouse wheel up) Ctrl + - (Mouse wheel in)	Zoom In Zoom Out	
Ctrl + Alt + Arrow key (Mouse wheel press) + move mouse	Pan graph Pan graph / Pan workspace	
Right click mouse + move mouse	Orbit	
Hold ESC key Remove hold of ESC key	Ability to zoom in and out Back to normal view	
Select nodes press Ctrl then move mouse	Copy nodes using Ctrl key	

Appendix 2 – Bonus Content > LandDevelopment

Civil 3D Toolkit > LandDevelopment > CogoPointExtensions

Cogo Points in Civil 3D stand for Coordinate Geometry points. Cogo points can be stored in a project outside a drawing and reference by multiple users.

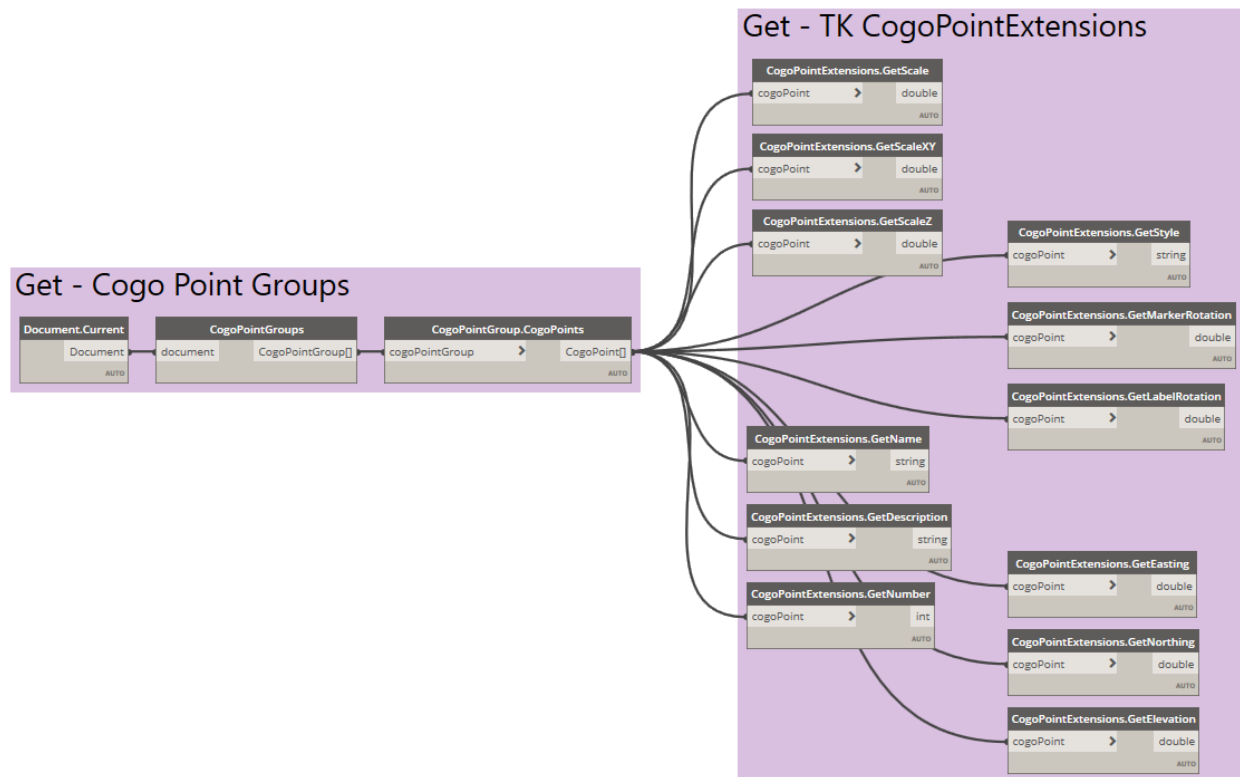


Figure 5.1.A CogoPointExtensions.Get

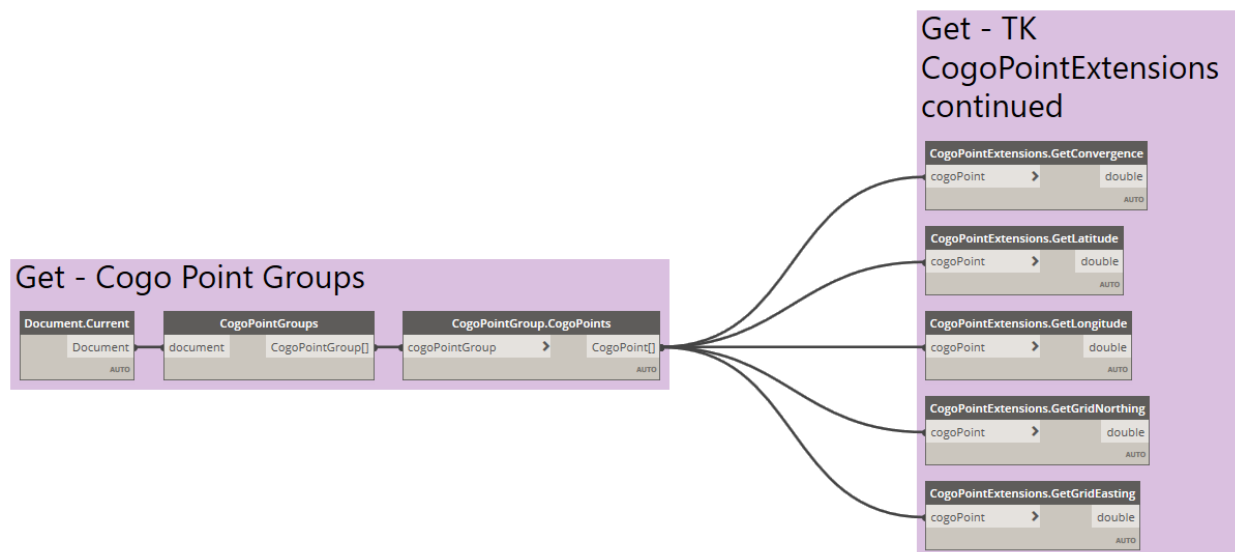


Figure 5.1.B CogoPointExtensions.Get Continued

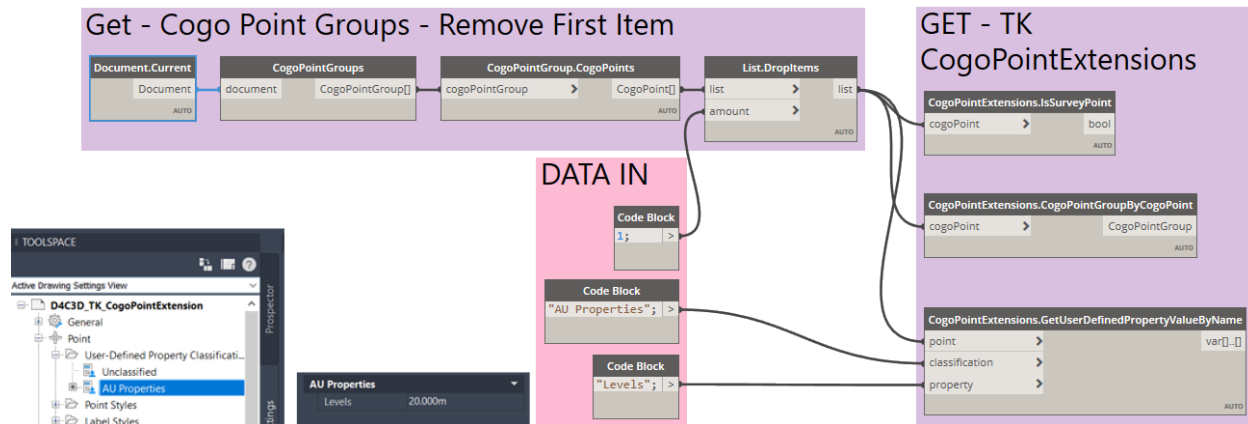


Figure 5.1.C CogoPointExtensions.User Defined Properties

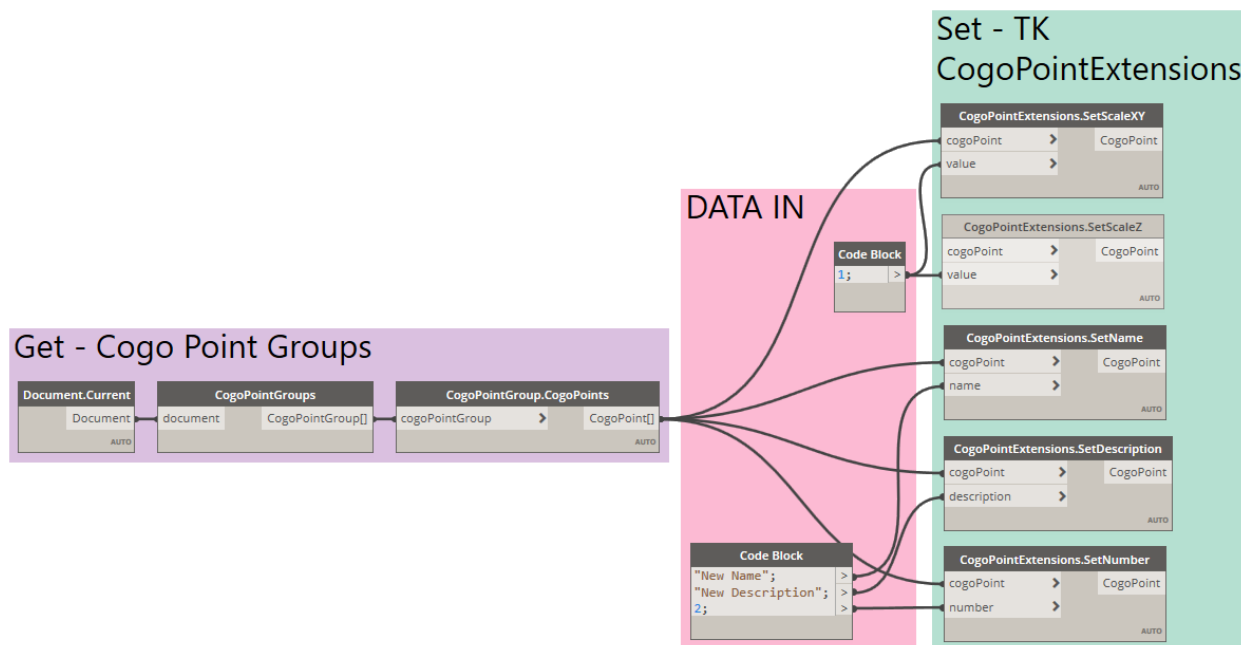


Figure 5.1.D CogoPointExtensions.Set

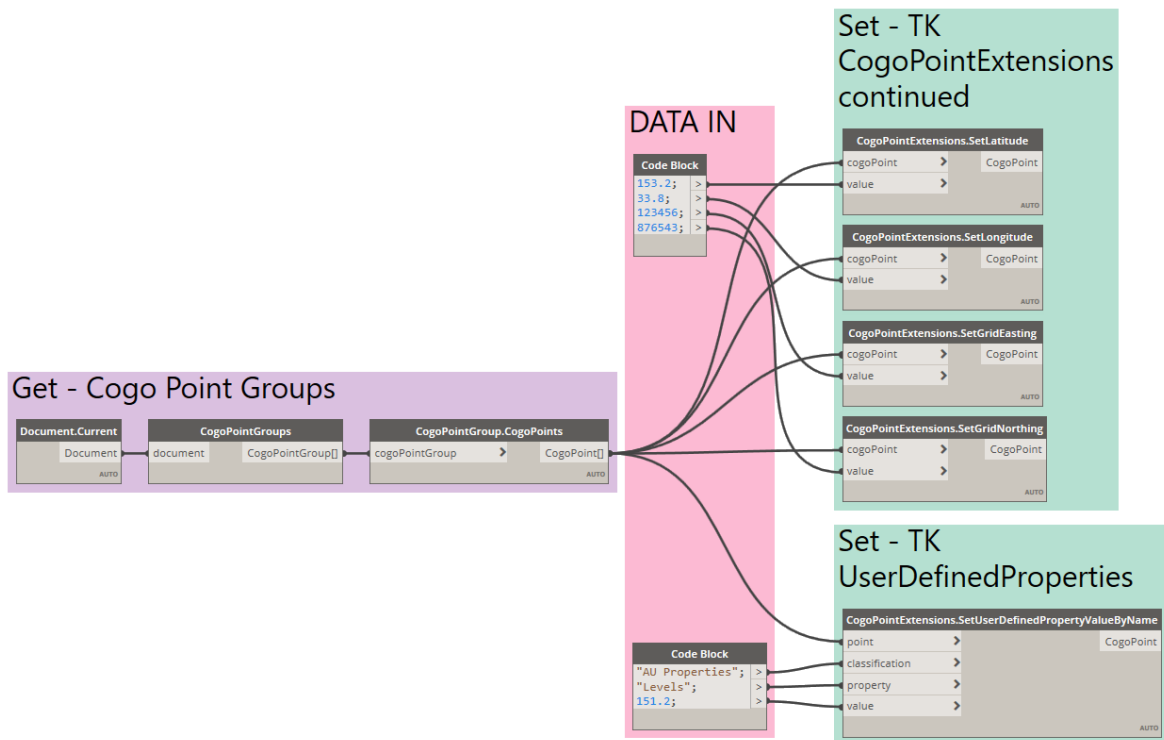


Figure 5.1.E CogoPointExtensions.Set Continued

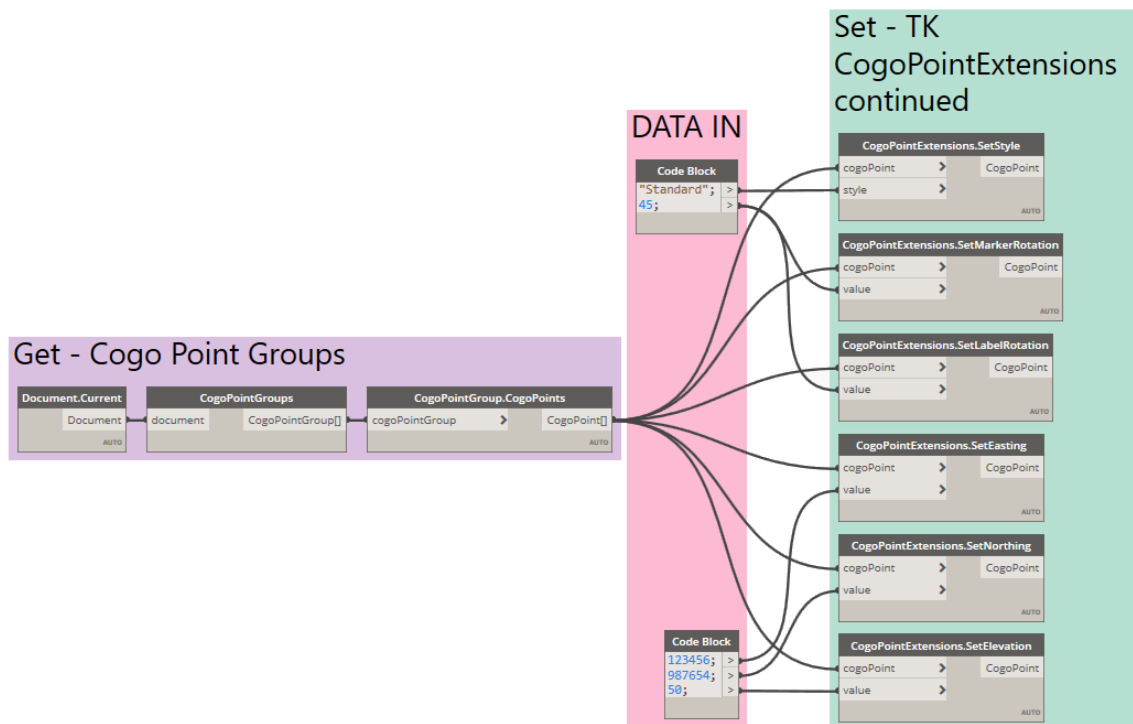


Figure 5.1.F CogoPointExtensions.Set Continued

Civil 3D Toolkit > LandDevelopment > FeatureLine

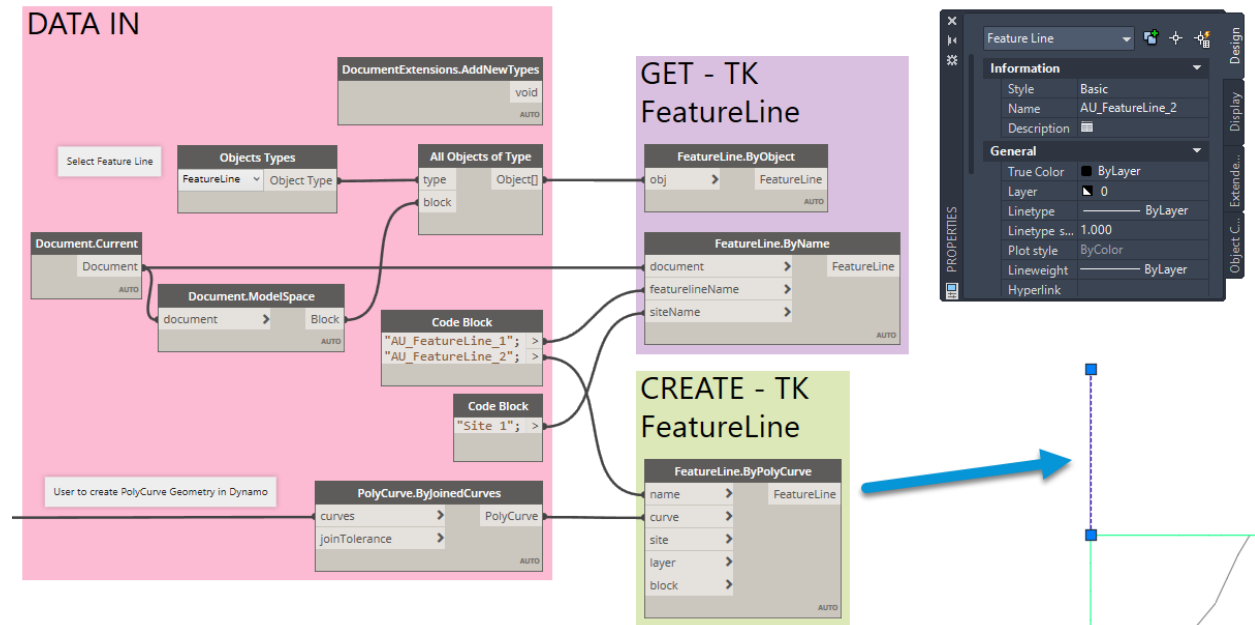


Figure 5.2.A FeatureLine.ByObject, ByName and ByPolyCurve

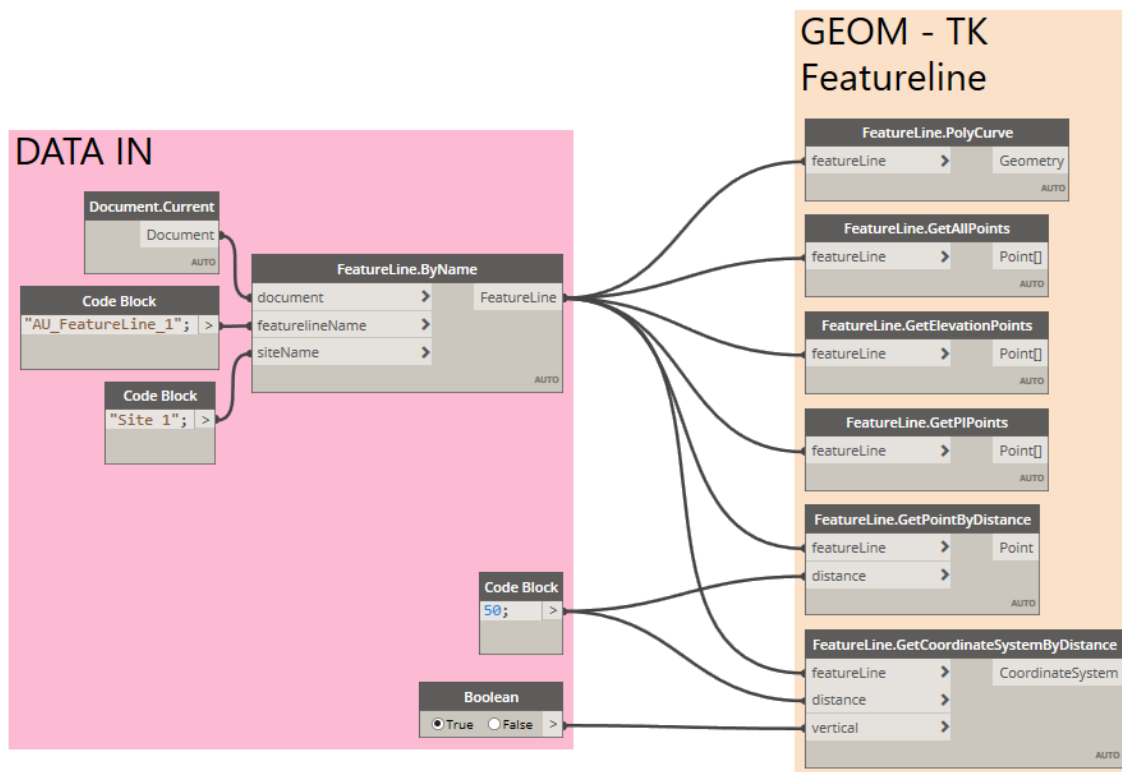


Figure 5.2.B FeatureLine Create Dynamo Geometry

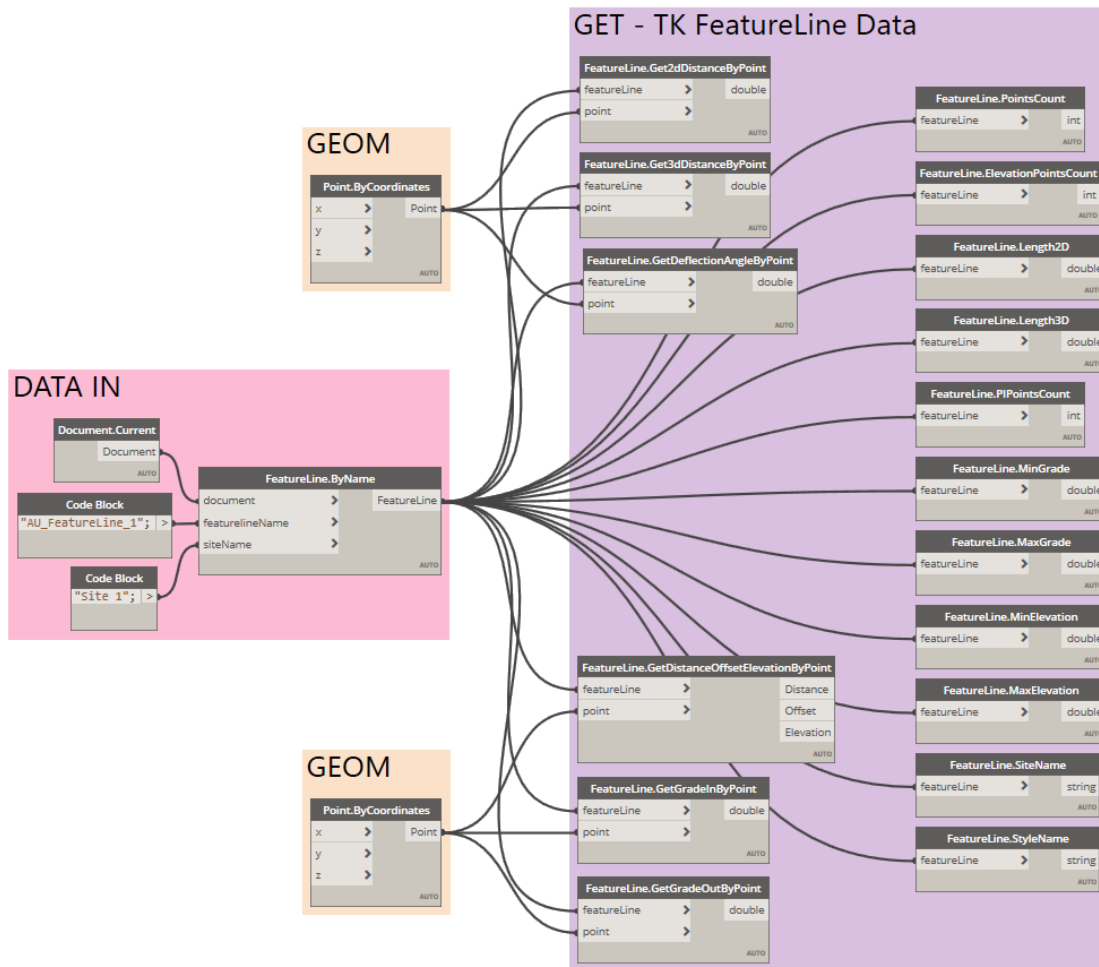


Figure 5.2.C FeatureLine Get Data

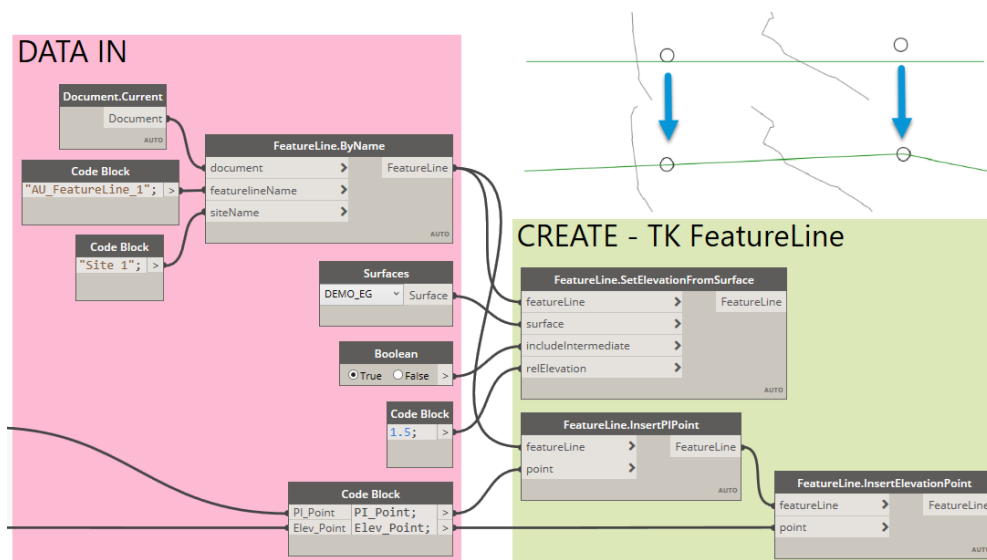


Figure 5.2.D FeatureLine.SetElevation and InsertPoints

Civil 3D Toolkit > LandDevelopment > Parcel

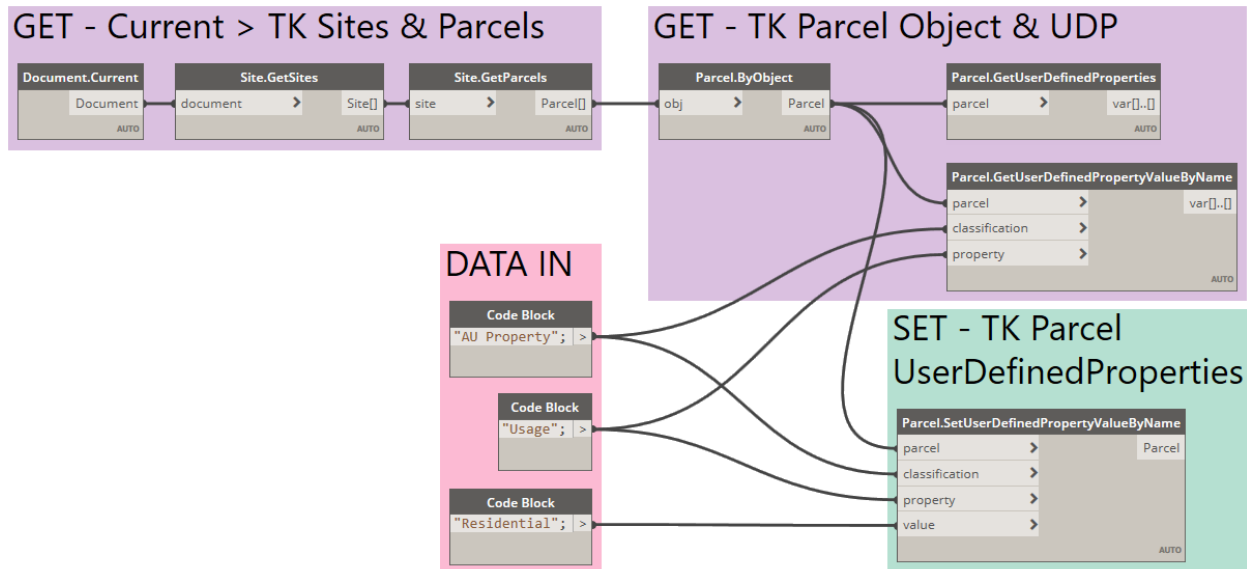


Figure 5.3.A Parcel.Get User Defined Properties and Set User Defined Properties

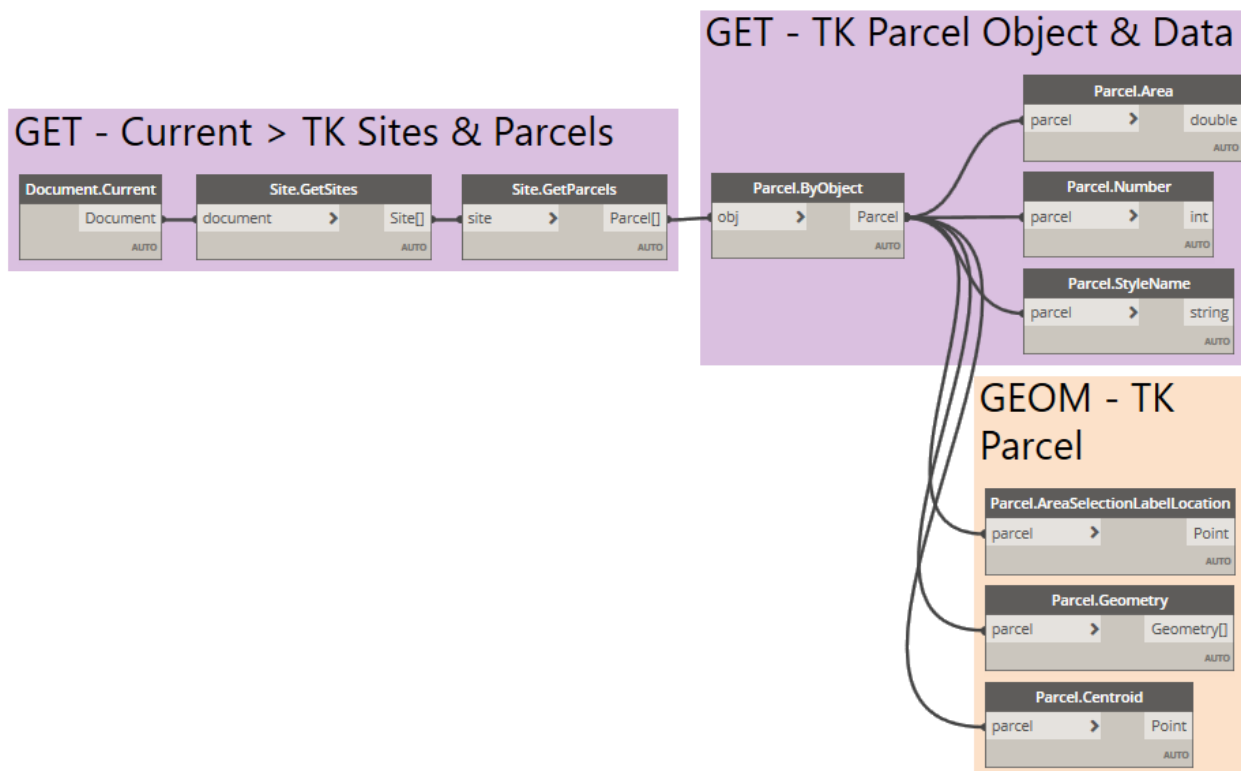


Figure 5.3.B Parcel.Get Data & Geometry

Civil 3D Toolkit > LandDevelopment > Site

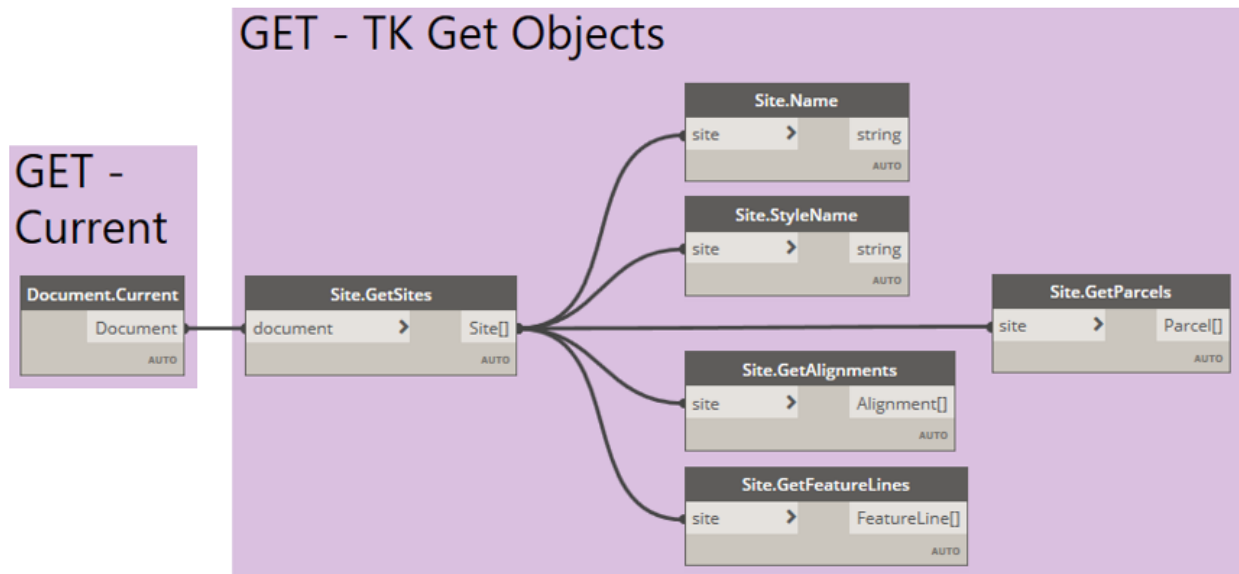


Figure 5.4 Site.Get Objects

Acknowledgement

Learning Civil 3D Toolkit and Dynamo for Civil 3D requires a lot of research, reading and testing. I would like to say thank you to Paolo Serra & Safi Hage for developing the Civil 3D Toolkit package and for providing their full support, technical advice and sharing some sample Dynamo files. I would also like to say thank you to Adam Walmsley, Ben Wardell and David Licona for their assistance and technical advice.