AUTODESK UNIVERSITY

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The Crossroads of Civil 3D and Revit

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Learning Objectives

- Learn which project types are best executed in Civil 3D
- Learn which project types are best executed in Revit
- Learn which project types are best executed in both Civil 3D and Revit
- Discuss challenges and best practices for executing a project utilizing both Revit and Civil 3D

Description

For civil engineers, geotechnical engineers, multidisciplinary firms, and many others, the question of primary authoring software can be a complicated one. Should you choose Civil 3D software? Should you choose Revit software? Or is there a need for both? This industry talk will discuss and evaluate the criteria to use for deciding the most appropriate software for a range of project types. We will also consider which sort of project may be best served by utilizing both software systems—and we'll discuss the challenges and some suggestions of best practices for executing such a project. Join us as we share what we have learned while navigating this intersection of these two platforms.

Speaker(s)

Desirée Mackey, PE, SE
Desirée has been in the AEC industry since the1990s. She holds a bachelor's degree from University of California, Davis and a master's degree from Massachusetts Institute of Technology. Desiree has worked in construction and as a structural engineer, and now is the Design Technology Practice Leader for GEI Consultants. Desirée is a regular speaker at many conferences, she co-founded the Rocky Mountain Building Information Society, was Chair of the Structural Engineers Association of Colorado's BIM Committee, served as an AUGI board member, Treasurer, and Vice President, serves on the AU Advisory Council, and is a member of the BILT North America Committee.

Brian J. Hailey, PE
In 1998, armed with a Bachelor of Science in Civil Engineering from Colorado State University, I began my career working at a general civil engineering firm using Land Desktop (LDT). Within a short time, I became the resident (self-taught) expert in LDT and AutoCAD and then learned AutoCAD Civil 3D upon its release. Today, as a registered professional engineer in the State of Colorado and CAD Manager, it's my goal to deliver best-in-class support for GEI's CAD staff using AutoCAD Civil 3D, Infraworks and other software solutions. To that end, I am professionally certified in Autodesk software, have taught at Autodesk University eleven times since 2007 and won the AUGI Top DAUG competition at AU 2011. With a strong technical skillset and experience as a Civil Engineer and instructor, I regularly provide custom, effective trainings for any size firm. These training sessions include AutoCAD, AutoCAD Civil 3D, AutoCAD Map3D, and Infraworks.

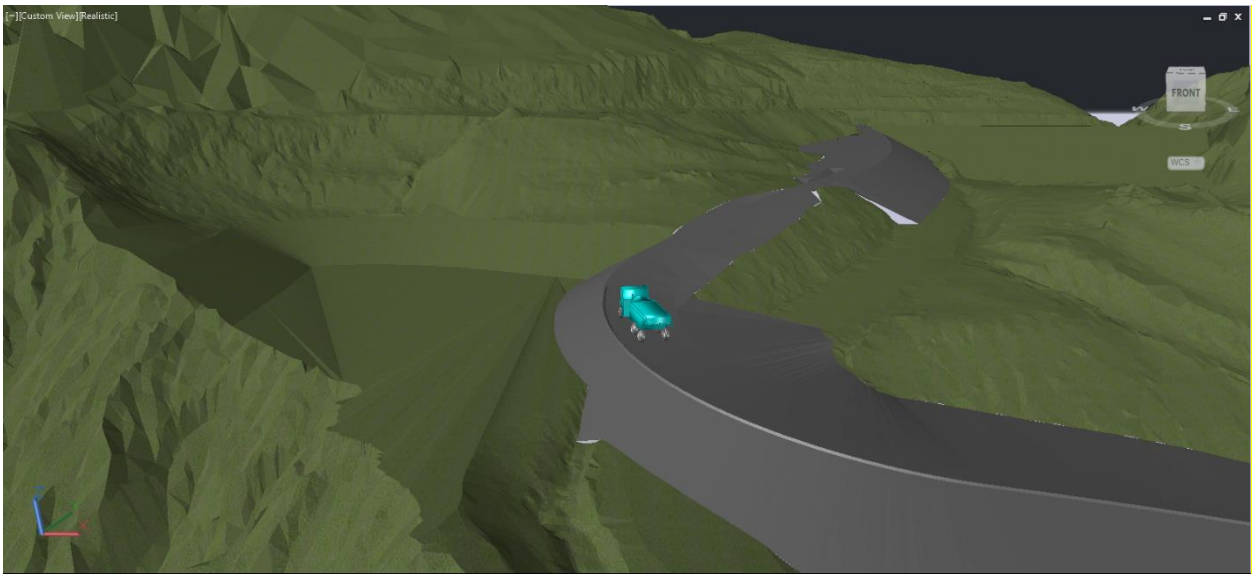
Introduction

There are many project types that present a question of the appropriate platform and authoring software. Certainly, the scope of the project is the obvious driver for this choice. There are additional considerations as well, such as collaboration needs, and deliverable requirements. This session will discuss these factors and provide examples for when each software, Civil 3D or Revit, is most appropriate, and when the answer is to use both.

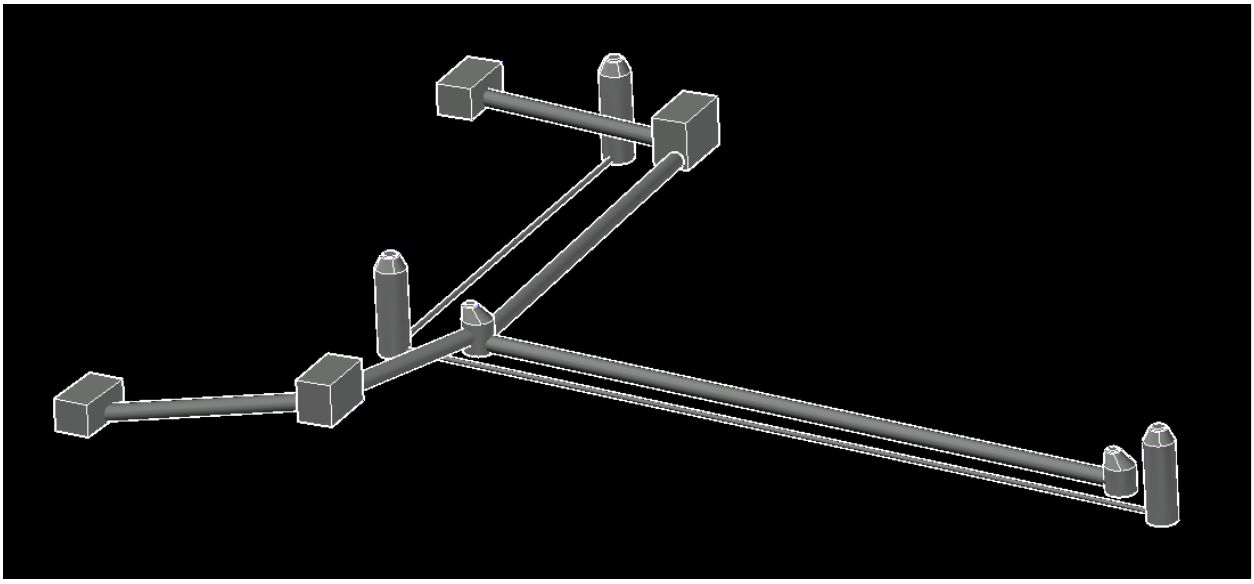
When Civil 3D is the answer

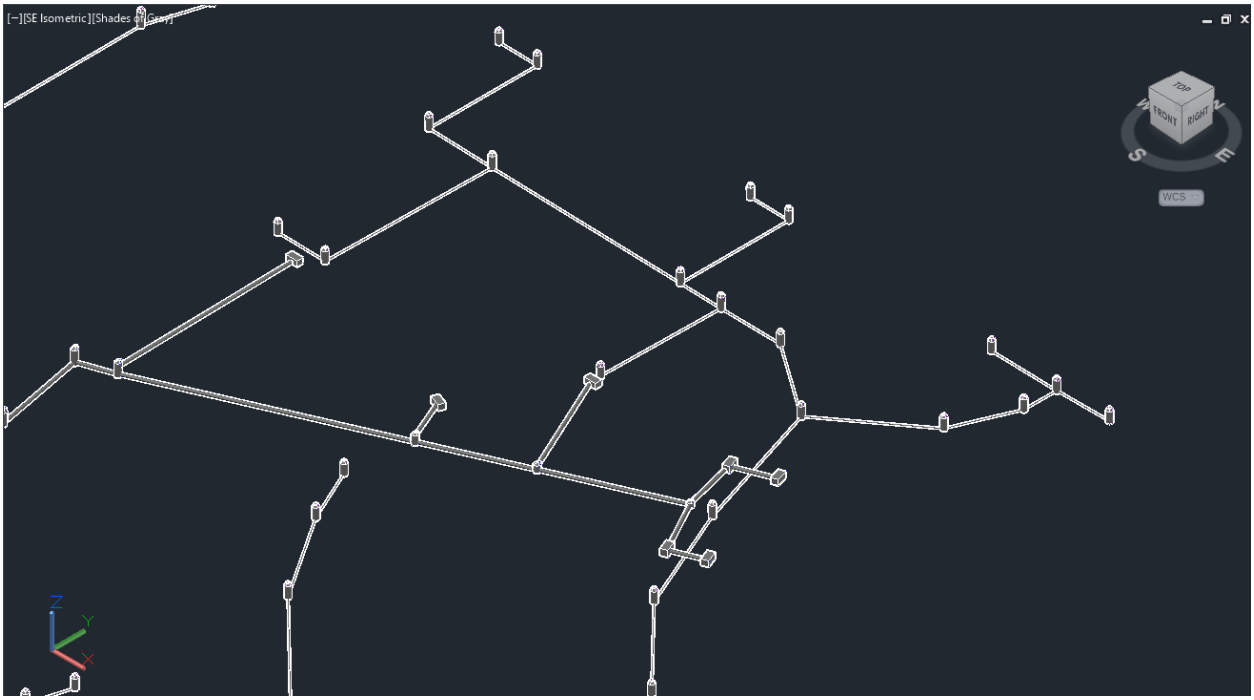
Civil 3D is the obvious choice for all things soil, grading, cut and fill volumes, roadways, underground utilities, and so on.

Roads are typically good candidates for modeling in Civil 3D. Roads are the elements most often modeled using the corridor tool within Civil 3D. Where Civil 3D is the best choice for road modeling, if a road runs over a bridge, Civil 3D may not be the best choice for modeling the bridge structure. Bridges are addressed more later. Below is an example of a road that has been modeled in civil 3D using the corridor tool.

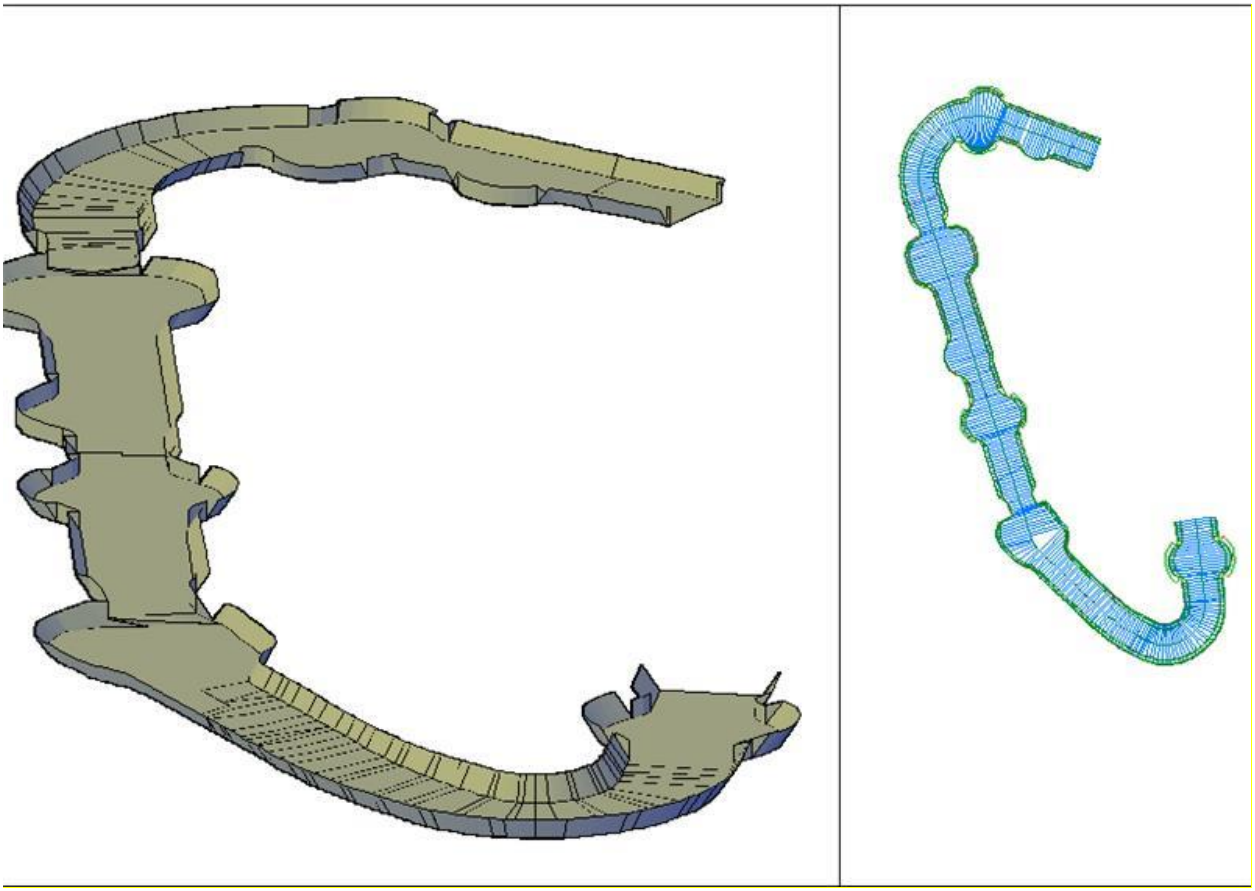


Underground utilities are another good candidate for modeling in Civil 3D. Distribution piping specifically lends itself to modeling in Civil 3D, however, yard piping (example: underground piping at a treatment plant) may be better suited for modeling in another program, like Plant 3D or possibly Revit.

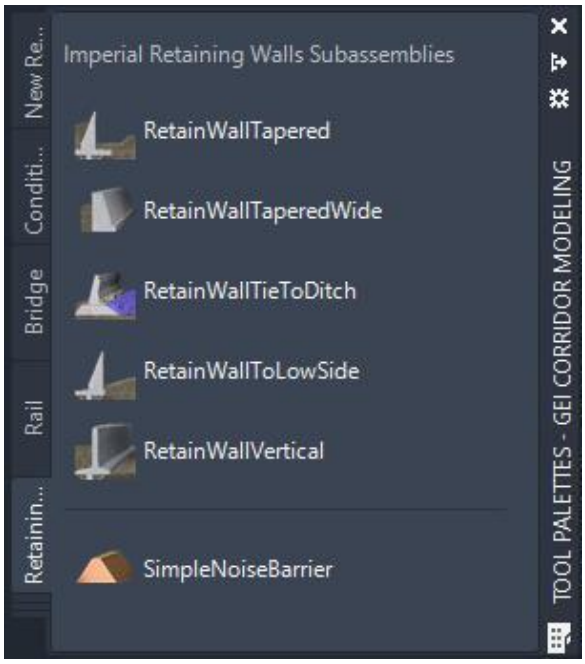


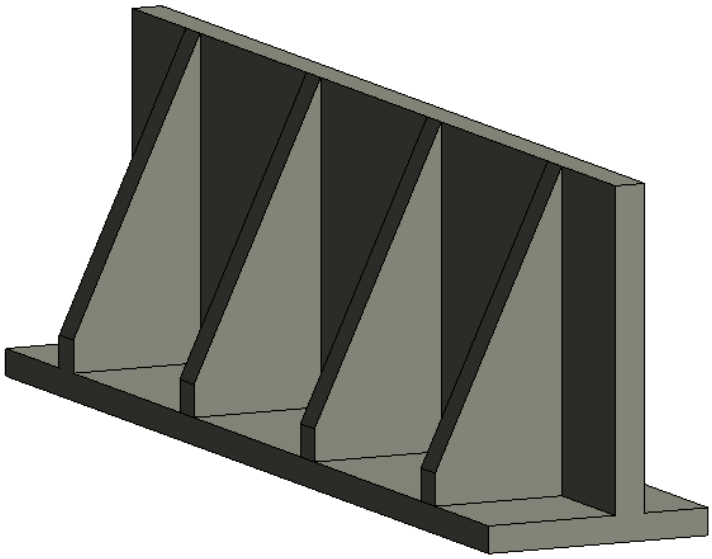


Moving beyond the obvious project types, elements such as walls, trenches, and the like are a good candidate for being modeled in Civil 3D when those elements have consistent cross section shapes. This effort is often achieved using the corridor tool, which can be used for more than just roads, which can expand the scope of what is possible within Civil 3D. A good example of a place where corridors were utilized in a somewhat non-traditional way is shown below. This is the white-water rafting course for the 2012 Olympics.



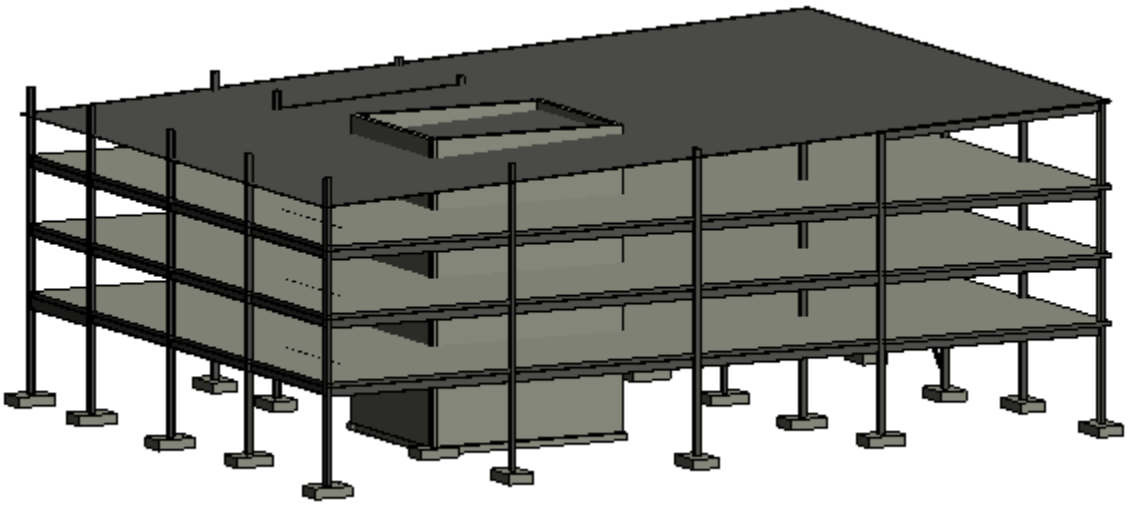
Walls are as elements that could be modeled in more than one software. Civil 3d is an appropriate choice for specific wall types, especially if the remainder of the scope of the project is already modeled in Civil 3D. Civil 3D deals with walls with consistent cross sections well, using a corridor model. Walls with inconsistent cross-sections, like walls with counterforts shown below, would not be candidates for a corridor model. There are other wall types that are well-handled by Civil 3D using sub-assemblies, shown below. Additional iterations of other unique wall types could be created using the sub-assembly composer.



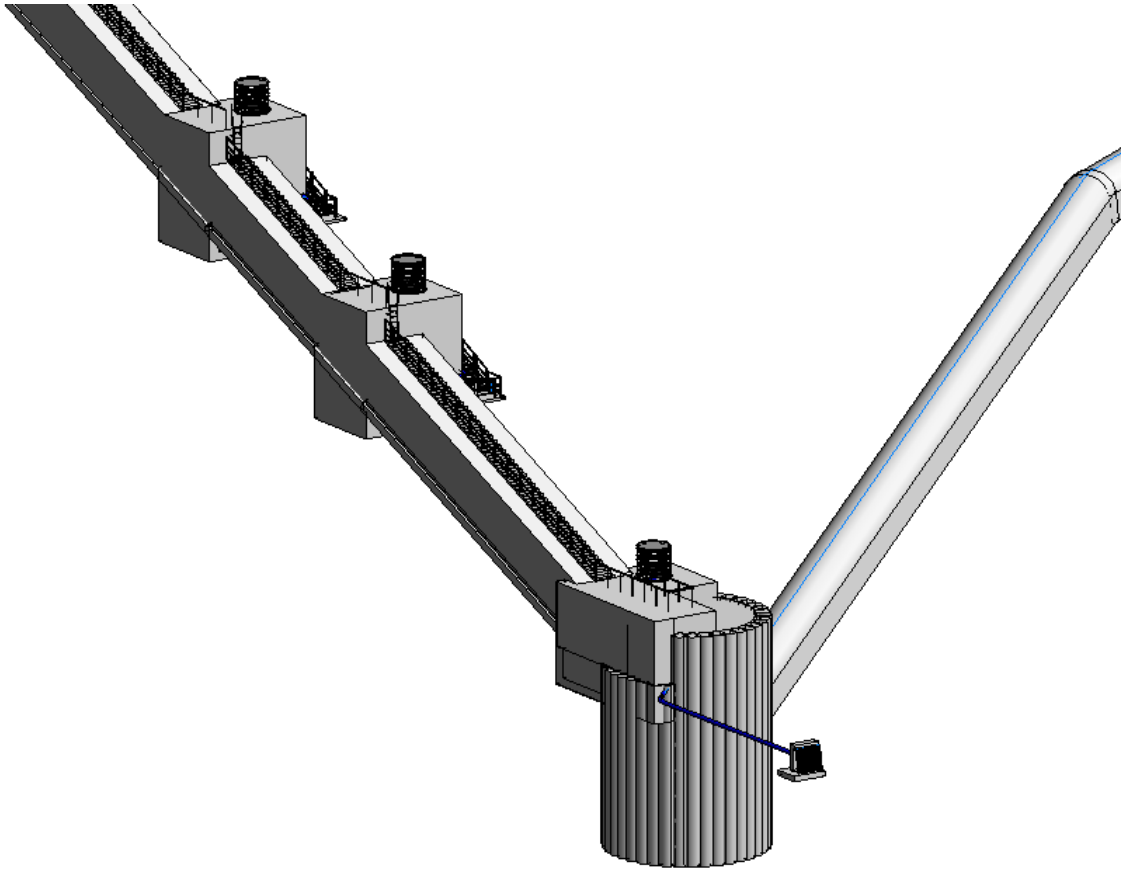


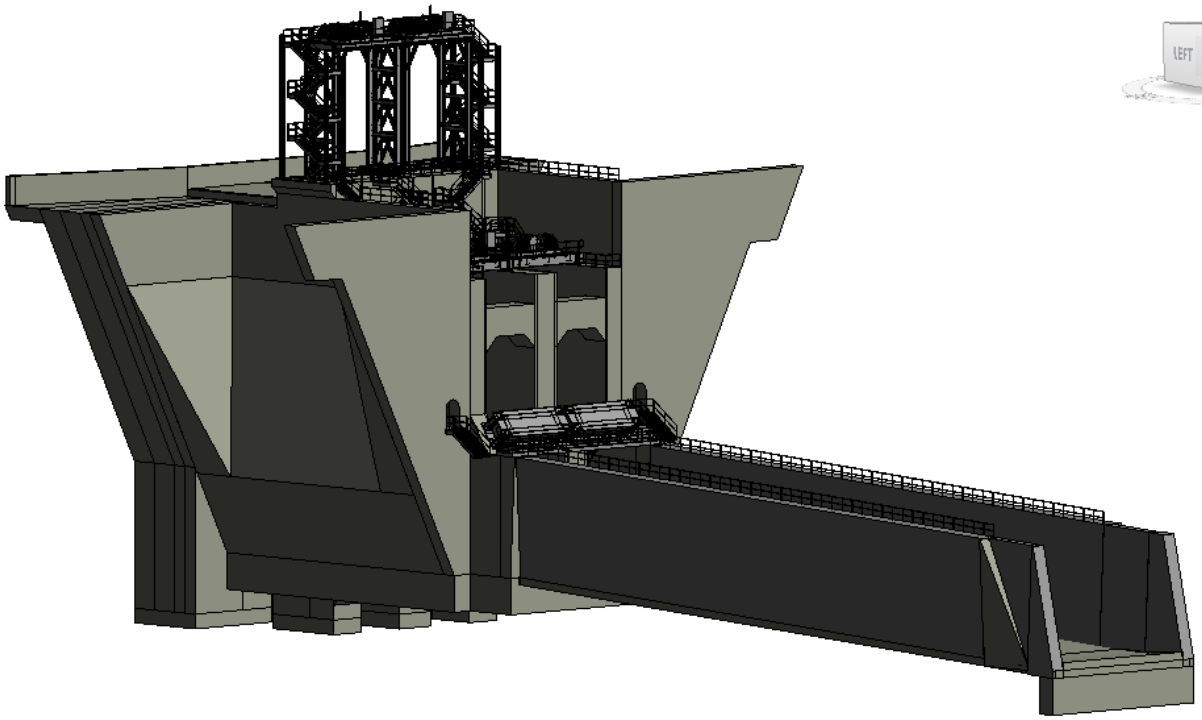
When Revit is Right

Like civil 3D, there is a large category of projects that are easy choices for Revit. These are any building-type structures, and certainly anything with a structural system that can be defined using typical building components, like beams, columns, walls, and so on.



It is important to remember that the term “building-type structures” is not limited to actual buildings. This term, and therefore the projects that may be suited for modeling within Revit, should be expanded to other structures that can be defined with building-type elements, even if a beam, for example, is used to model something that is not technically a beam. Consider the following examples.




LEFT
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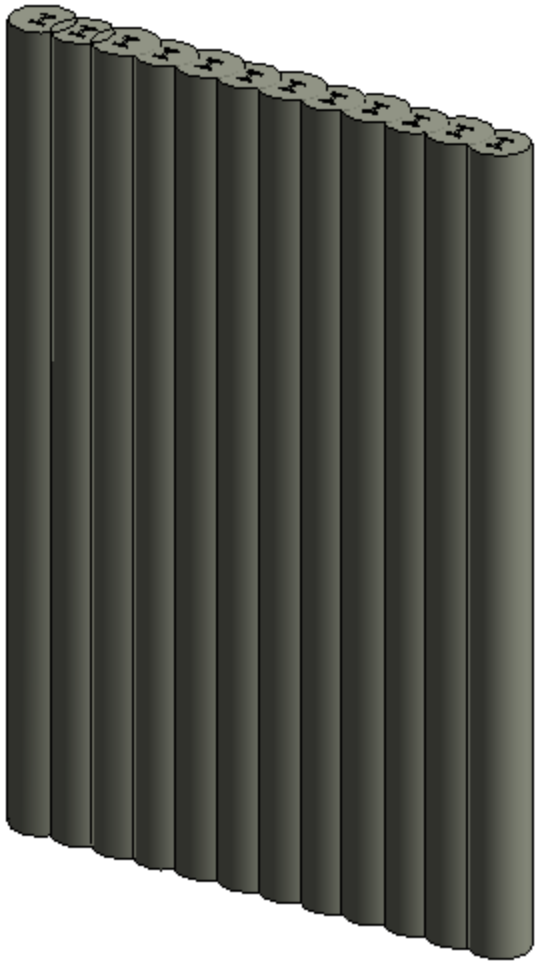
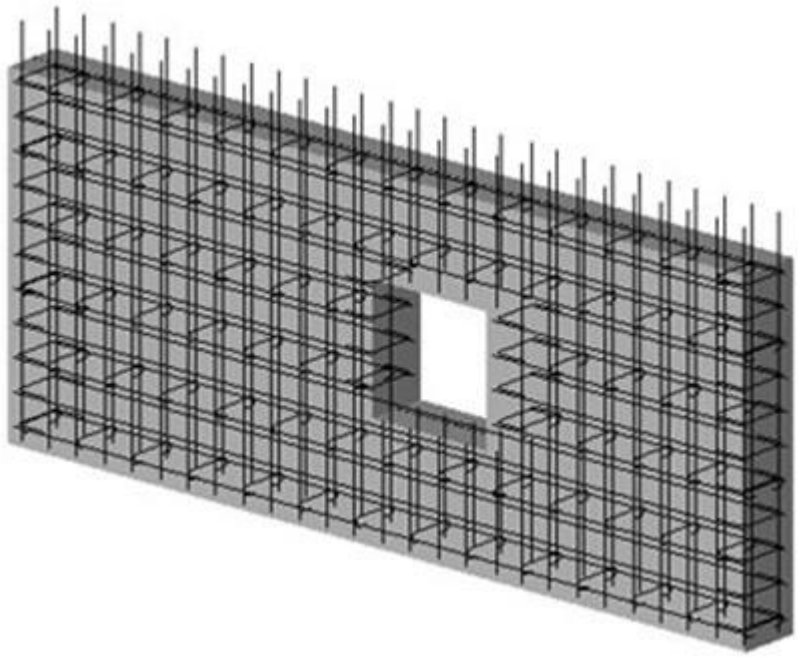
Moving beyond the building-type structures, another criterion for evaluating if a project is well-suited for modeling within Revit revolves around the material and basic shape of the elements in question. A simple way of stating this is to consider Revit any time the project includes defined enclosed volumes of man-made material. This is often just one step further from the consistent cross section consideration with Civil 3D. If there are not consistent cross sections, Revit may be the answer.



If the scope of a project can be completed entirely within Civil 3D, and the project includes walls, one should try to model the walls within Civil 3D. If the walls do not fit the criteria discussed, then Revit can be of use. Revit is a robust tool for all sorts of walls. It is also worth noting that Revit is also the better choice if wall reinforcement also needs to be modeled, as shown below.



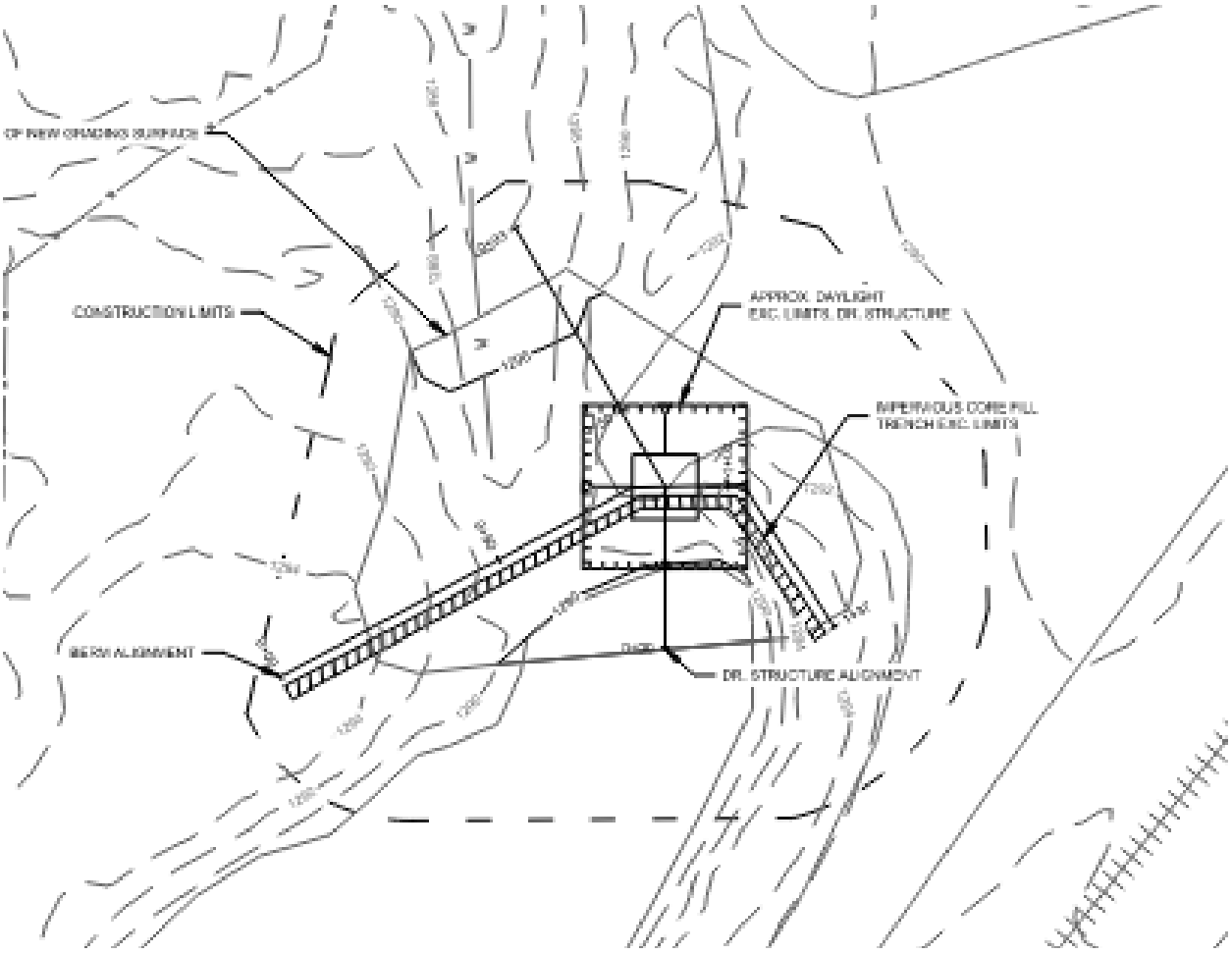
When Civil 3D and Revit Should Work Together

The general criteria that trigger the use of both Civil 3D and Revit are intersecting project types – project that include a combination of disciplines, and a variety of elements discussed in the above sections that would prompt the use of both programs. Of course, this collaboration works best when the scope of the project can be divided by discipline or portions that can be individually assigned to one software or the other, but projects can be successful even when this is not the case. Some examples of project types that might be candidates for this collaboration are discussed below.

What about this project?

Wastewater Treatment Plants

Wastewater treatment plants are a good example of a project that integrates a couple different disciplines and would likely be a good candidate for using both Civil 3D and Revit. Obviously, any underground utilities, grading and other earthwork would be completed using Civil 3D, and the building structures would be completed in Revit. The piping between buildings is the wildcard here. This work could be completed in Revit, or possibly in Plant 3D, and the decision would likely depend on how the scope of the work is divided.


CONSTRUCTION LIMITS
APPROX. DAYLIGHT
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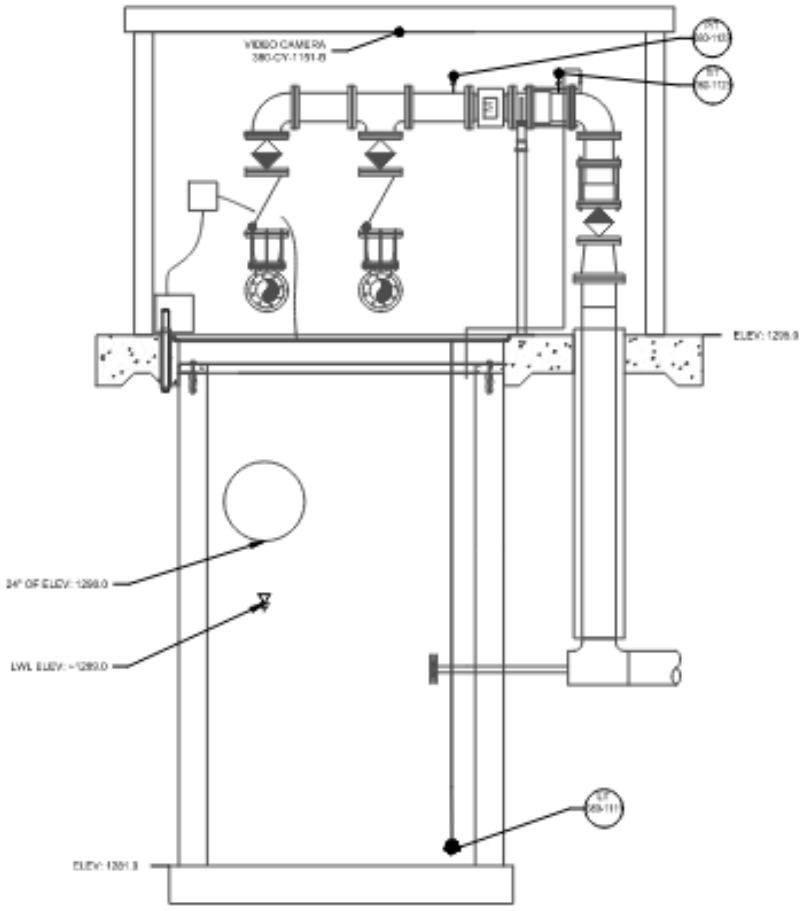
IMPERVIOUS CORE FILL
TRENCH EXC. LIMITS
DR. STRUCTURE ALIGNMENT


VIDEO CAMERA
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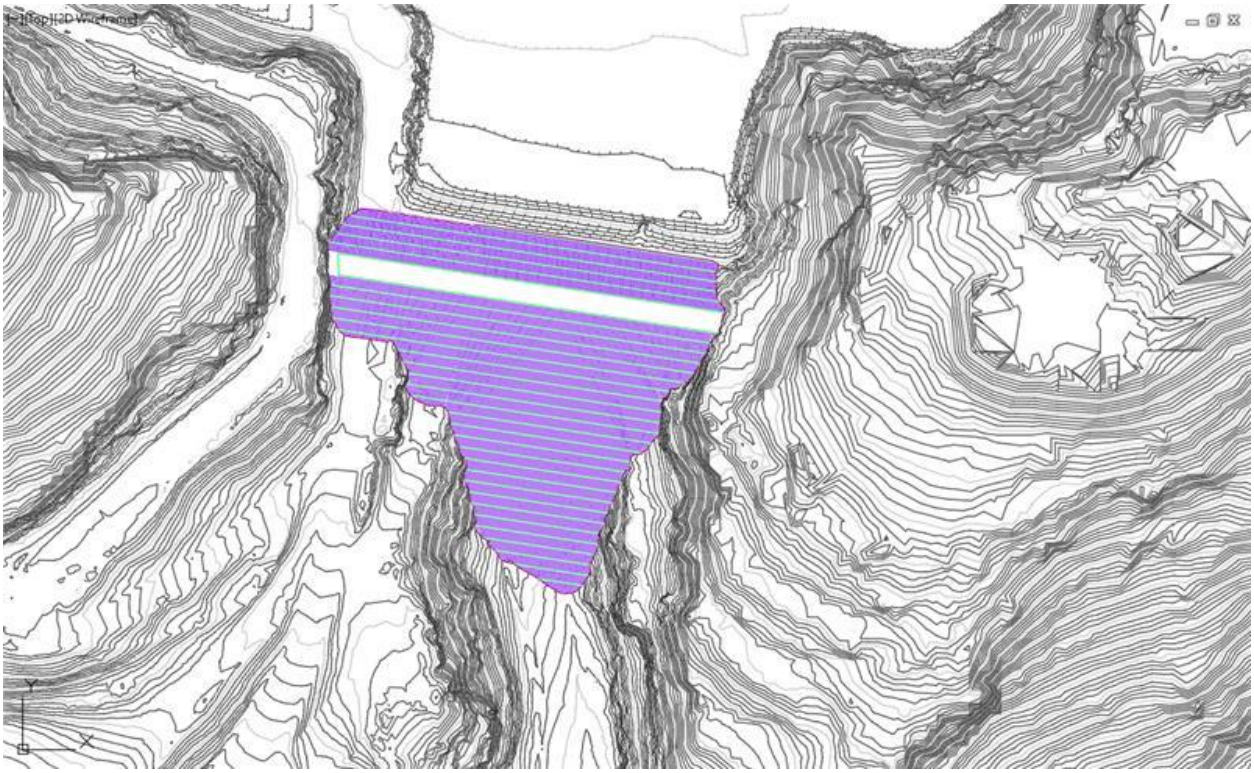
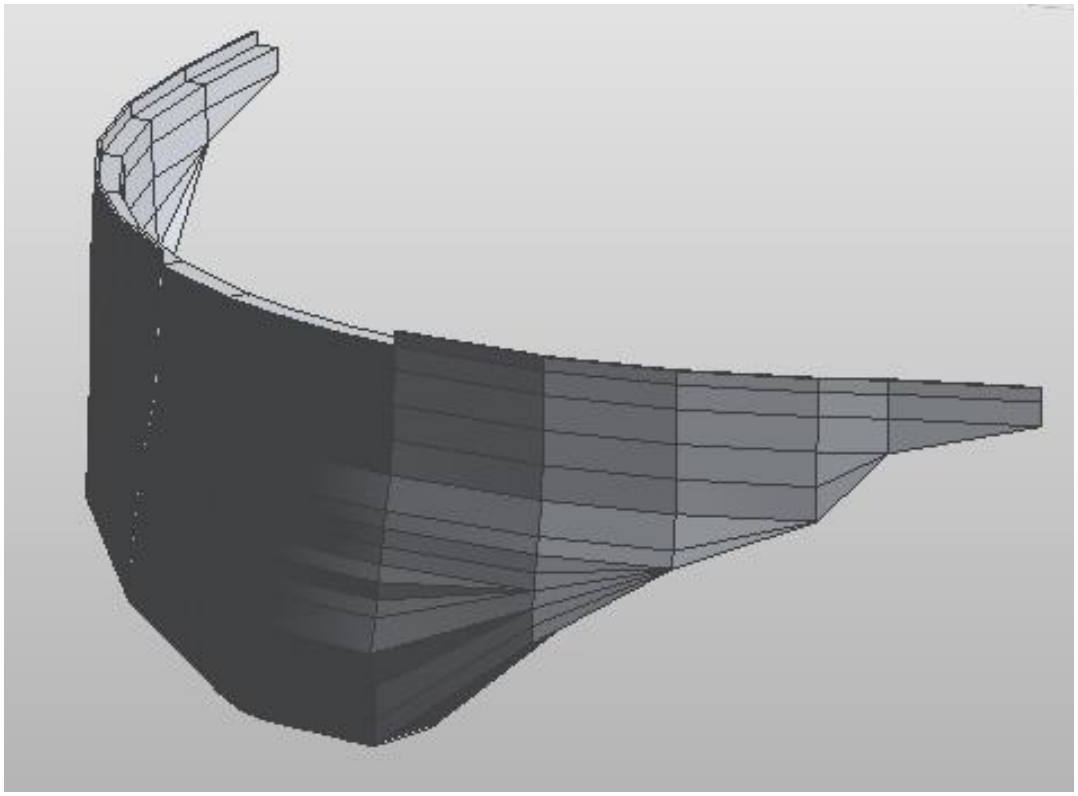
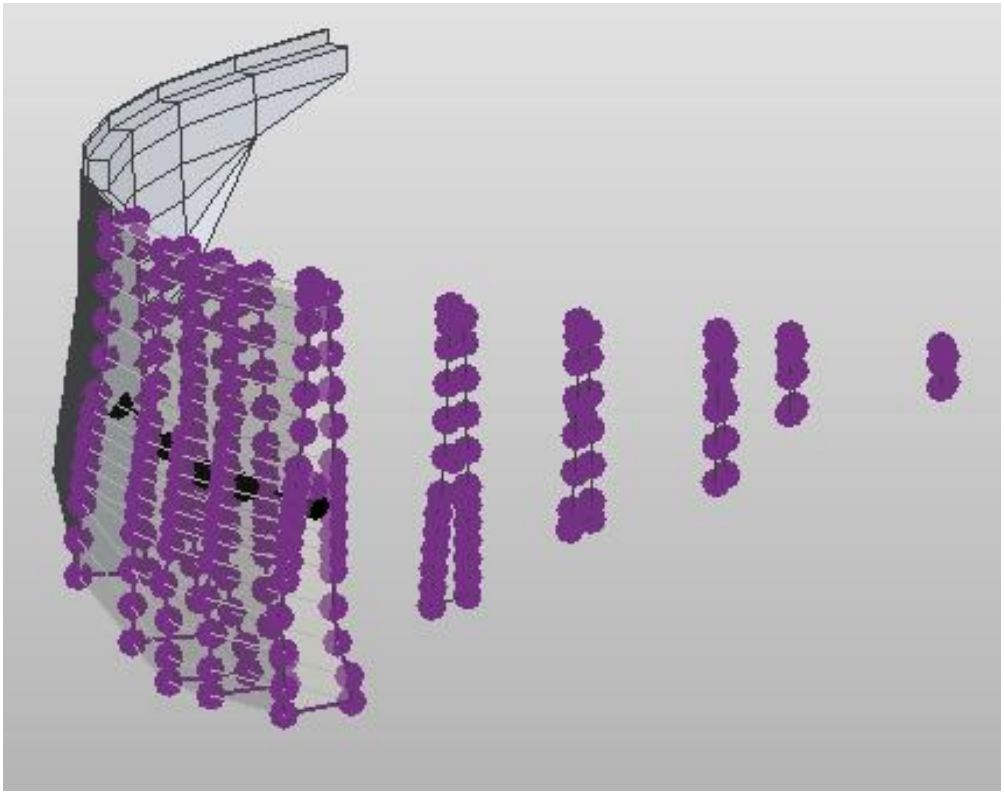
Dams

Dams are a project that could be entirely completed in Civil 3D, or possibly could have a Revit component. Earthen dams could, and should, be modeled in Civil 3D, like in the picture below.



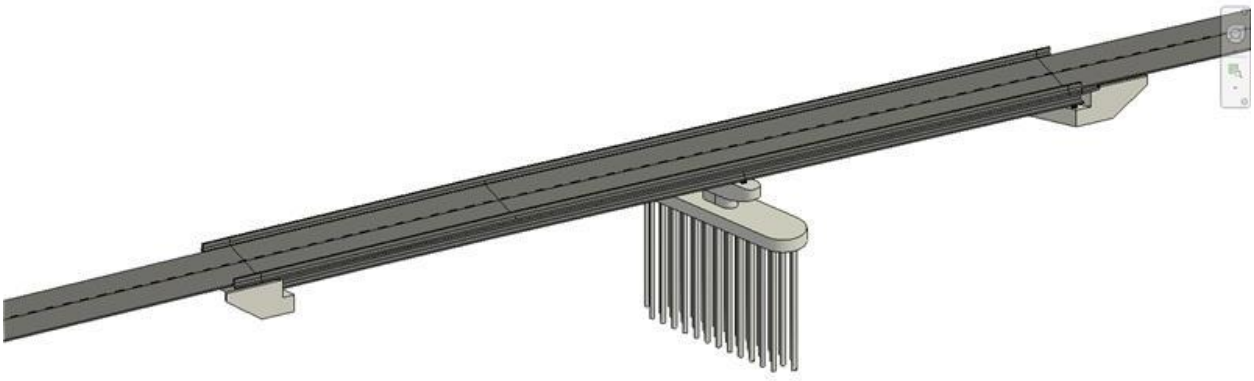
A dam project would always include some amount of earthwork, which would be completed in Civil 3D. The other obvious aspect of a Dam project would be any control structures, which would likely utilize Revit. Control structures are also good examples of places where "building-type" elements would be sufficient to model the various aspects of the structures, but something modeled using a beam element may not actually be a beam. Concrete dams are a unique case that offer opportunities for collaboration between Revit and Civil 3D. Depending on the shape of the dam and given the unique shape of cross sections across a dam, Revit may be a good choice for modeling the dam itself. The example below is a concrete dam that was modeled using massing and Dynamo within Revit.

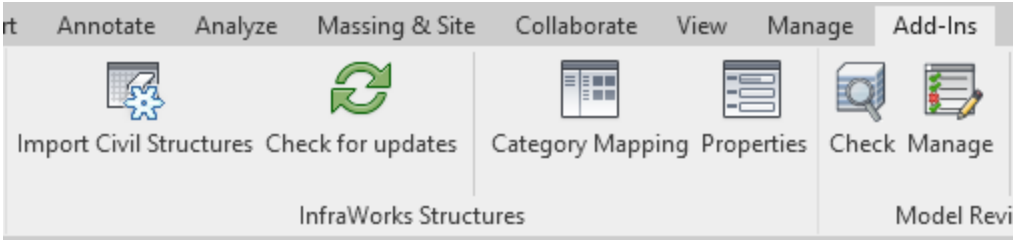




Bridges

Bridges are a challenging project type. Bridges more likely lend themselves to Revit, and certainly would for some structural systems. InfraWorks has “bridge tools” but does not have documentation tools, so while InfraWorks could be a useful tool, the documentation would require another software.

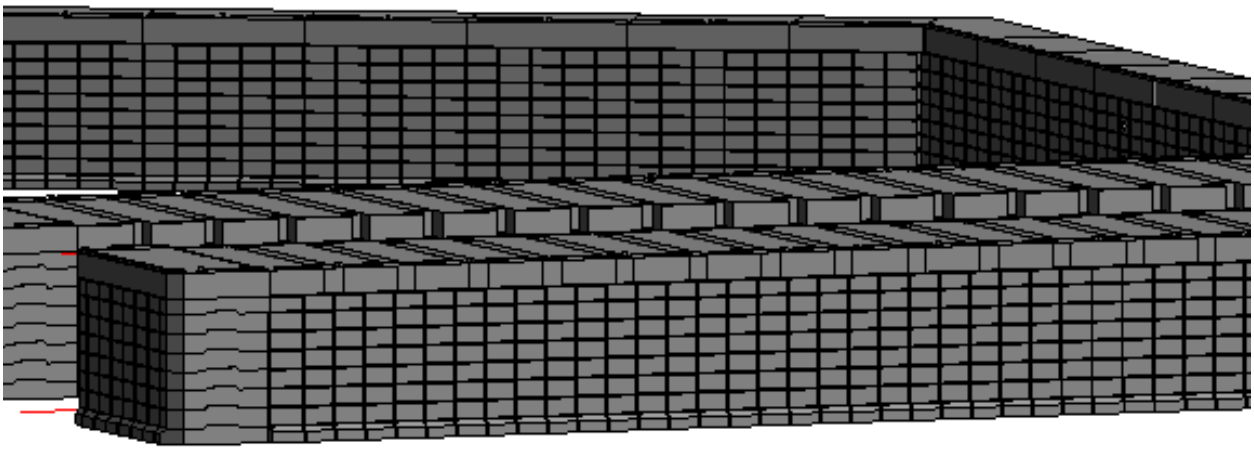


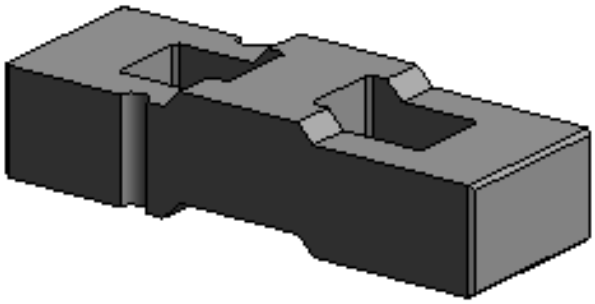


Piers

Piers are certainly an example of intersecting disciplines and project types. Certainly, the earthwork, dredging, grading, as well as any roads and utilities, would be completed in Civil 3D, but the pier structure offers some options. If the construction of the pier lends itself to the use of the corridor tool in Civil 3D, that could be an option. Revit may also be a consideration,

again, depending on the shape and structure of the pier. What is shown below is a pier that was mostly completed in Civil 3D, but the custom concrete blocks were created and assembled in Revit.

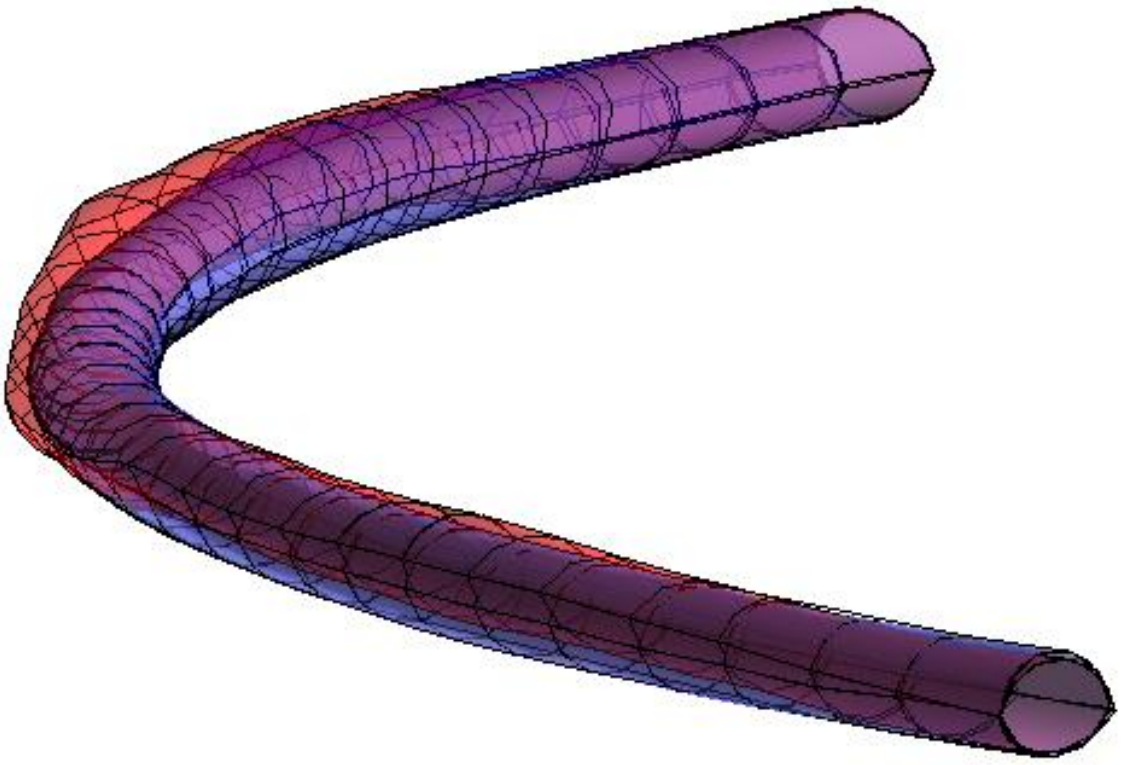




Tunnels

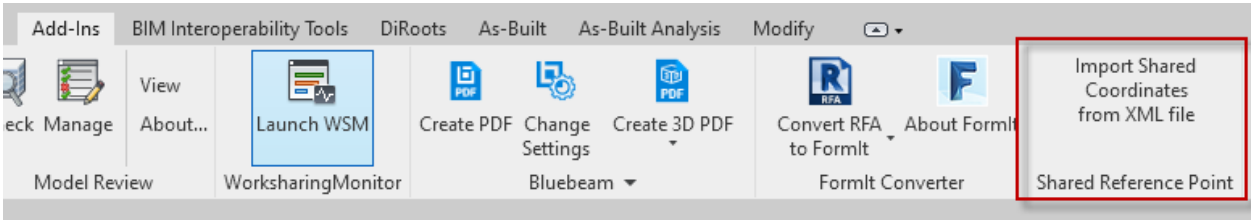
The term “tunnel” is sort of a catch-all. These structures could include anything from irrigation channels to any sort of large pipeline or a combination of some structure that extends through a tunnel. Like many of the other examples, all the earthwork and related scope would be completed in Civil 3D, and the corridor tool is always an option, but it may be the case that the tunnel itself is better suited to be modeled in Revit? The image below shows a site photo of a tunnel where the project was completed in Civil 3D.

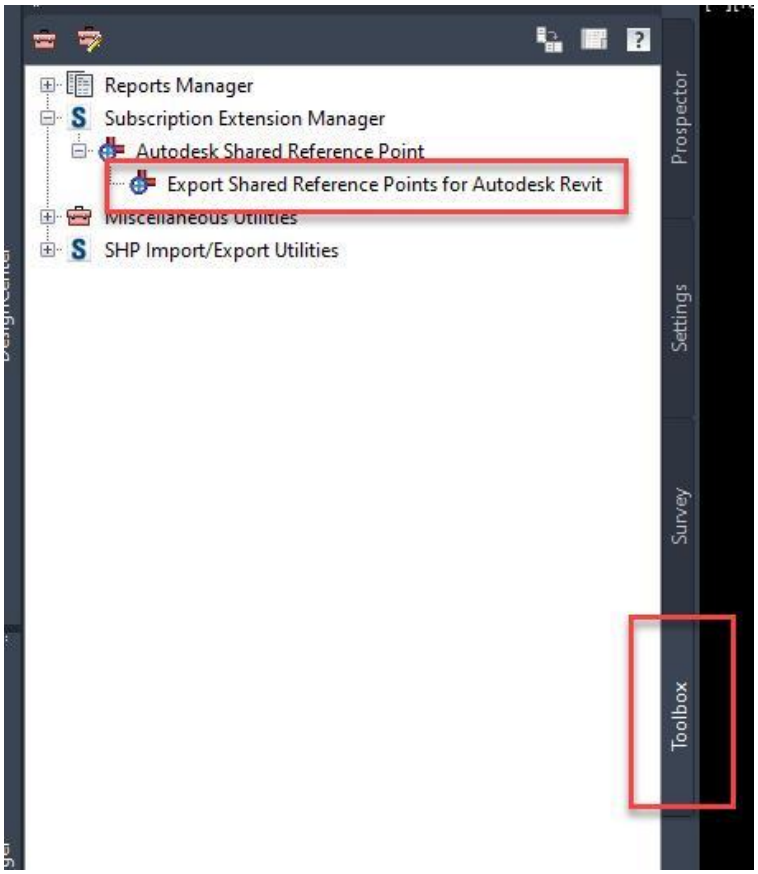
This second tunnel was completed in Revit. The difference between these examples is that in the first, we were concerned mostly with the earthwork, and the underground utilities going through the tunnel. In the project shown below, the concern was the shape and potential change of shape and movement of the tunnel structure itself. The data for the existing tunnel was collected using sensors, and then modeled in Revit to visualize any movement.



Challenges

There are certainly challenges when more than one authoring software is required for a project. This is especially true when completed by one team where the documentation is all one package. The obvious decision to be made is where the sheets are composed. The strongest consideration here is which software is the primary software used to do most of the modeling. If the scopes, and sheets, can be fully separated, both Civil 3D and Revit can be used to create their individual sheets. The challenge is if the scope of the work requires both programs to be intertwined, and that the geometry created in one needs to reference the other. The recommendation in this case is that the 3D geometry from one be input into the other, then the sheets all created in one platform. The challenge with exchanging geometry, between Revit and Civil 3D specifically, is not necessarily the fidelity of the geometry once transferred, but the location and coordinates of the geometry. There is a utility called Shared Reference Point that offers a way to sync the coordinates between these two platforms, which is the recommended path forward.





One other item to consider when exchanging 3D geometry between Civil 3D and Revit is that, while they overlap, the general scope of work completed in each of these platforms is detailed, and likely very different. This creates a situation where exchanging all geometry from one platform to the other would result in some amount of irrelevant or extraneous information. Depending on what falls in this category there are options within each platform to filter the information. This adds effort to the process but can be completed.

Conclusion

While there are pros and cons to choosing to use both Revit and Civil 3D on the same project, the individual strengths of each software are compelling enough to work through the challenges. In addition, the projects that sit at this intersection between software are some very interesting ones, so it is certainly worth the challenge to leverage and collaborate with both.