TR20789
360 of InfraWorks 360

Angel Espinoza
Autodesk, Inc.

Learning Objectives

- Discover how easy InfraWorks 360 is to learn
- See how easy InfraWorks 360 is to use
- See how powerful InfraWorks 360 is for design
- See how well InfraWorks 360 integrates with other applications

Description

Get a complete view of InfraWorks 360 software. See how you can use it for preliminary planning, detailed design, road and bridge design, drainage design, creation of images and videos, and collaboration with other industries. Get tips and tricks to use InfraWorks 360 software quicker and easier. This session features InfraWorks 360 and AutoCAD Civil 3D. AIA Approved

Your AU Expert

Angel has been an Autodesk Civil Engineering Technical Specialist for about nine and a half years, specializing with Autodesk infrastructure design products. Prior to joining Autodesk he had previously worked for a combined 23 years in the civil engineering community – 14 years for engineering companies in southern California, and 9 years with an Autodesk reseller. He has been writing his Civil 3D blog since August of 2004 and has taught Infrastructure related classes at Autodesk University since 2005.

360 of InfraWorks 360 - Overview

Any 360 of InfraWorks 360 must begin with the fact that it is an environment that is the entire planet and we can create models for any place on earth, above it, below it, at any time in history, or the future.


Before we begin, here are some sample images of the different types of things that can be done:
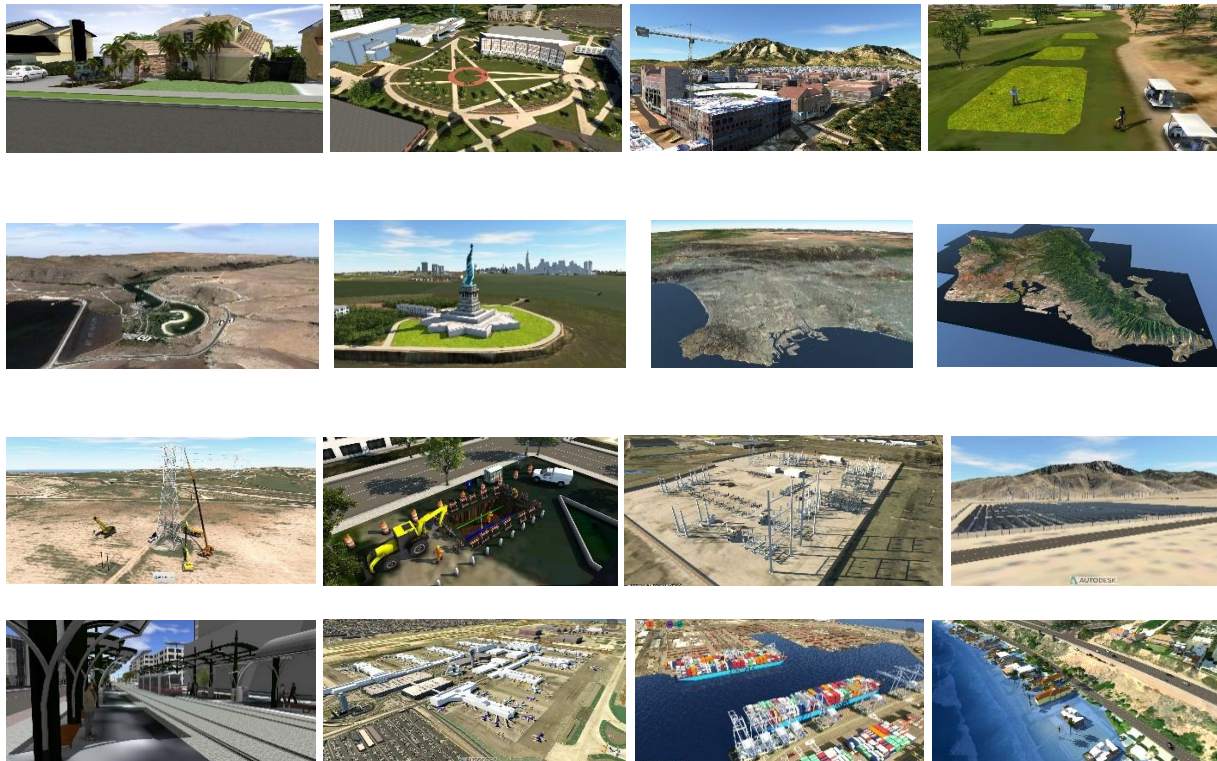
Build It Yourself

With Autodesk InfraWorks 360 it is possible to build a model from various data sources. These may include LandXML, SHP, Revit, SketchUp, ReCap Point Cloud formats, Raster formats, we can even reach right into a Civil 3D drawing and import surfaces, alignments, pipe networks, etc.
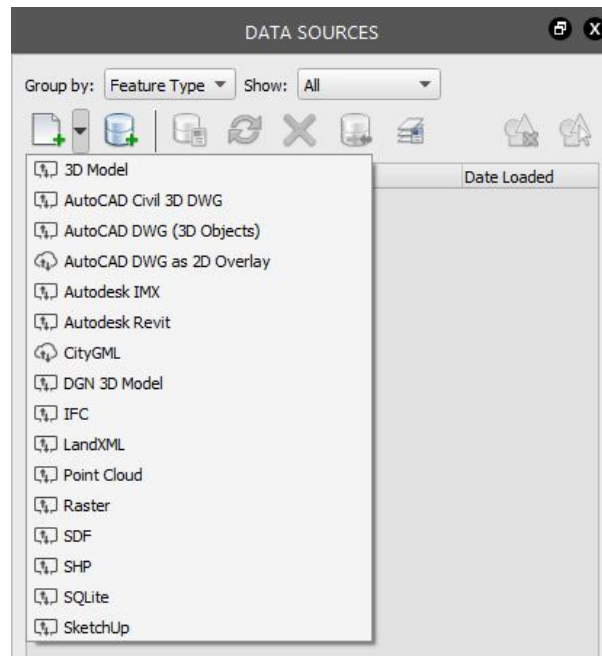
Ease and accuracy is possible if the data corresponds to some known coordinate system. This will allow the data to be translated/transformed and placed exactly correctly on the planet surface. If no known coordinate system is applicable, then we must manually place it.

We can add any number of these types of data into InfraWorks 360. Occasionally, similar data types, such as surfaces, need to be managed to properly control which takes precedence if the data is co-located (i.e. which exists first in time, or is more current.)

I will begin this session by building a project site for near the city of San Luis Obispo, CA. I will Drag and Drop the following file types into a blank InfraWorks 360 model: .LandXML, .Raster, .SHP

## Let Model Builder Start It For You

Another way to start a model is to allow Model Builder to put together, from some available sources, a model of up to 200 square kilometers (approximately 77 squares miles). These sources include:

For roadways, railways and water features – OpenStreetMaps
For buildings – OpenStreetMaps
For georeferenced imagery – Microsoft Bing Maps
For terrain – within U.S. and territories, USGS. Outside U.S. SRTMGL1 and ASTER GDEM
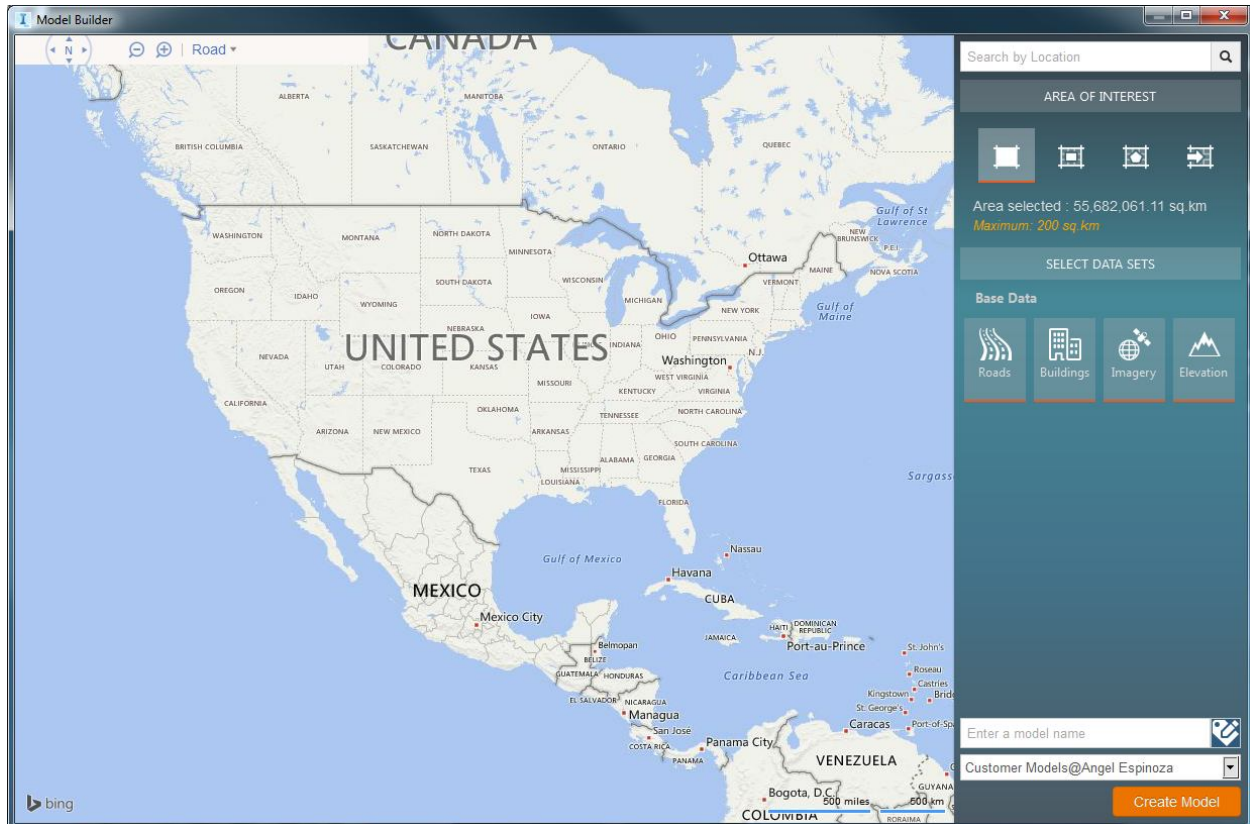
We can specify any location by either using the map window, define a rectangular polygon within the map, defining an irregular polygon within the map, or by importing a .SHP file into the map.

In order to complete this process, we give the requested model a name and assign it to a group. Groups are used to control access and security. Then we press the "Create Model" button.

We will be notified that the model is being created in the cloud. We will receive an email when it is ready for download and it will appear on the InfraWorks home screen.

Generally, it takes between 2-10 minutes for the model to be assembled for us. This depends on area and density of data, such as number of building, roads, or water features.

InfraWorks Model Builder Email

Here is an example of an email that we receive once our model is ready for download:
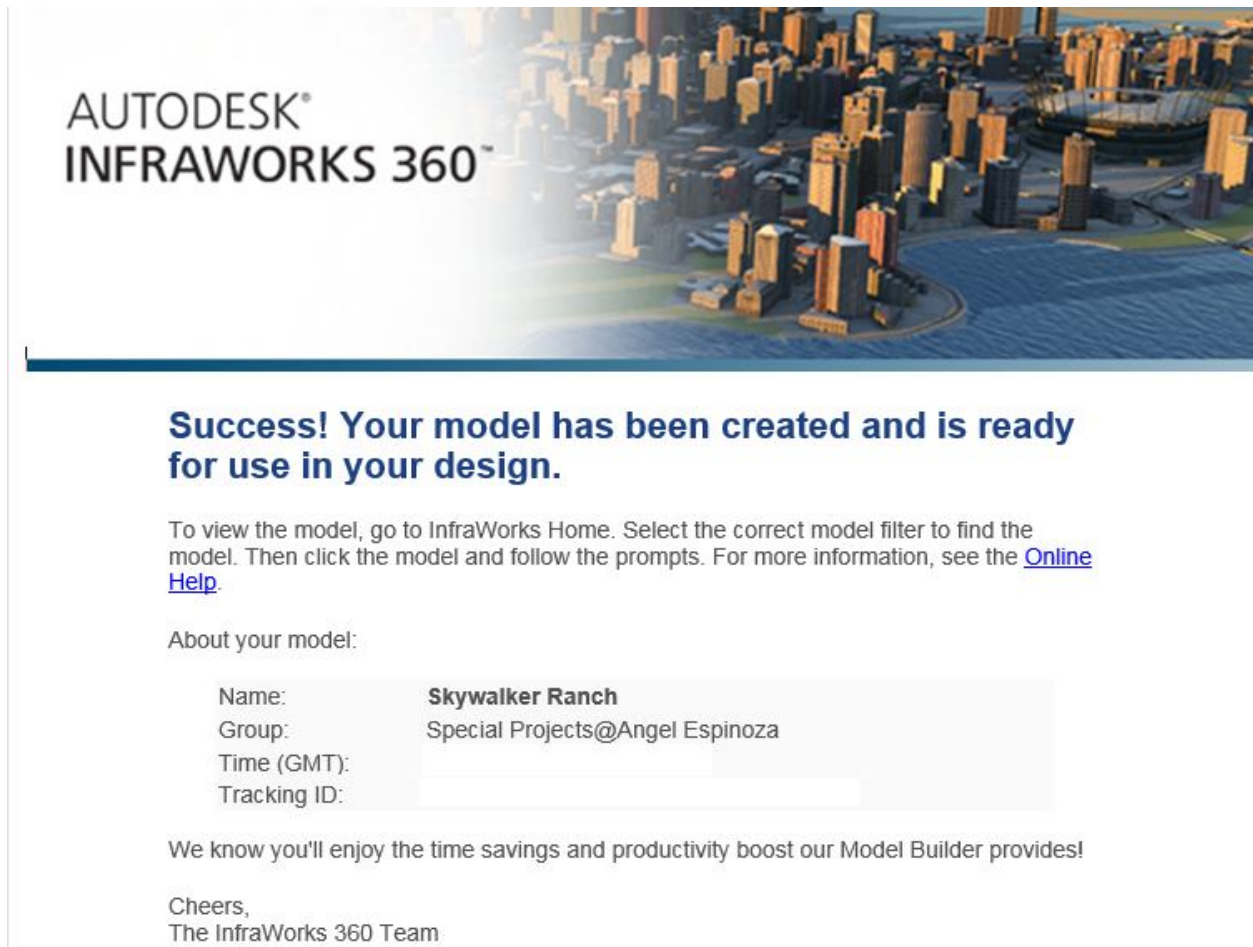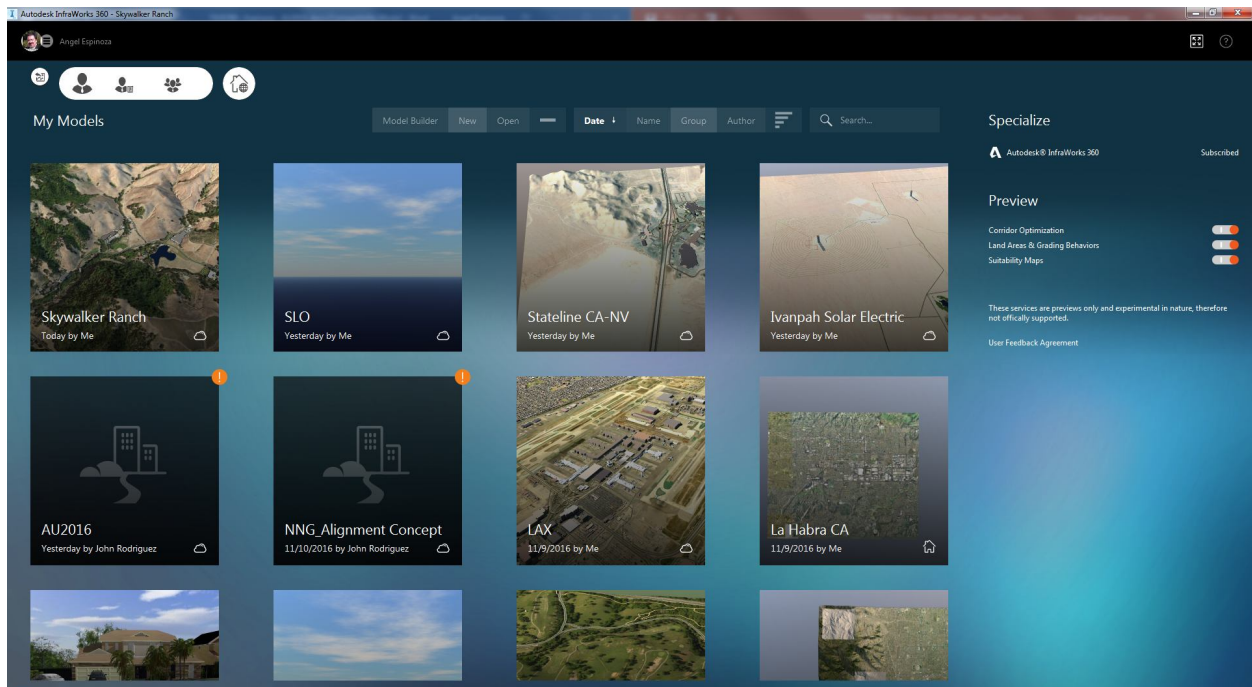

By picking on the model tile/image on the Home screen the model will begin to download (This occurs only the first time).

The time it takes to download will, of course, be dependent upon our internet download speed, but many users can start from nothing and have a georeferenced base model in approximately 10-15 minutes.

Once downloaded, the model is stored locally and runs locally.

InfraWorks Home screen

Much of the InfraWorks Home screen is explained by this "Help" page:
http://help.autodesk.com/view/INFMDR/2016/ENU/?guid=GUID-01AABC51-386E-4E5B-A901-C317CBC050E3

But here are a few important features found on the Home screen:

Entitlements and Preview Functionality
The right hand side of the screen lets us know what we are subscribed to. In other words, what we are entitled to use.
There we will also be able to toggle "ON" any preview capabilities that are currently available.

Model Thumbnail tiles
The largest portion of the Home screen contains many thumbnail images of the models that we have access to. We may have created them or someone included us in a group that contains those models.

Manage Models and Groups
In the upper left had corner there are icons to manage groups, models and group memberships. We can also get to our InfraWorks 360 Portal and Web Administrator. We will revisit the Web Administrator during the collaboration section on page ??.

Model Builder
Access the Model Builder Map and interface that we previously discussed.

Opening a Model

We can open a model by picking on a model tile/image or we can browse to the location of the model with the "OPEN" option.

If you have access to many models, it is helpful to type into the "Filter" window the name or group in order to limit the tiles to those that are wanted or similar.

Maneuvering

Most of the maneuvering can be done via the mouse as follows:

Left-Pick and Drap   3D Orbit
Roll Mouse Wheel Forward   Zoom In
Roll Mouse Wheel Backward   Zoom Out
Press Mouse Wheel and Push Forward   Elevate
Press Mouse Wheel and Pull Backward   Descend
Right-Pick and Drag   Pan

Additional fine maneuvering can be done with the following keys:

The Arrow Keys   Move Forward/Backward & Turn Left/Right
WASD Keys (gaming keys)   Look Down/Up & Sidestep (Strafe) Left/Right

Bookmarks

Bookmarks can be same very particular perspectives and be recalled to quickly get to certain views of the model.
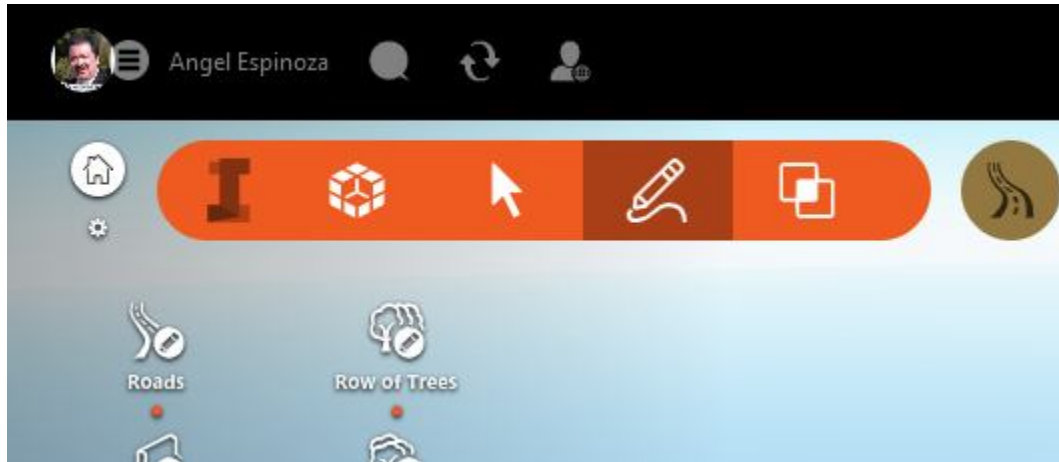
The "Bookmarks" icon can be found in the upper right hand portion of the screen.
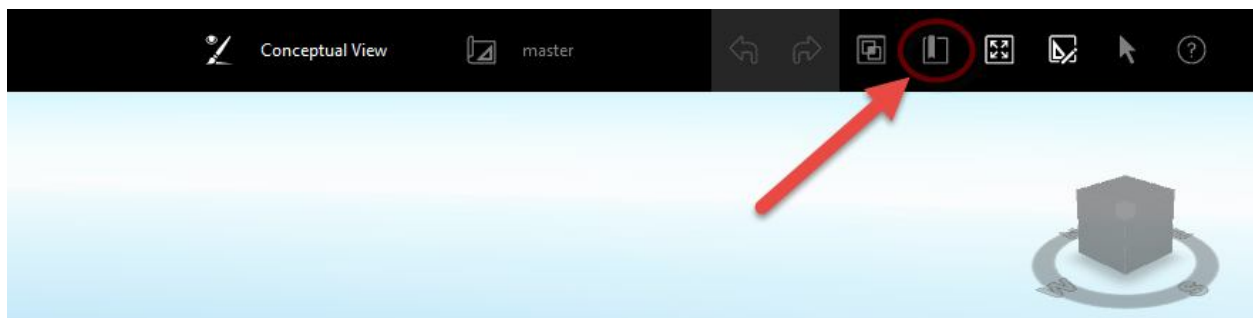
Sketching

Most things that can be sketched are found by selecting the Pencil icon under the "Intelligent Tools" "I" icon

To sketch you can simply continue to Pick and then quickly Double-Pick to end the sketch.

Although most of the following sketching capabilities can be found on the Right-Click Menu, you can also…

Add A Vertex
It is possible to add a vertex to a sketched object by hold the Alt key and pressing the left mouse button

Delete A Vertex
It is possible to Delete a vertex to a sketched object by hold the Shift key and pressing the left mouse button

Split on object
It is possible to split certain sketched objects by hold the Ctrl key and pressing the left mouse button

Fine placement
To place a point for a sketched object you can press the Ctrl key while pressing the left mouse button. This behaves similar to turning of the "Snap" option in AutoCAD.
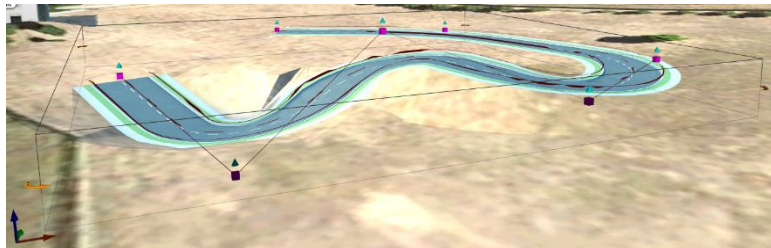
Sketching (Continued)

It is possible to sketch many types of objects within InfraWorks 360. We will cover a few in this session.

Sketch A Road

When we choose the sketch road icon the "Select Road Style" window appears. We can choose a style that the new sketched road will be, or we can use the current style and easily replace it later.

We can create a sketched road by picking consecutive points. We are not limited to the curvature of the road and the road will be a spline defined by the points that we pick.

The ability to add edit the road via the Right-Click menu or the editing methods that we previously learned, is possible.

We can change the roads grade by raising or lowering the cyan cones located at the grips.

Sketched roads, also referred to as "Planning Roads" are conceptual in nature and do not follow road and highway design rules. For example, we cannot specify road grades. We can only approximate a desired appearance.

When two Planning Roads intersect a rudimentary intersection will be created.

This intersection will not be able to be designed per a design vehicle's turning radius, nor would dedicated turn lanes be easily created.

We can use the "Style Palette" to manage and modify objects.

In the case of roads, we can drag-and-drop an existing style onto an existing road to change its appearance.

We would also be able to easily create new road styles to apply to both "Planning Roads" and "Design Roads" by using the "Configure Road Style" window.
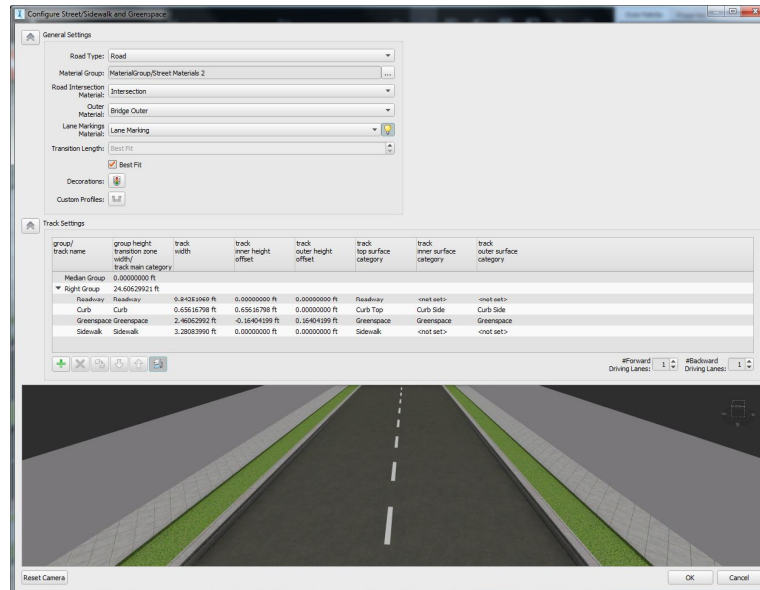
Sketch A Building

Sketching a building is among the easiest things that can be done. By selecting the Pencil icon (Create conceptual design features) once again we can select the "Add buildings" icon. We will again get the "Select Draw Style" palette where we can choose a "Façade" style that will be applied to our new building or we can use the current style and replace it at a later point.
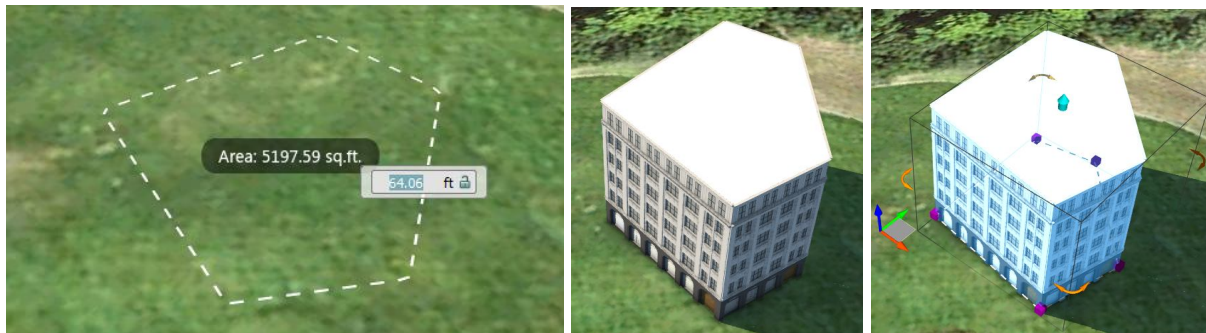
We pick the points for the footprint of the building and end the process by quickly "Double-Picking" the last vertex.

The cyan arrow at the top centroid of the building allow us to make is taller or shorter.

We can use the Style Palette to Drag-and-Drop another façade style onto the existing building. Removing all style s from the building will leave a massing of the building which in some cases is preferred.

All vertex editing applies to buildings as well.

Sketch Trees

Sketching a stand of trees is similar to sketching a building with a couple of additional options
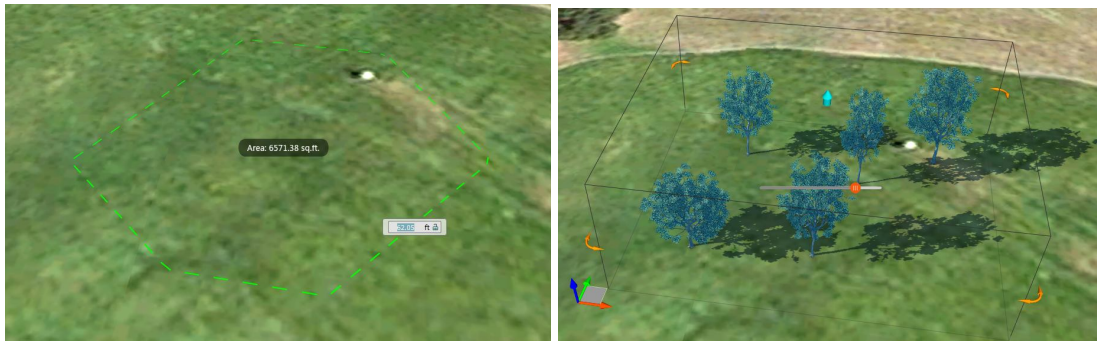
The slider that appears after the "Escape" key is pressed allows us to increase or decrease the number of trees in the stand of trees. The Cyan arrow at the top centroid of the shape makes the trees taller of shorted.

Sketch Water

Next, we will sketch a water area. The process should seem familiar by now. Picking until we Double-Pick to end the creation process.
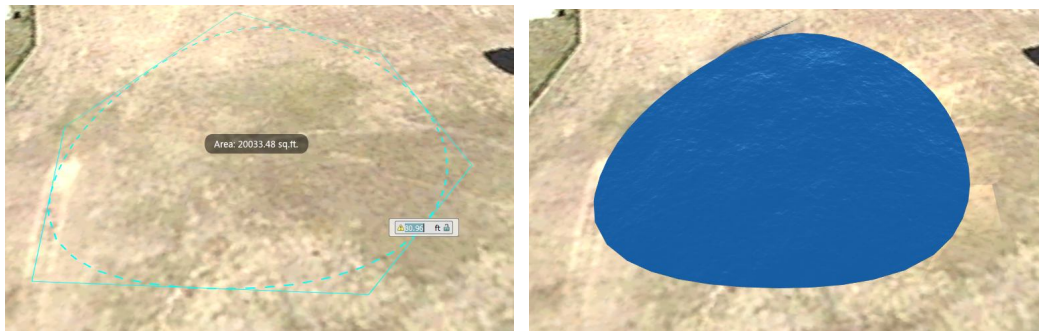

Sketch Coverage Area

A coverage can be created and will drape exactly on a terrain and can have a color or material applied to it. This can be used to denote important terrain regions (i.e. Parcels, soil types, etc.) or can with materials cover an area in order to represent a future condition.
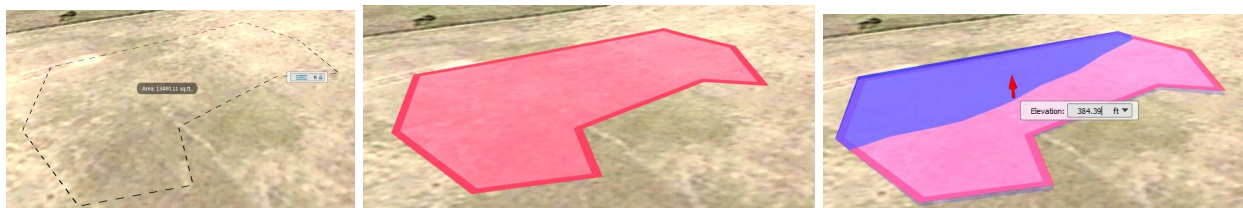

Or we can edit the vertices to form the land (grading) and can even via a Right-Click menu "Shape Terrain" which will place all of the coverage vertices at a common elevation and daylight to a distance which is the "Smooth Radius" in the Properties Palette.

Sketch Land Area

A land area can be considered similar to a Coverage Area except that it is always flat and can in addition to grading out to a specific constant distance, also daylight by a specific Cut and/or Fill grade. Grading styles can be found in the "Style Palette" and can be dragged and dropped onto a Land Area
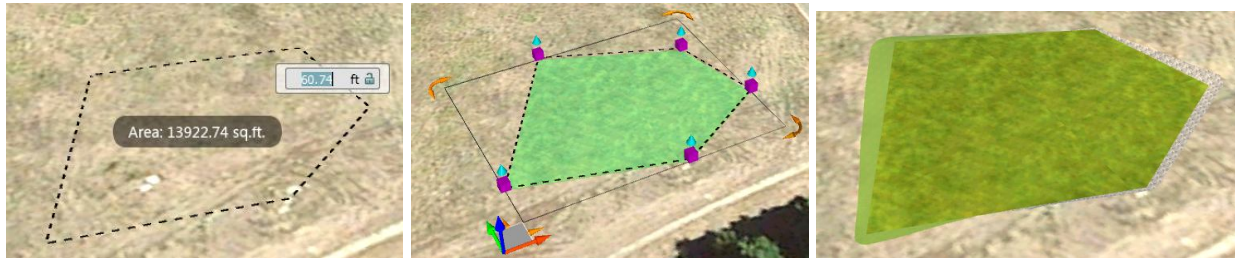
As with most items in the Style Palette it is easily possible to create custom Grading Styles that can be applied to "Land Areas"
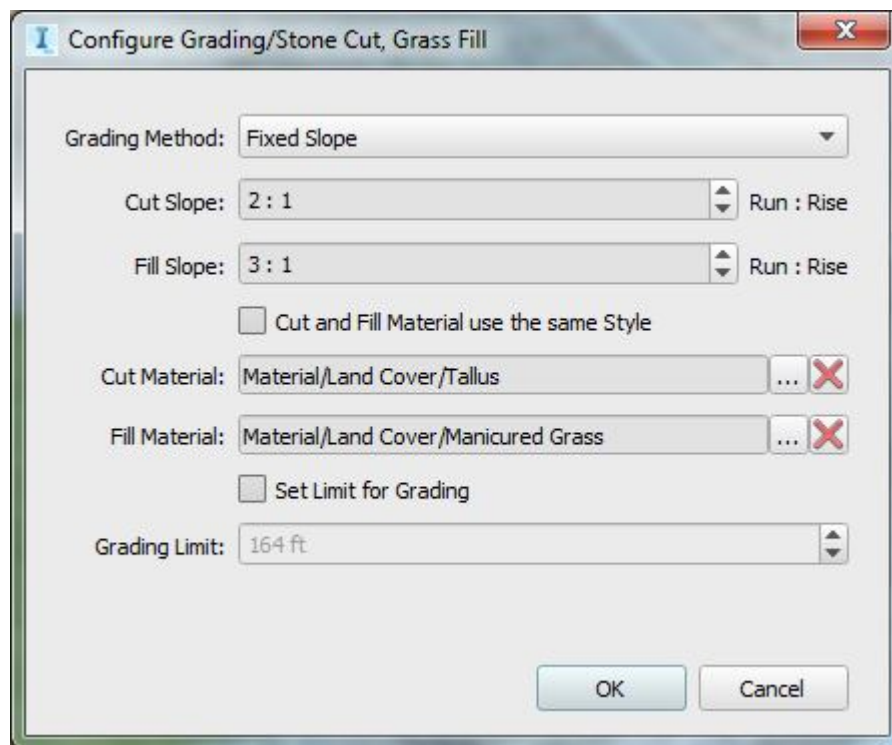
These Grading Styles can include different materials for Cut and Fill along with different Cut/Fill slope values.

By Design

InfraWorks has three types of Preliminary Design capabilities. They are Road Design, Bridge Design, and Drainage Design.

Road Design

Road Design currently uses AASHTO road design standards to create roads that adhere to common design requirements. There are two types of road that follow these standards. Design Roads and Component Roads. Here I rely on the Help pages to define them.

"Design roads are style-based roads that offer more precise control over geometry and grades. You can add design roads in-canvas or convert planning roads to design roads. Design roads also support modeling and analysis features such as corridor and profile optimization, sight distance analysis, as well as traffic and mobility simulation."

Component roads are configurable component roadway assemblies that also use vertical and horizontal geometry to offer more precise control of geometry and grades. You can add component roads in-canvas or convert design roads to component roads.

Unlike design roads, component roads are not associated with styles, and instead use component parts.

In addition to supporting the same modeling and analysis capabilities that design roads support, component roads also support some advanced capabilities that design roads do not, like superelevation, and linear road transitions.

Laying out design roads can be easy with the additional step of including a design speed.

You will also see where design speed appropriate radii will be applied to the roads (blue arcs).

When two Design Roads intersect an Intersection object will be created. This object contains properties for design vehicle turning radius, acceleration and deceleration lanes, median turn pockets and can be turned into Roundabouts.
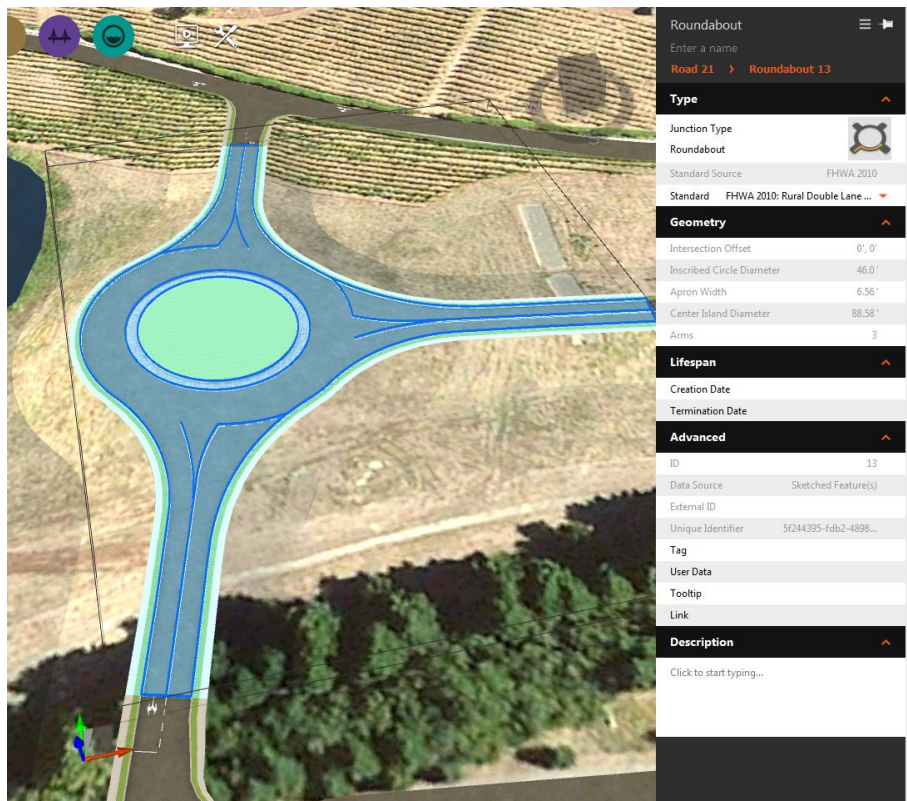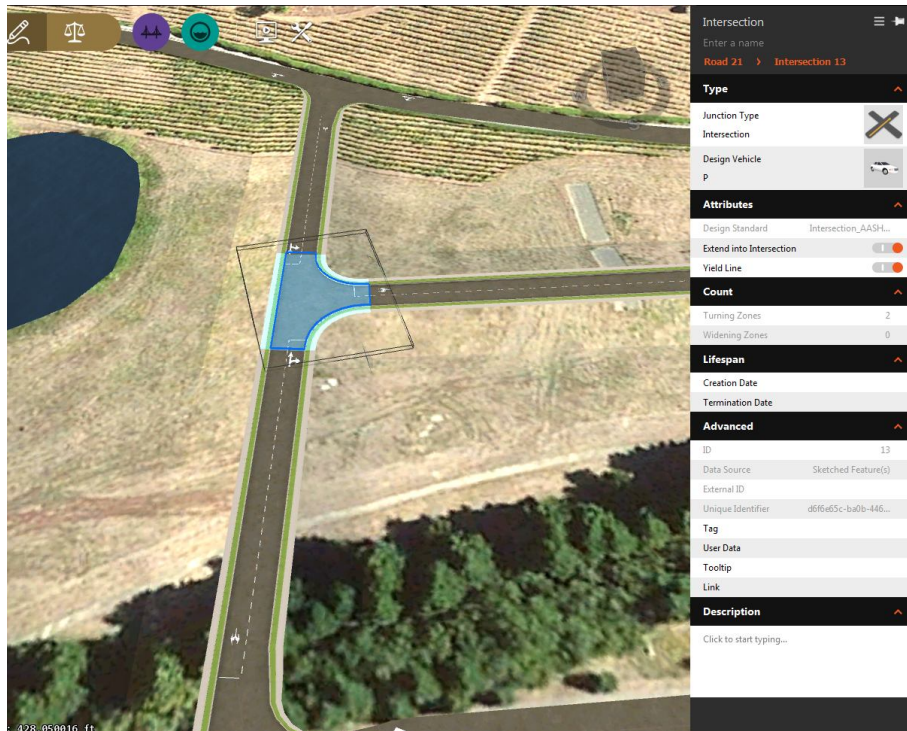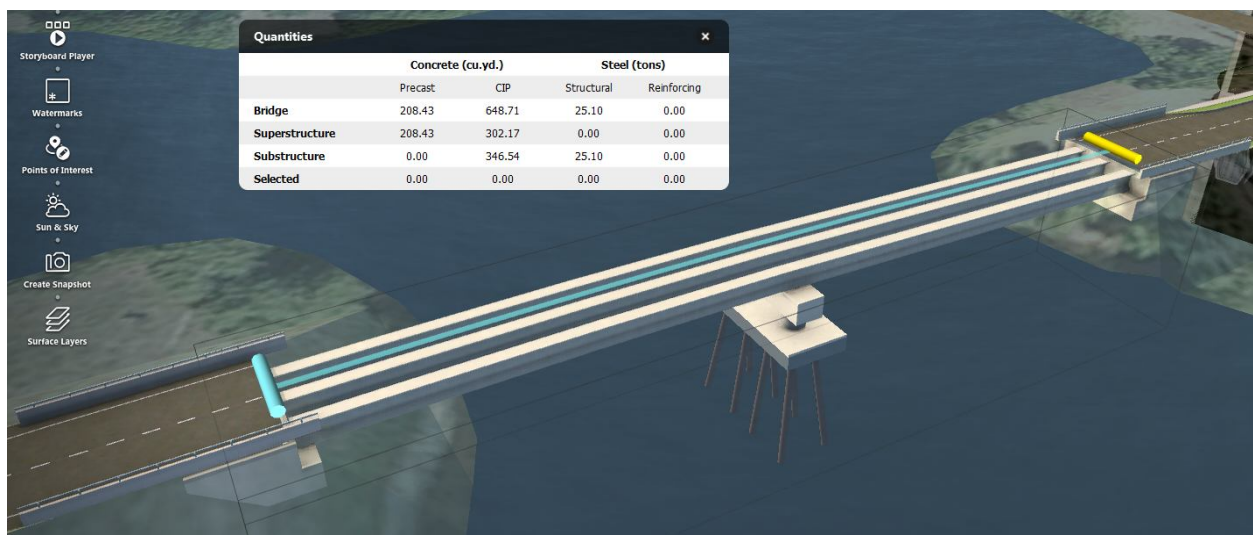
Component Roads do give us the most detailed road design layout abilities in InfraWorks 360.

Bridge Design

When Design roads are created across water bridges will be created automatically. We can also add bridges from the Right Click menu.
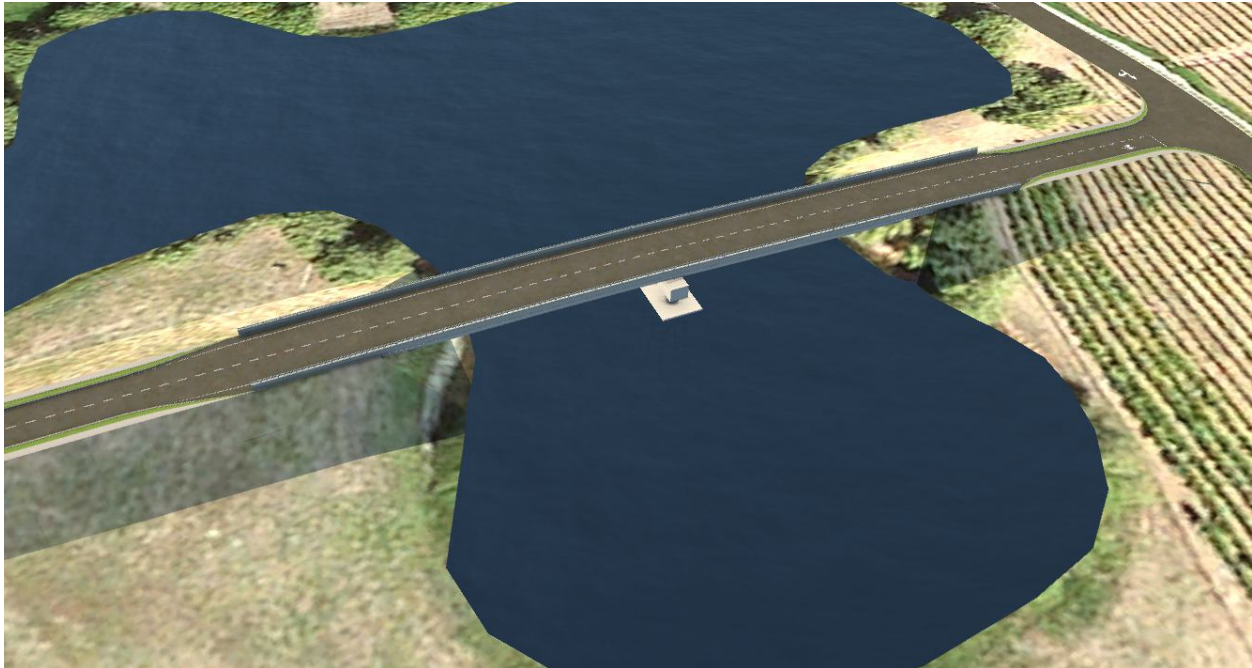
It is possible to turn off the visibility of bridge components, do girder analysis, change from Pre-cast I beam girders to steel plate, show the clearance envelope, show quantities and much more.

|	Concrete (cu.yd.)		Steel (tons)	
	Precast	CIP	Structural	Reinforcing
Bridge	208.43	648.71	25.10	0.00
Superstructure	208.43	302.17	0.00	0.00
Substructure	0.00	346.54	25.10	0.00
Selected	0.00	0.00	0.00	0.00

Drainage Design

For Design Roads that contain curbs you can add a Drainage Network via the Right Mouse Click Menu.

It is also possible to create Watersheds and to add culverts that automatically provide analysis.
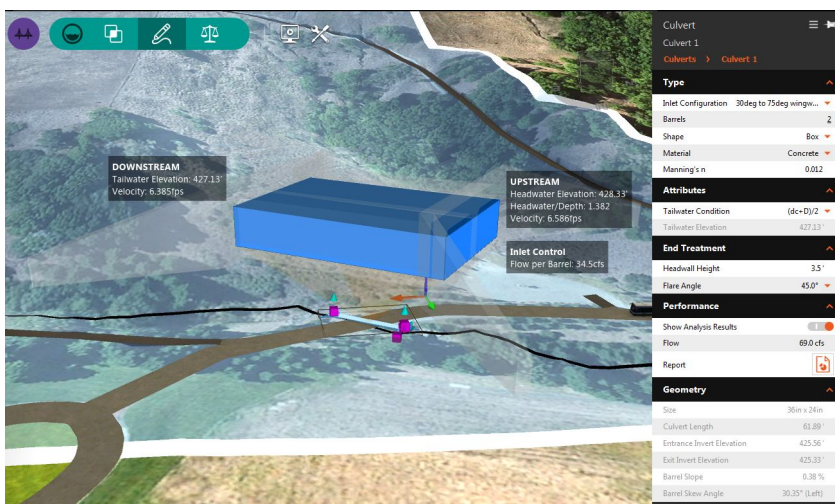
The Dynamic Duo

Civil 3D and InfraWorks were created to work directly with one another. Each can reach right into the other in order to bring forth civil design data.
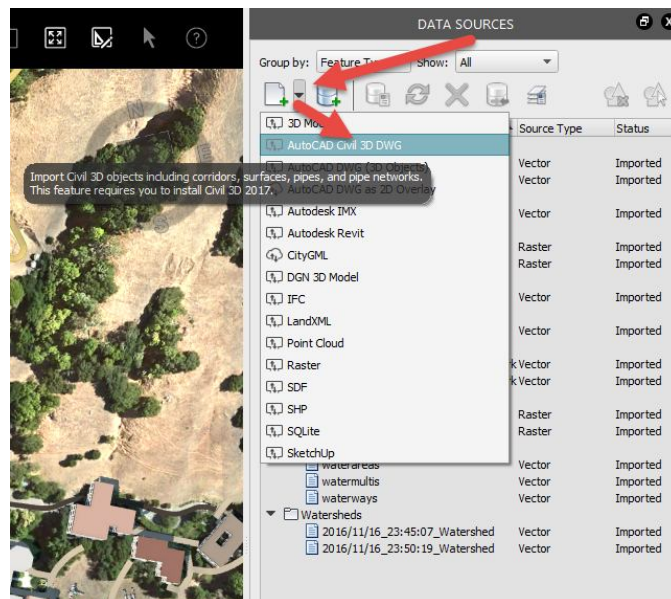
From within Civil 3D

From Civil 3D we use the "Open InfraWorks 360 Model" command in order to import as much data from the model that we wish.
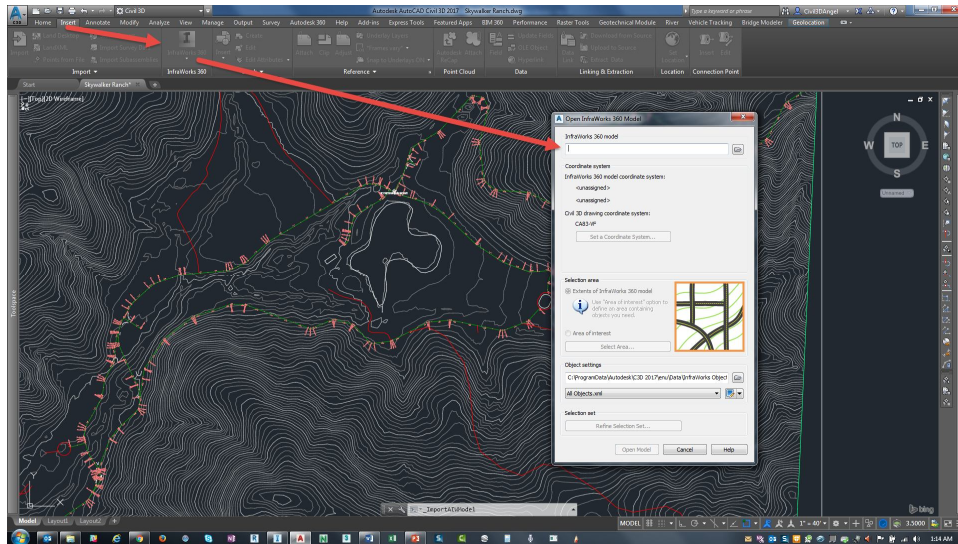
From within InfraWorks 360

From InfraWorks 360 we use the "From Civil 3D Drawing" from the Data Sources Palette to import from the drawing civil design data.
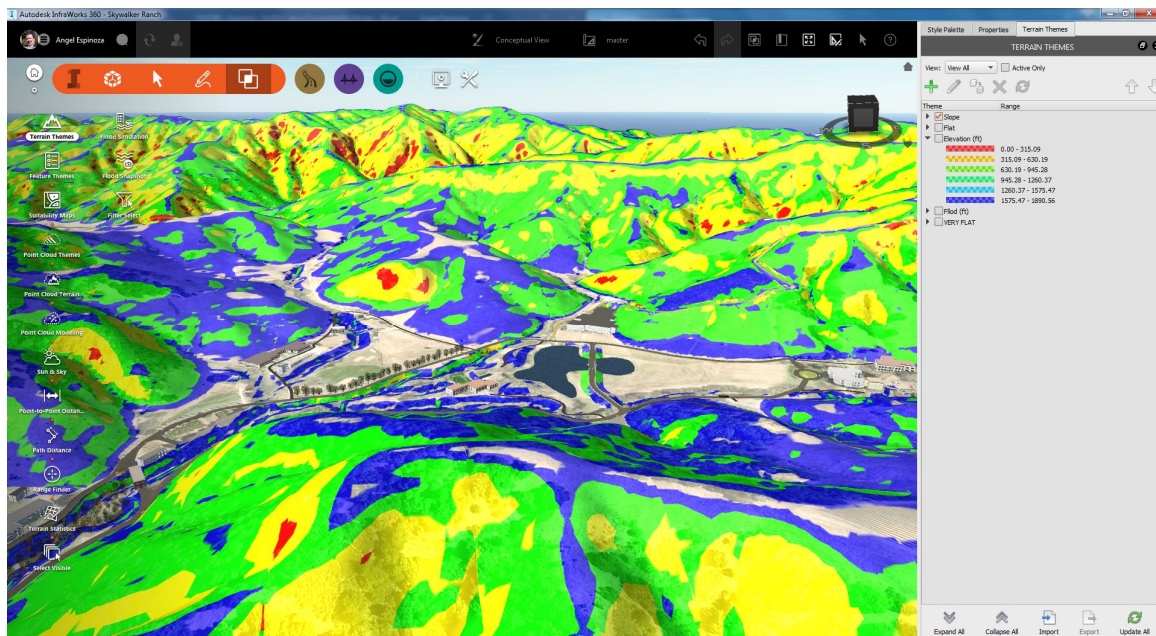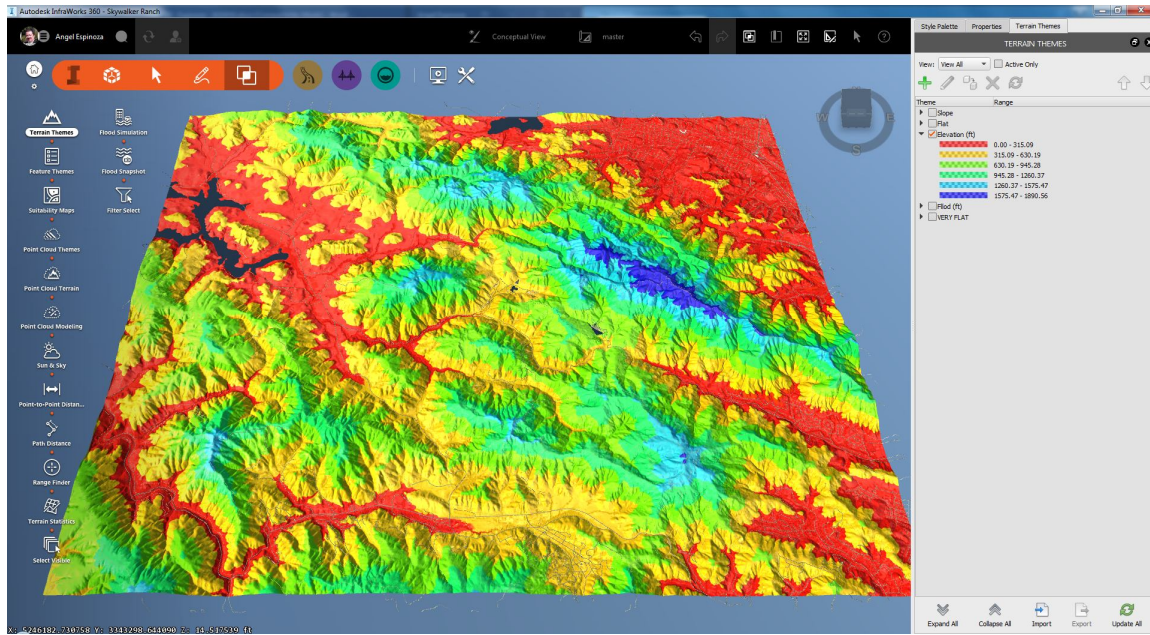

The most important tip is that it helps if the two sources are set to the same coordinate system.

You Can Analyze

There are many different analysis methods available in InfraWorks 360. In this session we will cover a few.
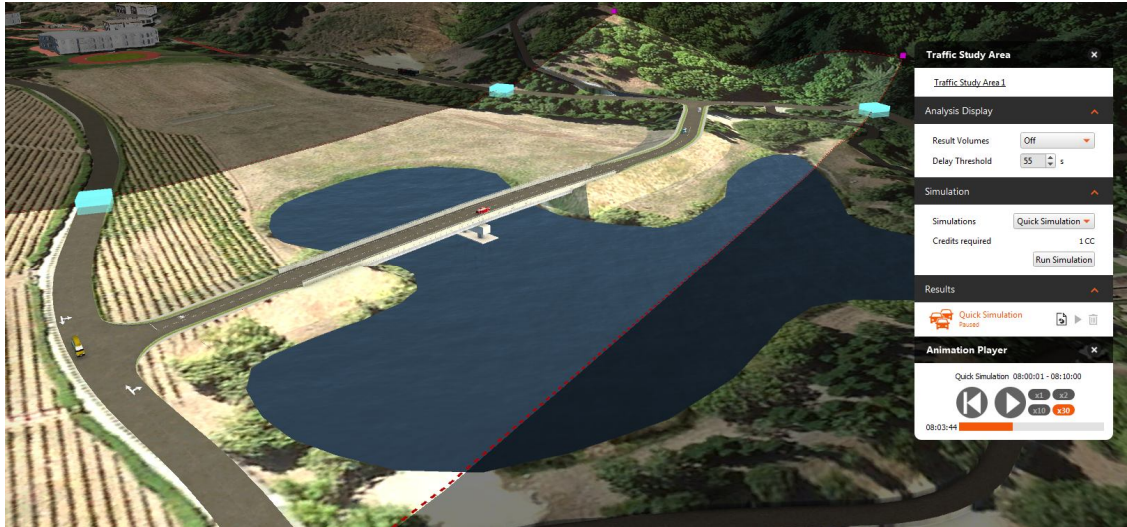
Terrain Themes

Quick and easy we can theme the surface by Elevation, Aspect, or Slope.

Traffic Simulation

The Traffic Simulation capability allow you to analyze traffic flow through intersections. This generates vehicle movement through the Design Roads network within the InfraWorks 360 model.


Mobility Simulation

Mobility Simulation is a separate environment that can begin directly from an InfraWorks 360 model. Similar to Traffic Simulation, Mobility simulation adds the study of pedestrians, cyclists, and public transportation to the analysis Unlike Traffic Simulation the results are never viewable in the InfraWorks model
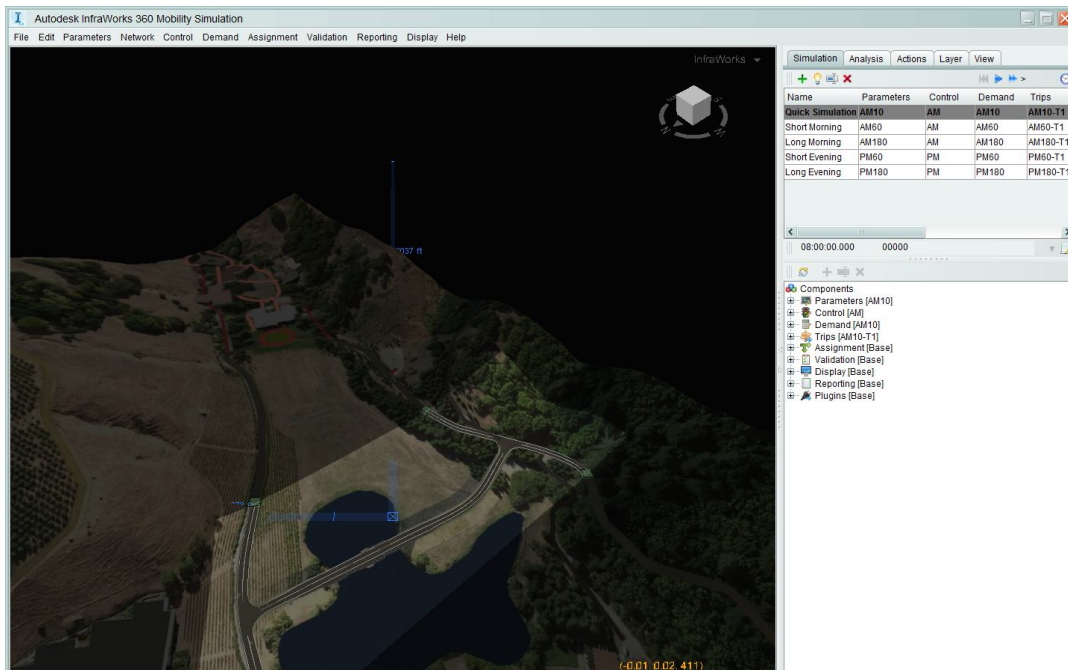
Additionally, once in the Mobility Simulation window other projects can be opened.

Flood Simulation

InfraWorks 360 is capable of doing Flood Simulation with the RiverFlow 2D plug-in that is purchased separately from Hydonia, LLC. This plug-in allow for user friendly flood analysis of both inland and coastal flooding events.
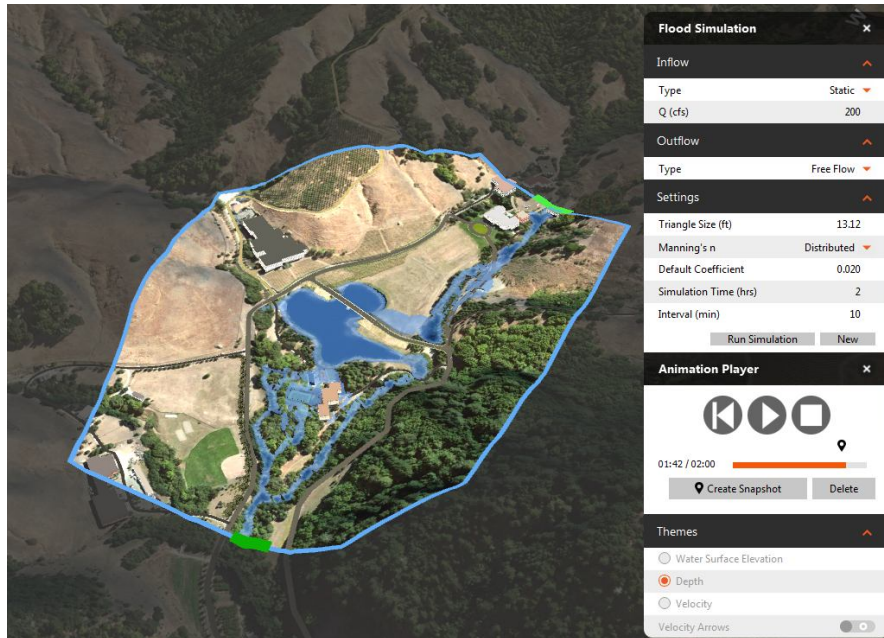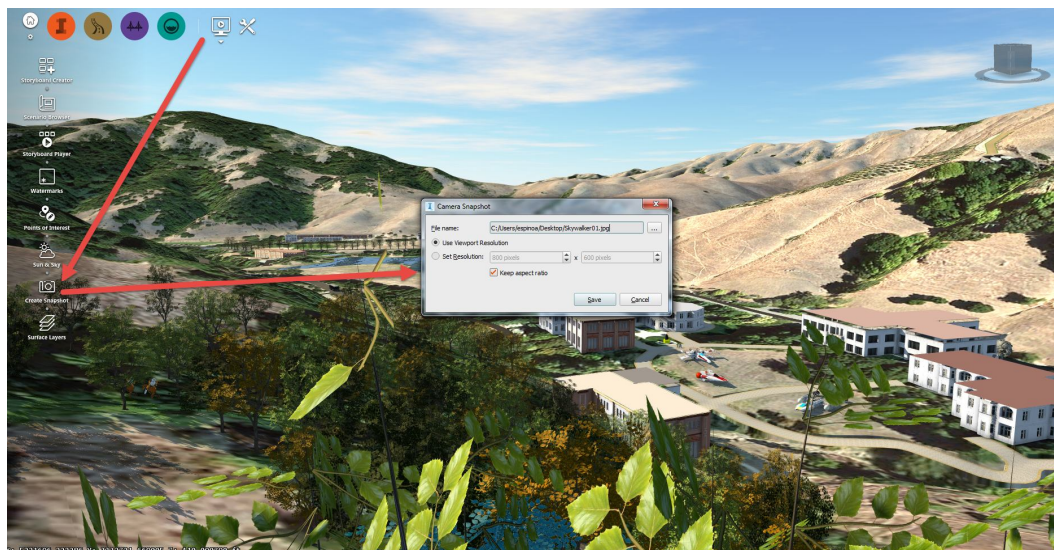

You Can Present

It is possible to share your models with others in various ways.

Create an Image

We use the Create Snapshot command in order to generate an image of our current point of view.

Create a Video

The Storyboard Creator allows us to create drive-throughs, walk-throughs, and fly-throughs. We can use keypoints in conjuction with bookmarks to specify our path manually or we can generate a storyboard from a Design Road at the design speed.
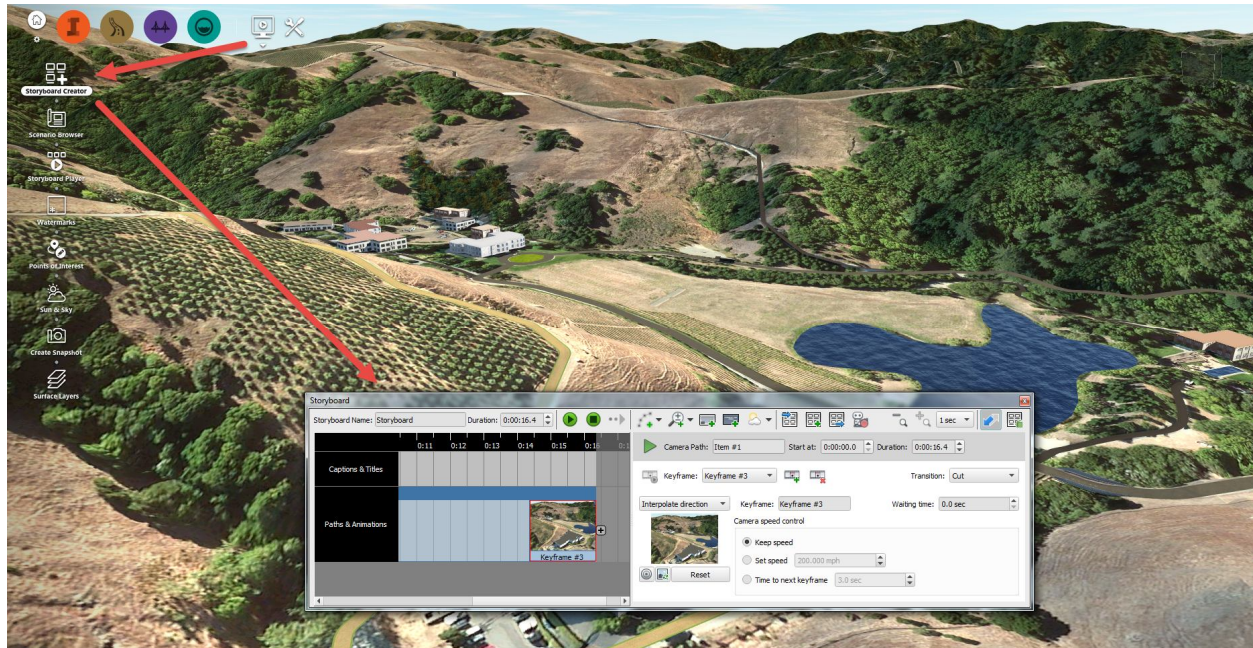
Collaboration

Although I left this for last collaborating with others can be the most productive capability of InfraWorks 360. It is possible to create Groups with Group Members that have roles that the group administrator defines. Via this method models we can securely share with whom we want and they will have only the rights that we choose.

In the following image captured from a help page some of the roles are explained.

Conclusion

It is very clear that InfraWorks 360 contains a tremendous amount of power to do conceptual and preliminary design quickly and easily.

We can move out design directly into Civil 3D and import many types of design and model data.

There is little wonder why so many users find using it empowering, fulfilling and fun!

And remember everything that we did today was done in under 90 minutes.