A Solid Foundation for Building Information Modeling and Civil: Bringing AutoCAD Civil 3D and Revit Together

Colt Scherbig
Project Coordinator
Trevor Koller
Project Coordinator

Class summary

The presentation will provide an in-depth discussion of effective practices regarding how to combine foundation designs in Revit Structure Suite software with civil-site designers in AutoCAD Civil 3D software to ultimately collaborate with architects in Revit Architecture software. The discussion will give guidelines on where utility modeling for building should transition from Revit MEP software above grade to AutoCAD Civil 3D software below grade and how to use Navisworks project review software in this review process. Key concept to review will be the difference between local coordinate systems that building designers work in as compared to the state plane coordinate system that civil engineers typically use. The discussion will then consider the new American Institute of Architects' BIM Protocol Exhibit E202 that defines the Level of Development (LOD) in models on a scale of 100 to 500. The presenter will demonstrate these LOD concepts with case studies from projects in 3 different project phases: design, construction, and facilities management.

Key learning objectives

At the end of this class, you will be able to:

- Discover effective practices for working with team in AutoCAD Civil 3D software and Revit software and learn how you can use Navisworks project review software to aid the coordination process.
- Discover what the global and state plane coordinate system is that civil engineers use in AutoCAD Civil 3D software.
- Discover what model Level of Development (LOD) is for design, construction, and FM in civil and foundation modeling.
- Understand what the BIM Forum LOD Specification is, and how it can be used with AutoCAD Civil 3D software and Revit software for site modeling.

OLD IS NEW …..

I Say:

"A picture is worth ….

You Say:

"A Thousand Words!"

OLD IS NEW …..

I Say:

"Measure Twice and

….

You Say:

"… Cut Once !"

IKERD CONSULTING

- Started in 2003
- 3 Areas of Focus:
  - DESIGN & CONSTRUCTION CONSULTING:
    Structural, Energy, Civil, Enclosures
  - TECHNOLOGY: Virtual Design & Construction with BIM
  - TRAIN: Technology Implementation

IKERD Consulting

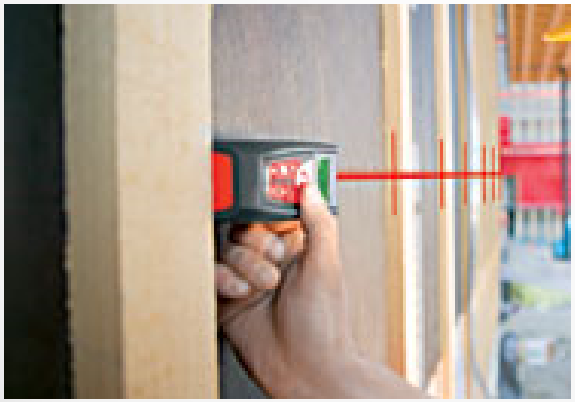
Chair the Designers Subforum

Co-Chair of the SEI – CASE Joint Committee on BIM
Chair Sub-Committee on Dev., Soft. & Train.

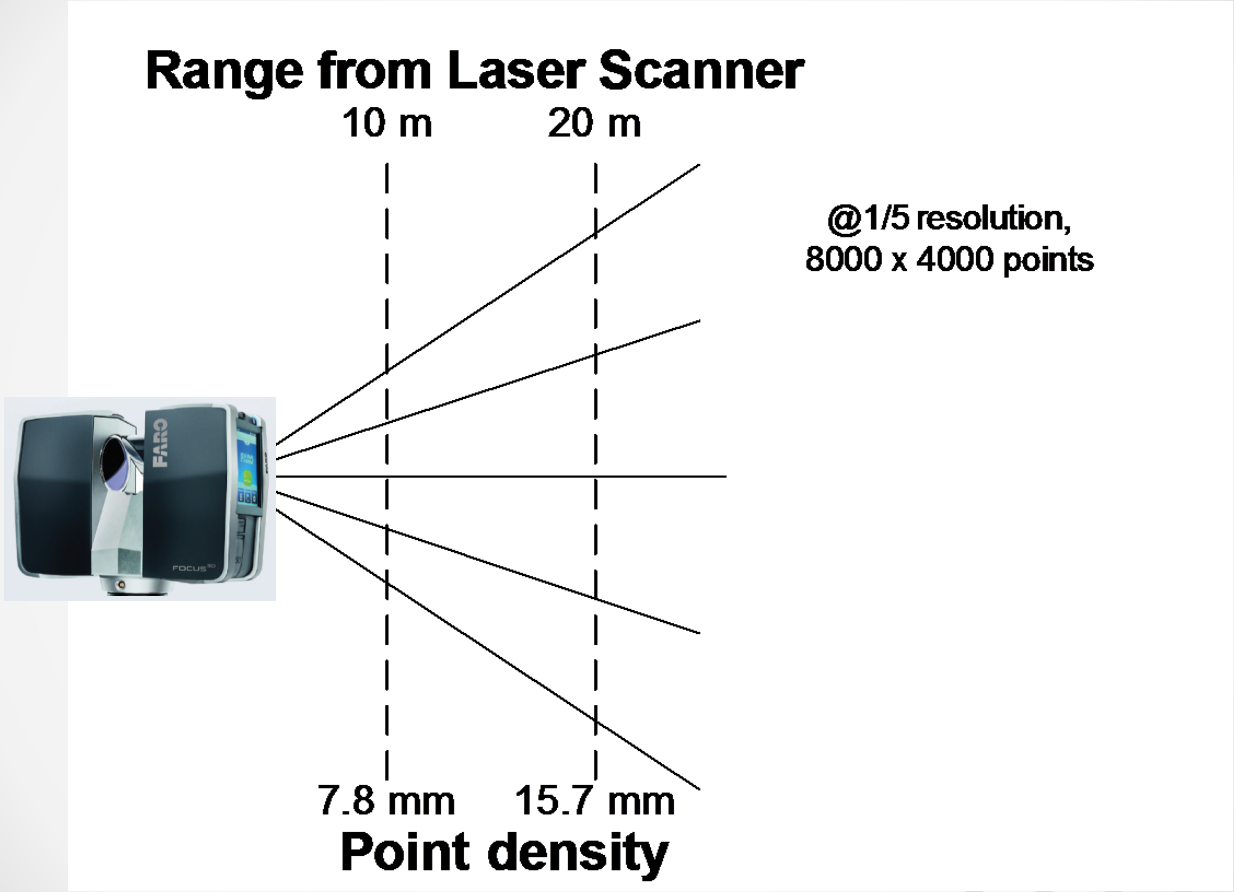
Committee member of TI Committee
Focused on BIM & IPD in Steel

Laser Scanning, Civil, & Structure

Technology Advancements

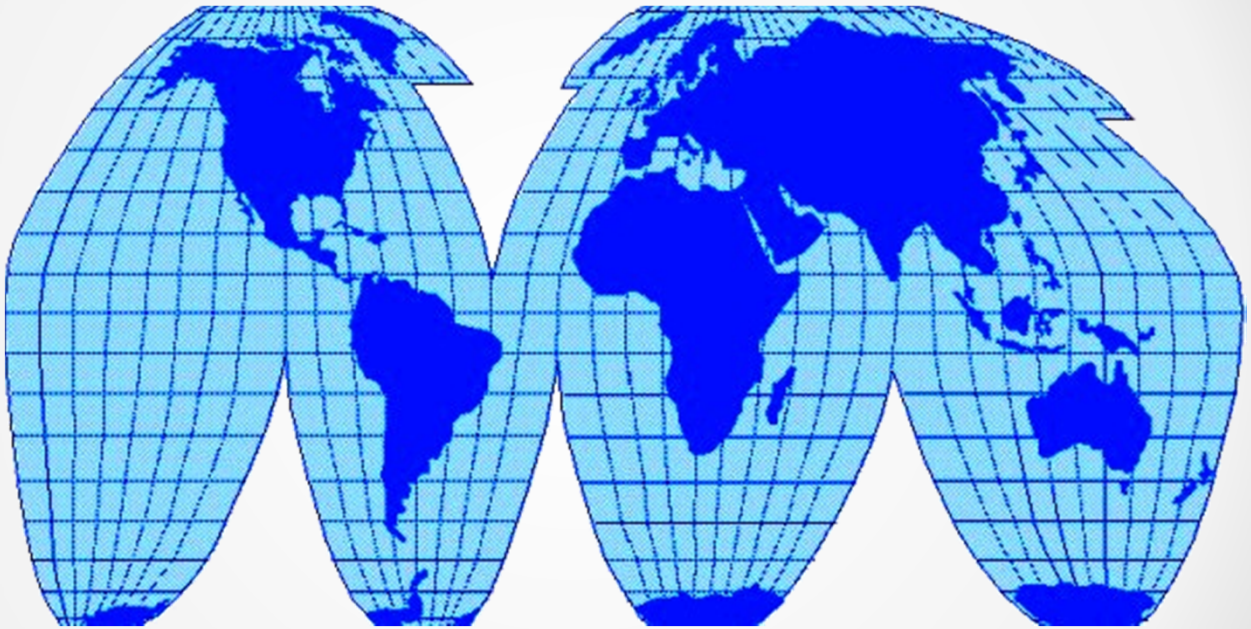


Resolution and Quality



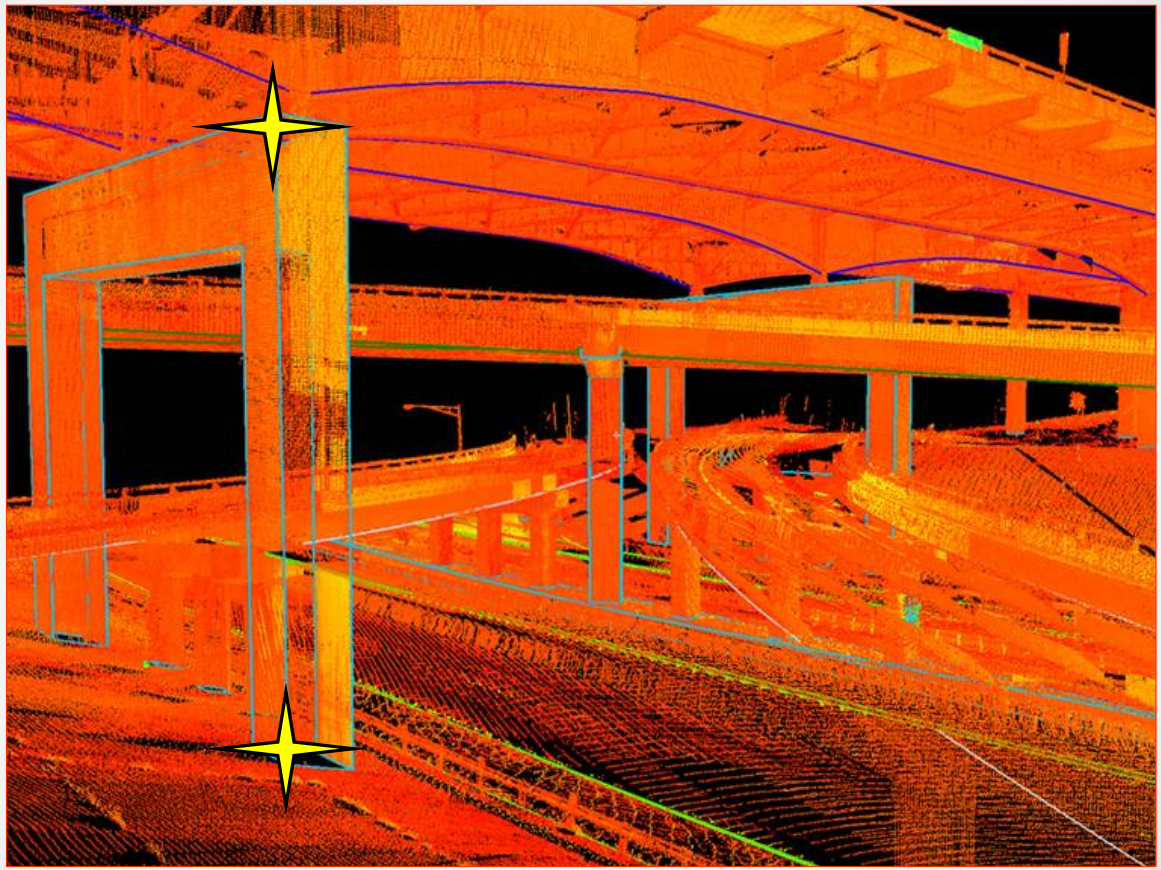
Planar View

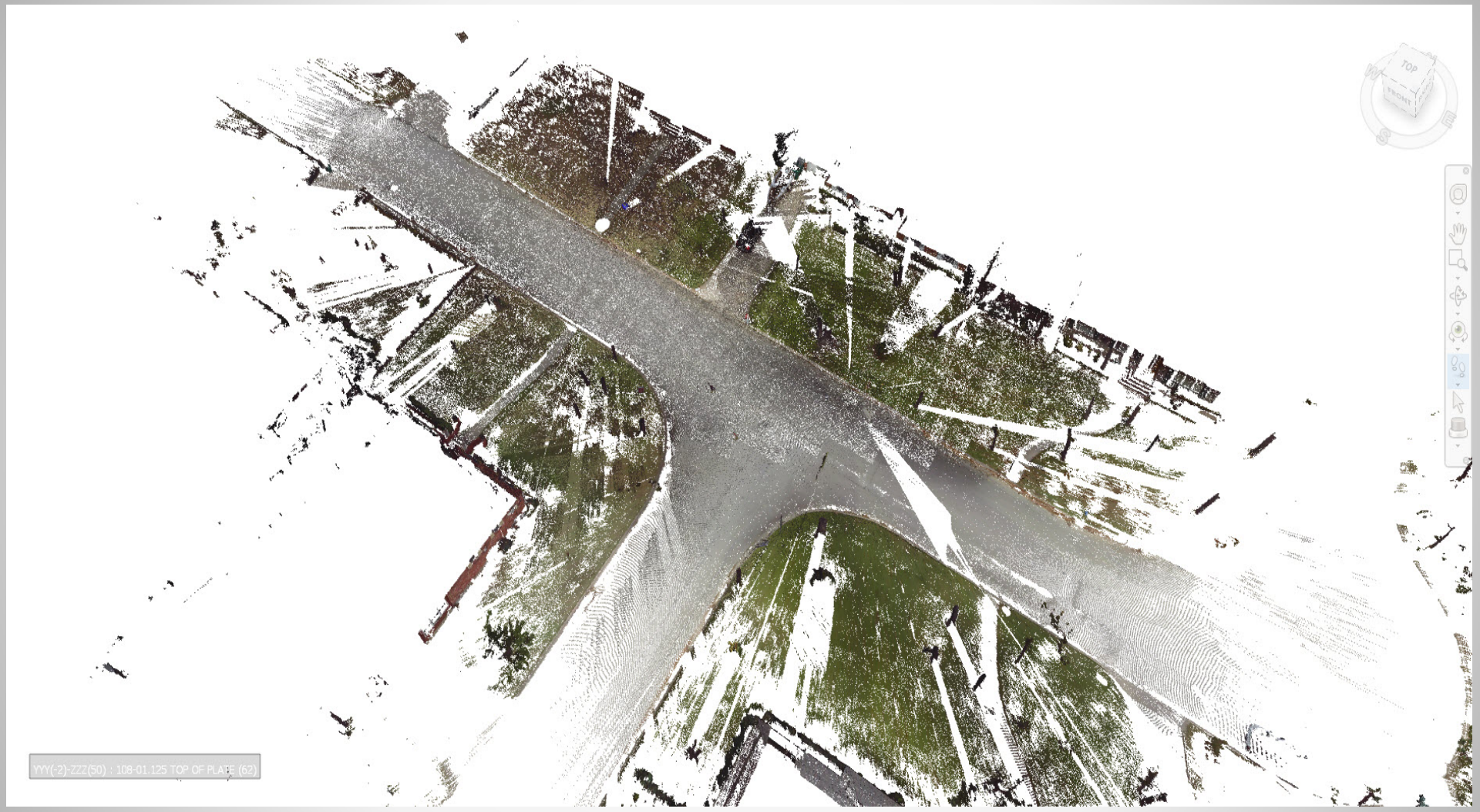
Planar View

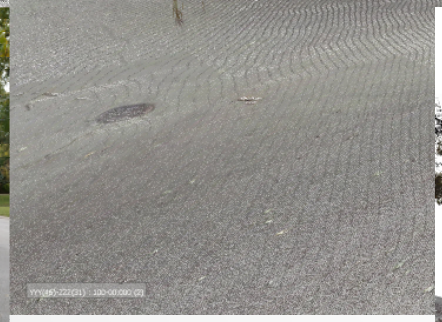


Planar View

Single Points vs. Point Cloud Data




TOP
YYY(-2)-ZZZ(50) : 108-01.125 TOP OF PLATE (62)



RORY MEYERS CHILDREN'S ADVENTURE GARDEN

Dallas Arboretum

Let nature nurture you.

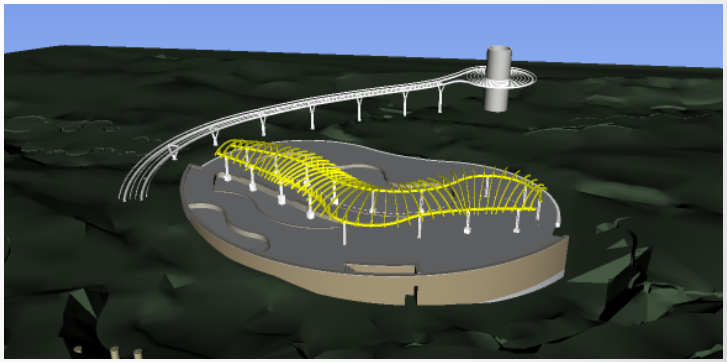
BECK

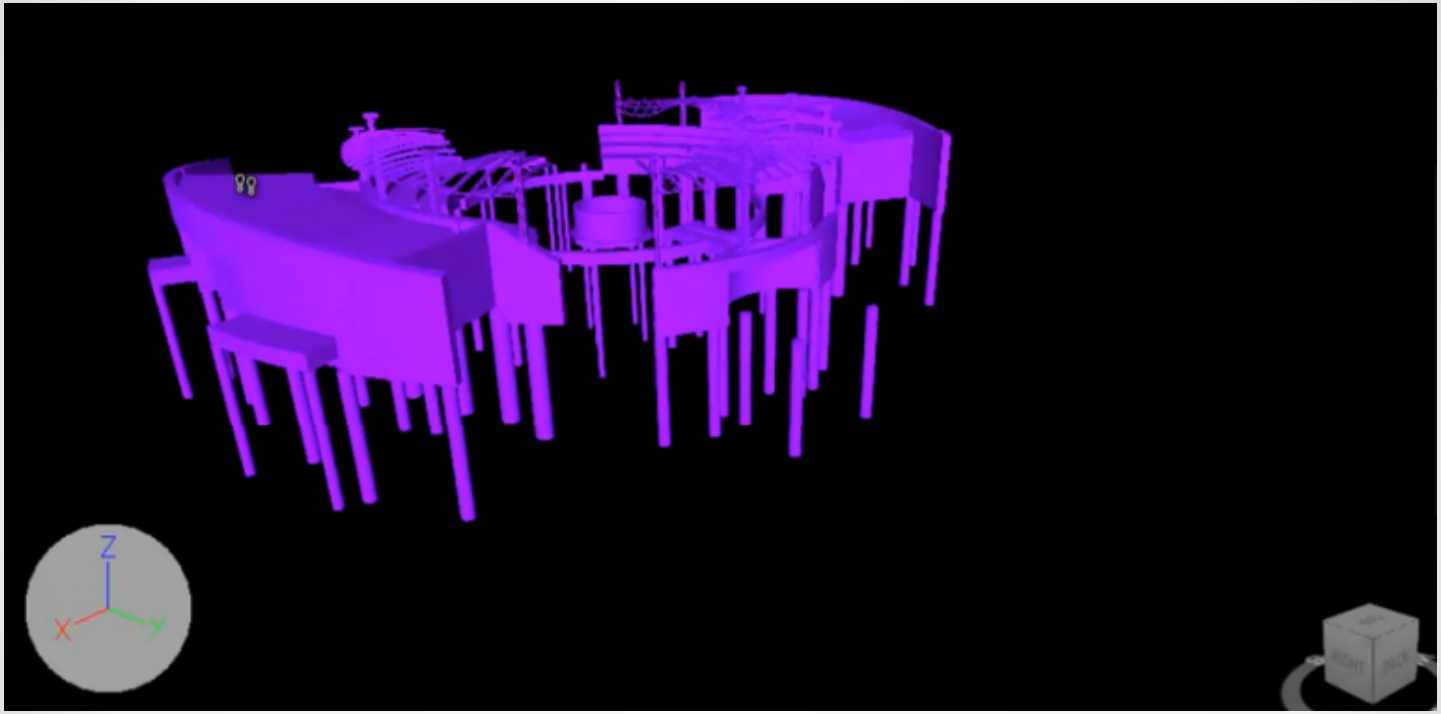
VS&R Van Sickle & Rolleri, Ltd.

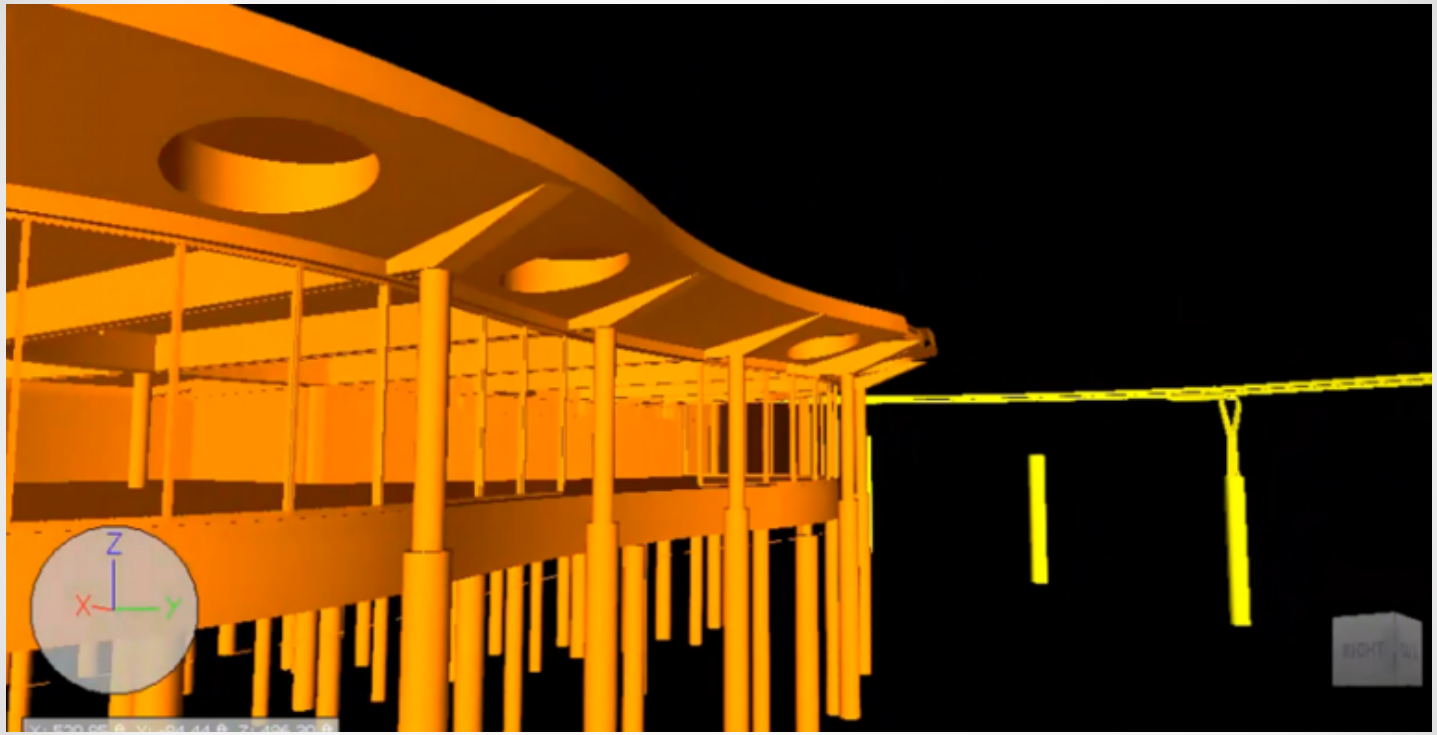
MKW

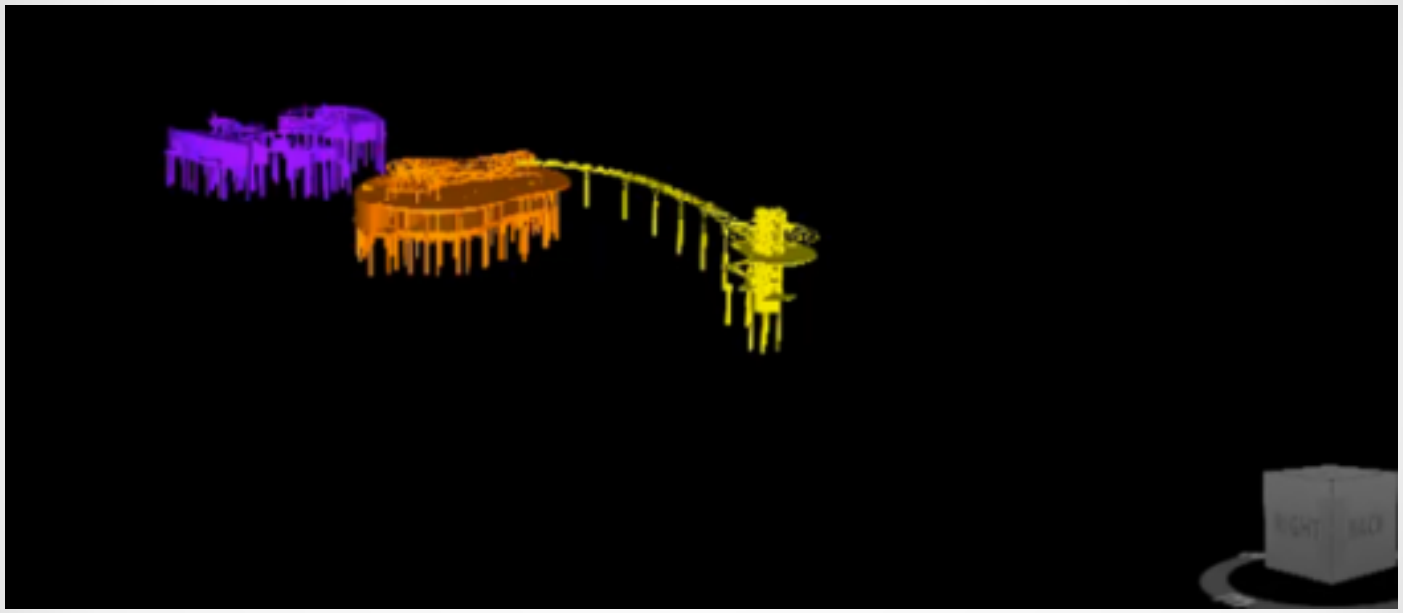
IKERD CONSULTING

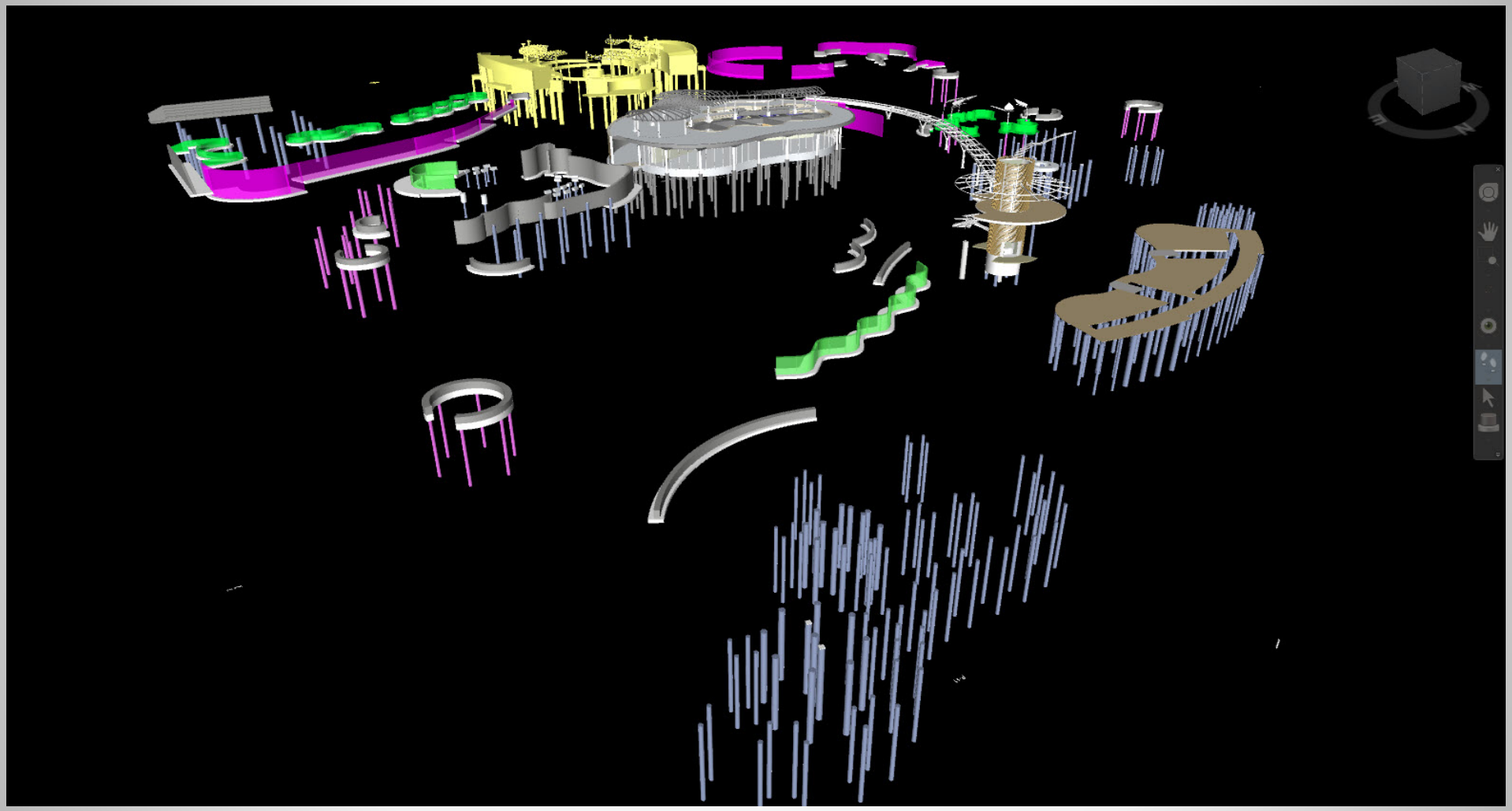
DattnerArchitects

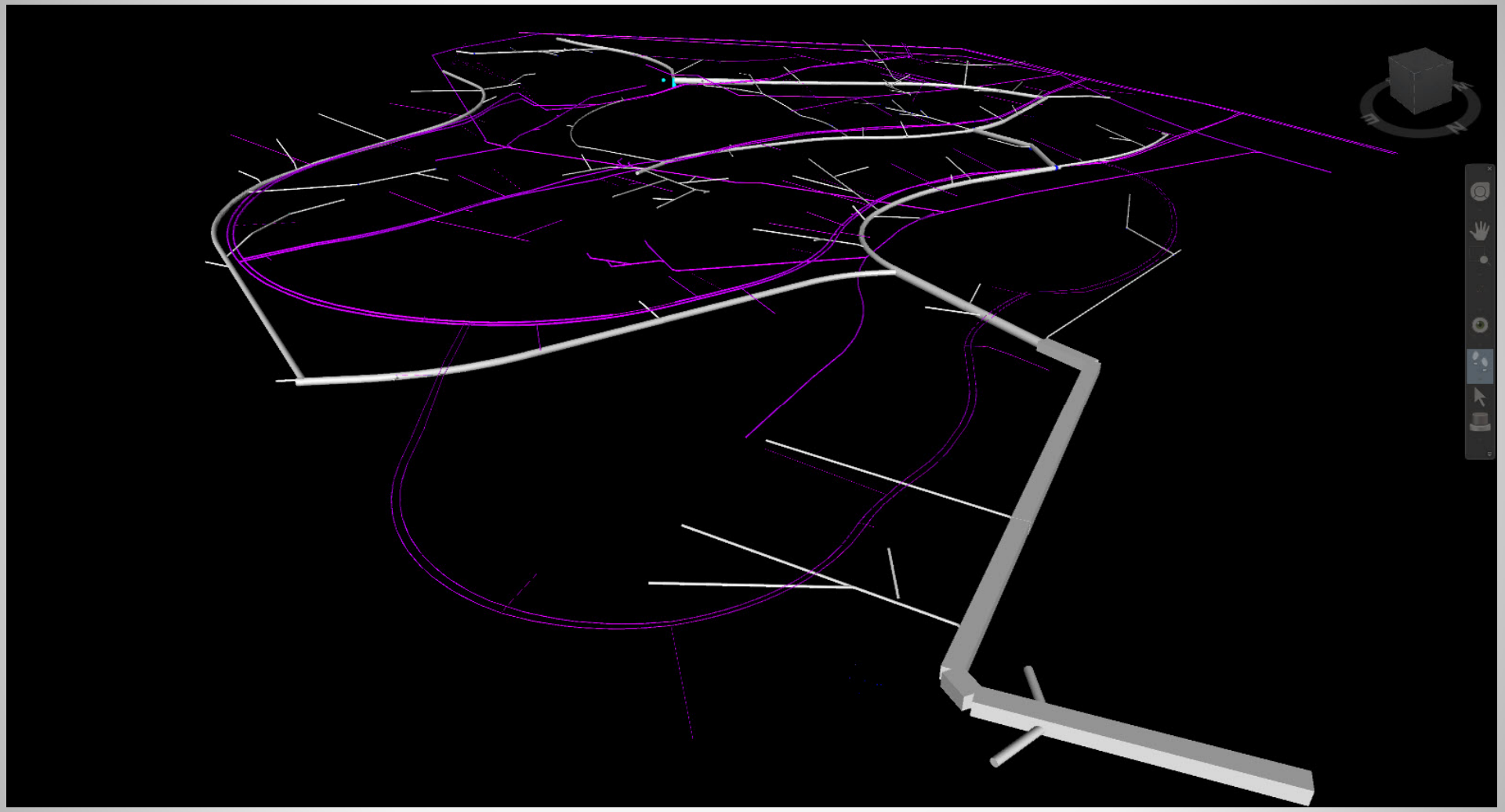


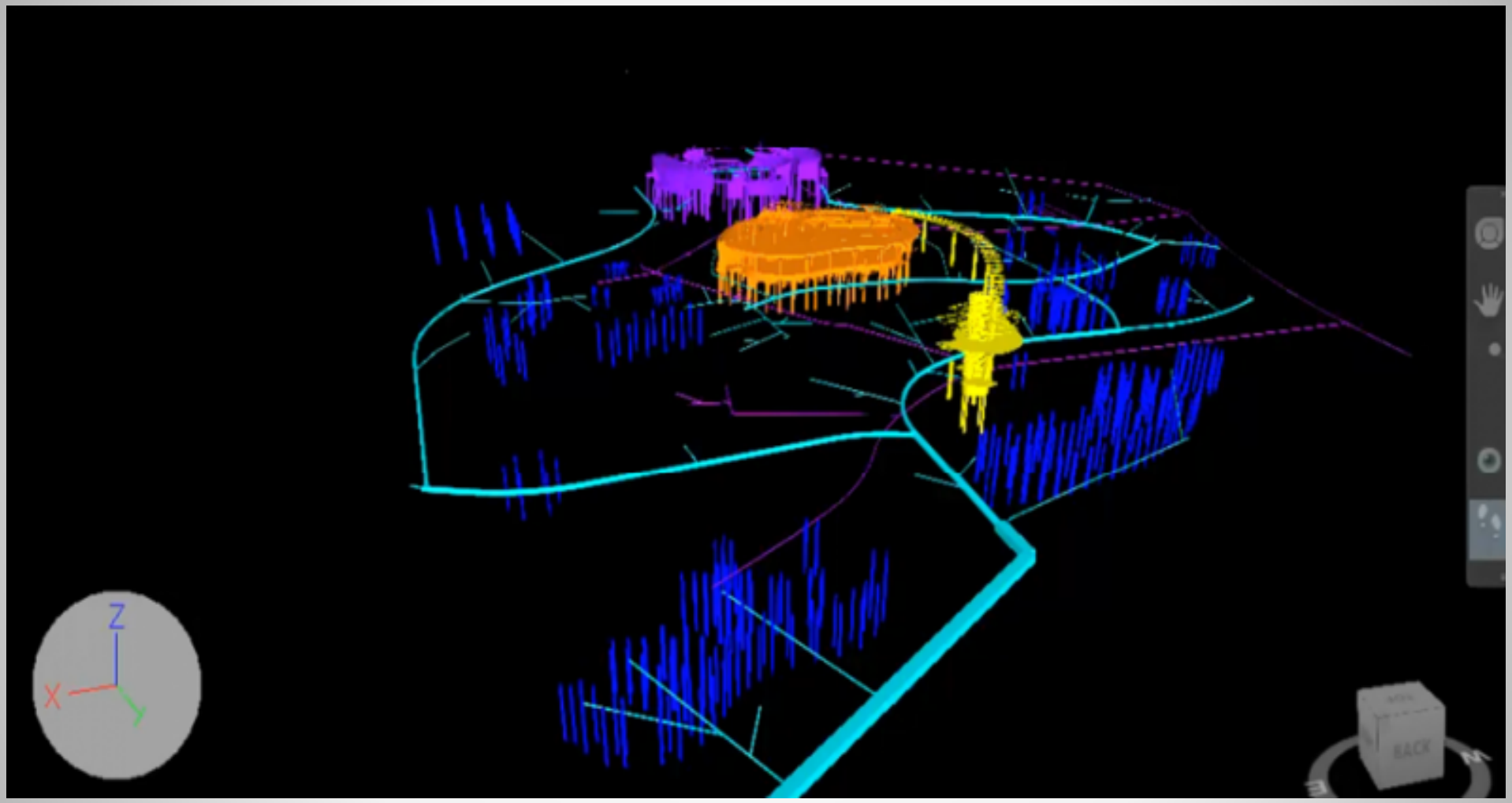

Z
X
Y

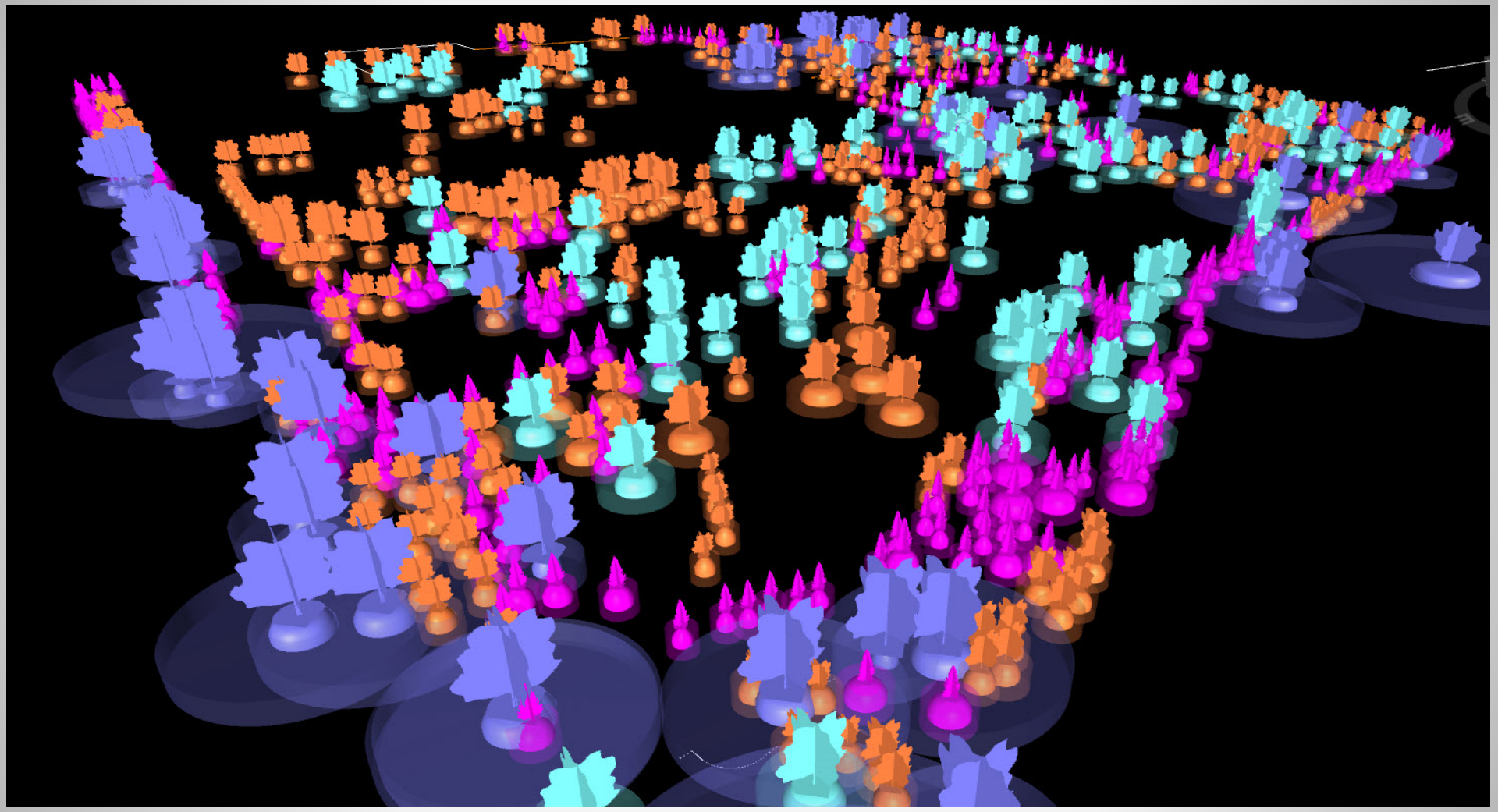

Z
X
Y

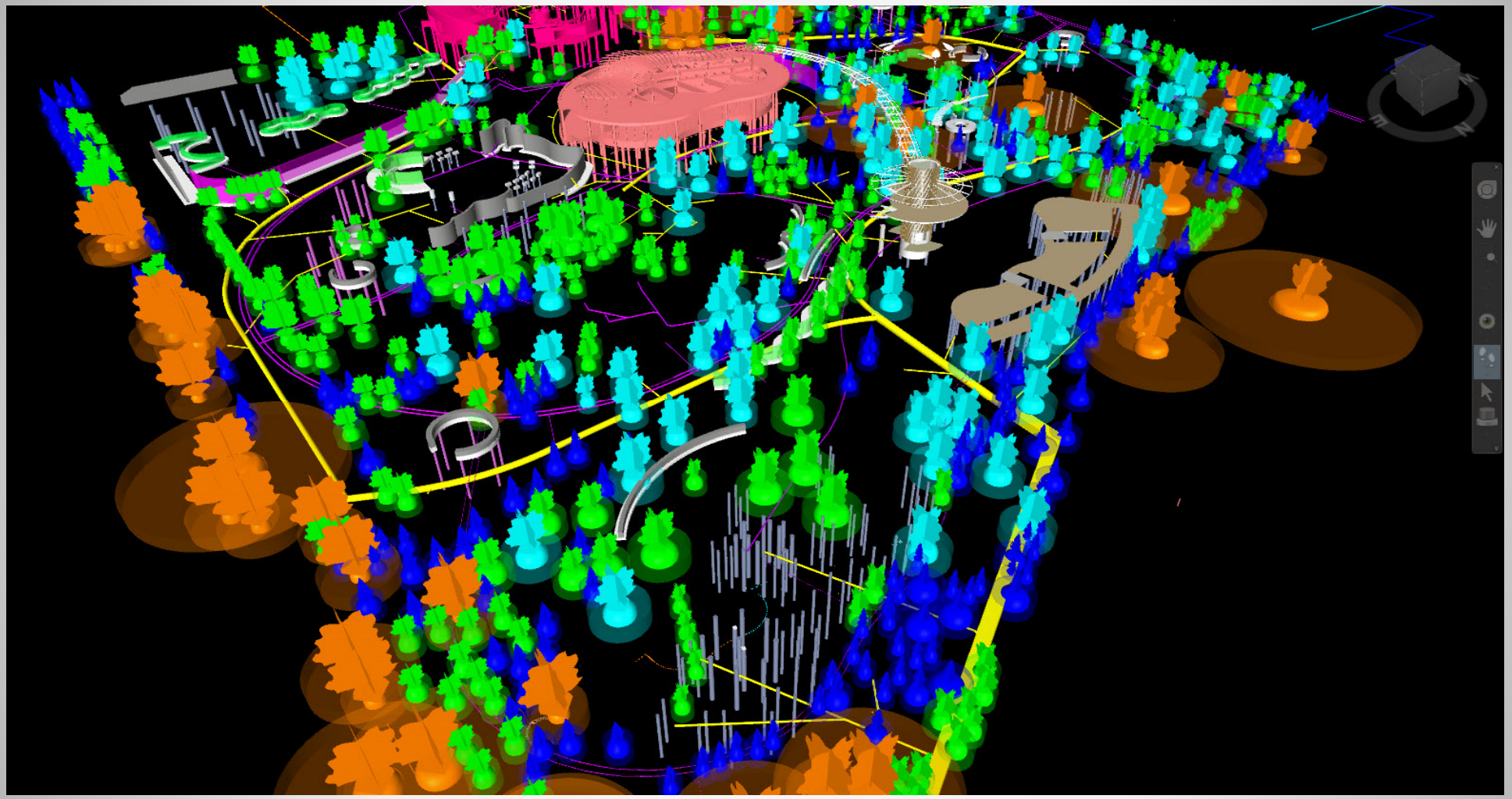


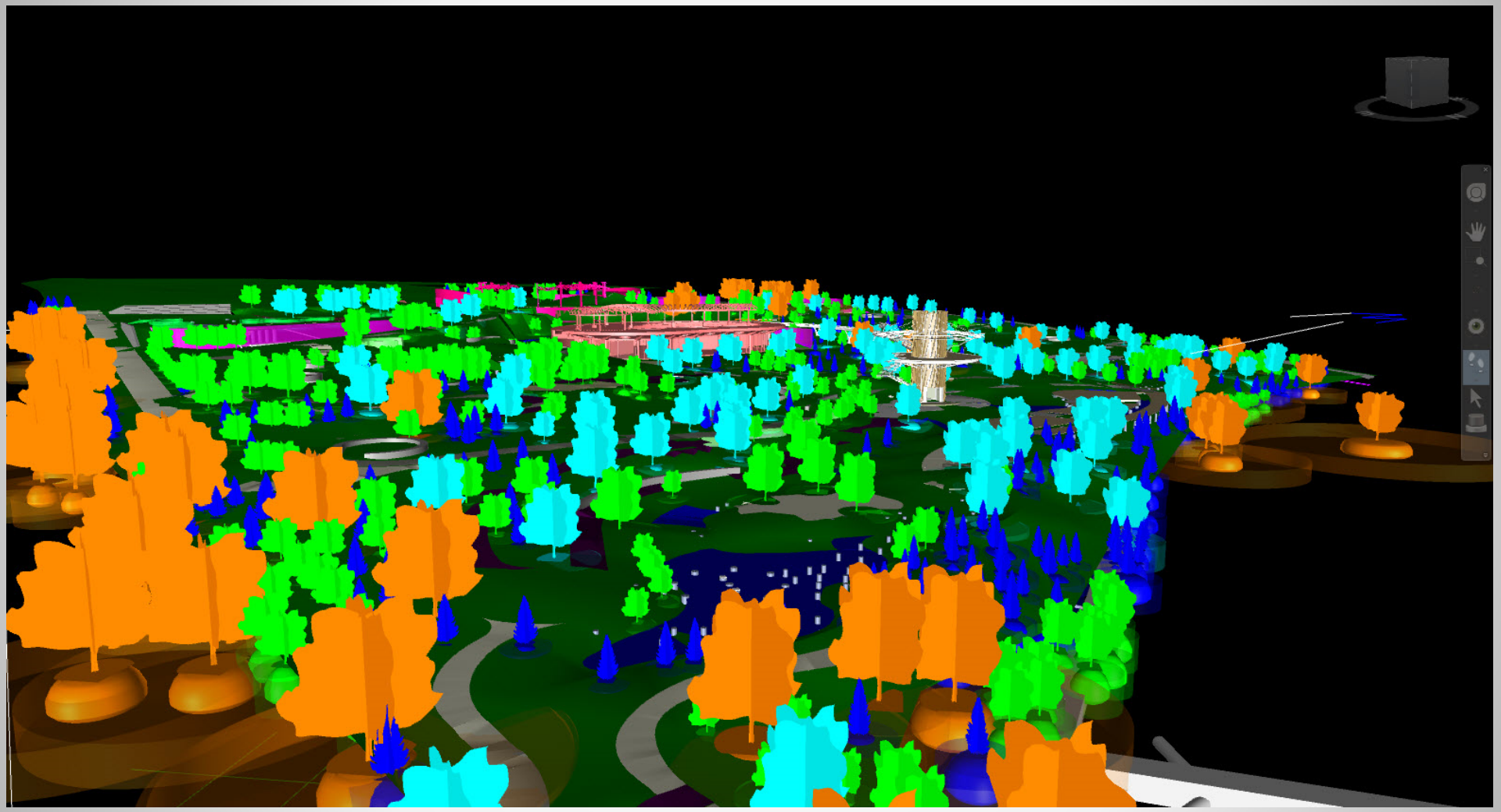




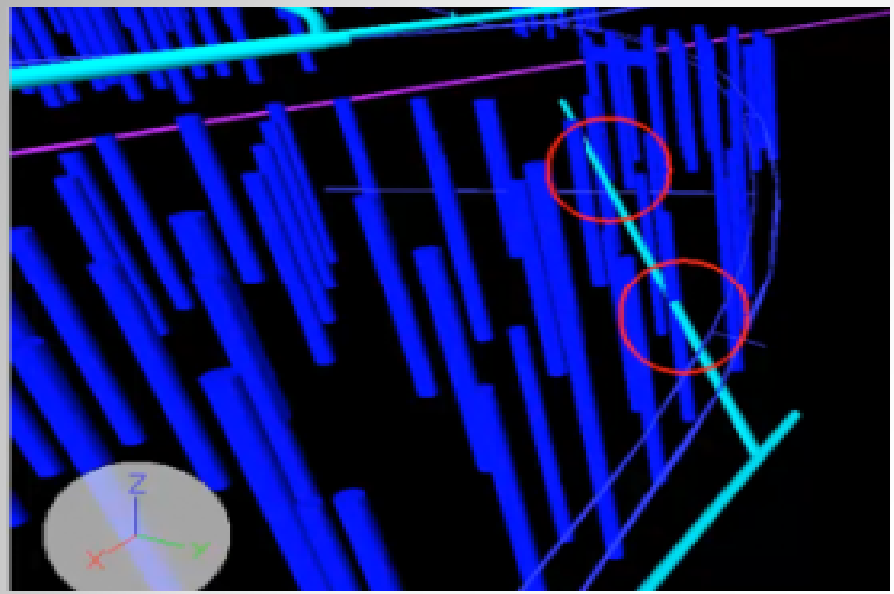

Z
X
Y
BACK

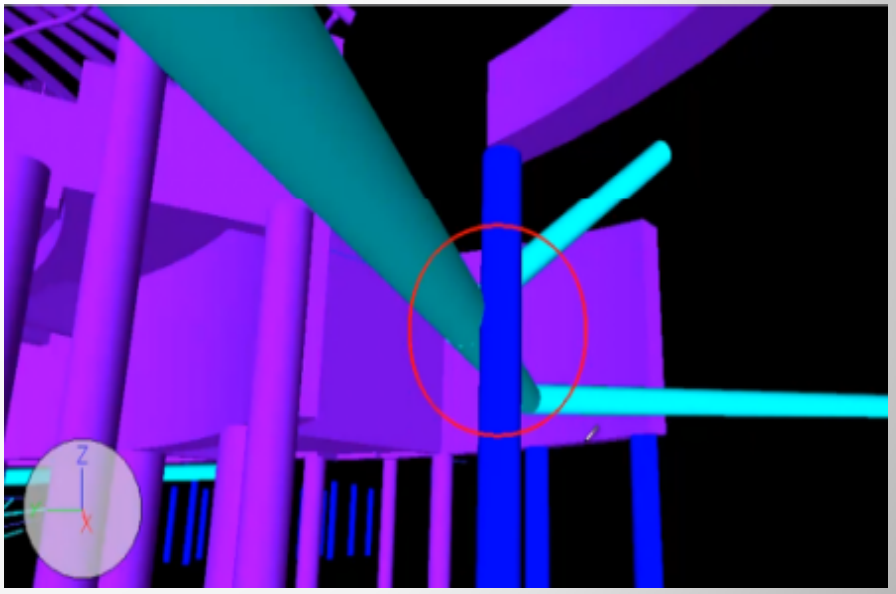


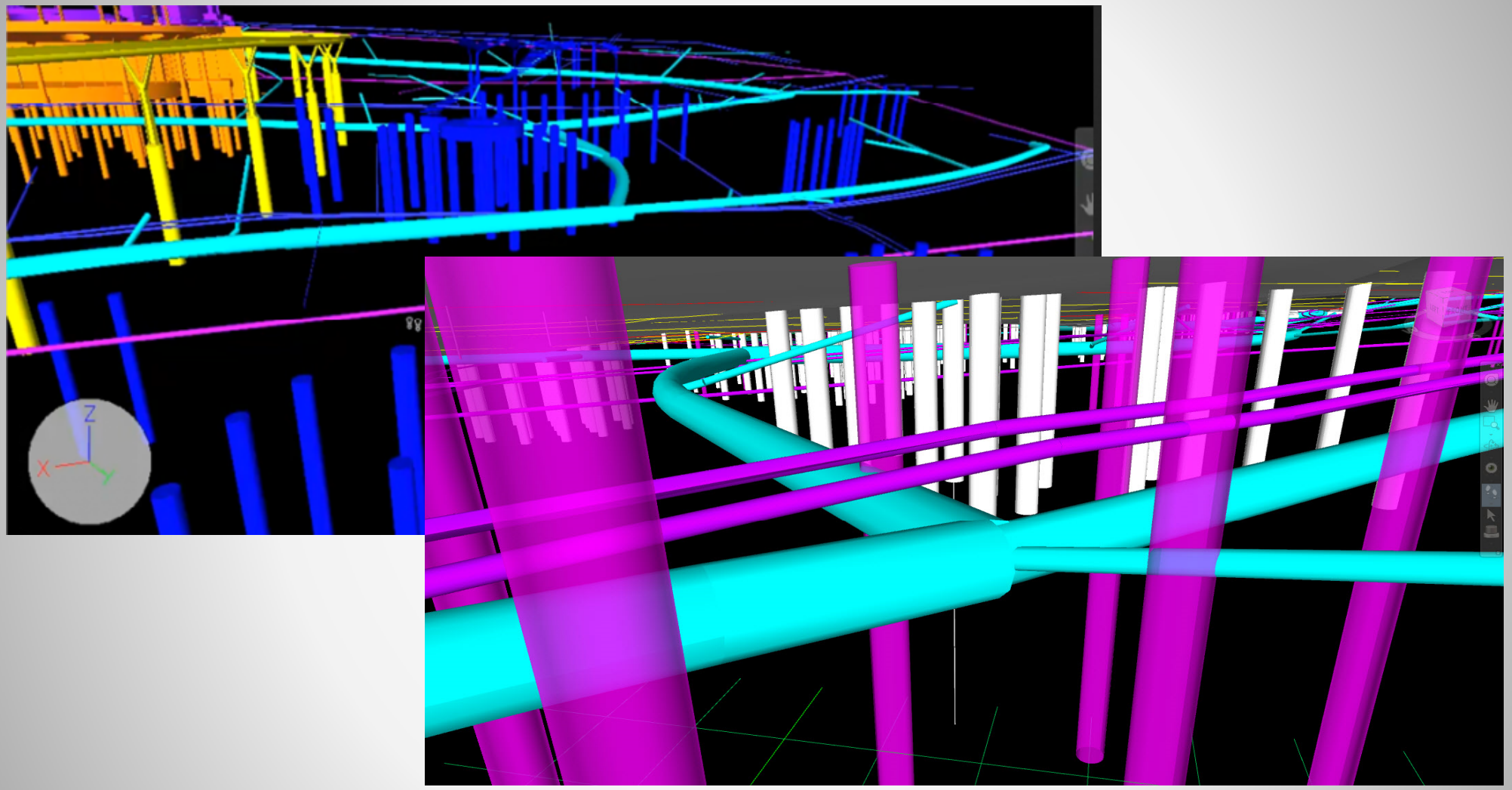


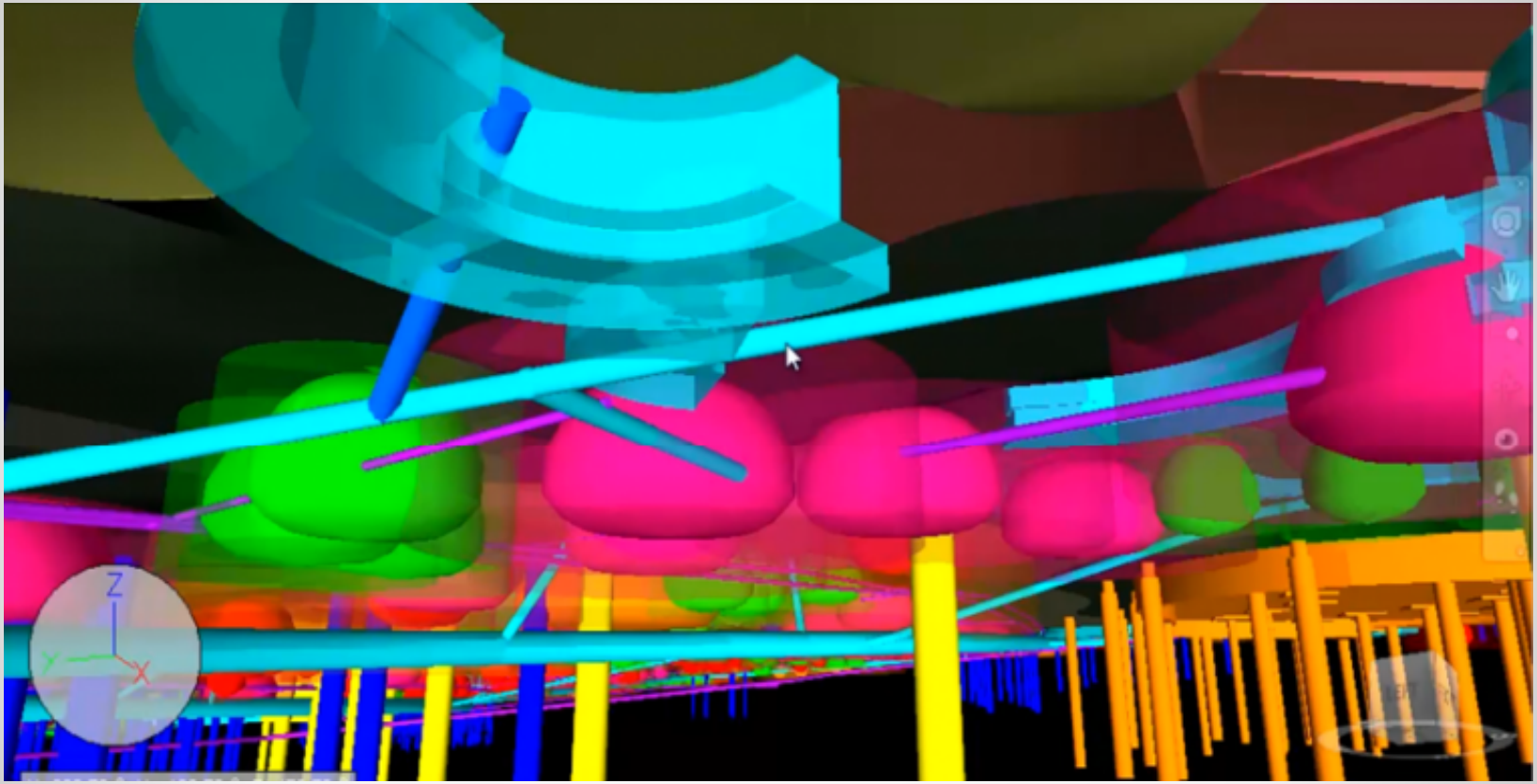


Structure vs Utilities

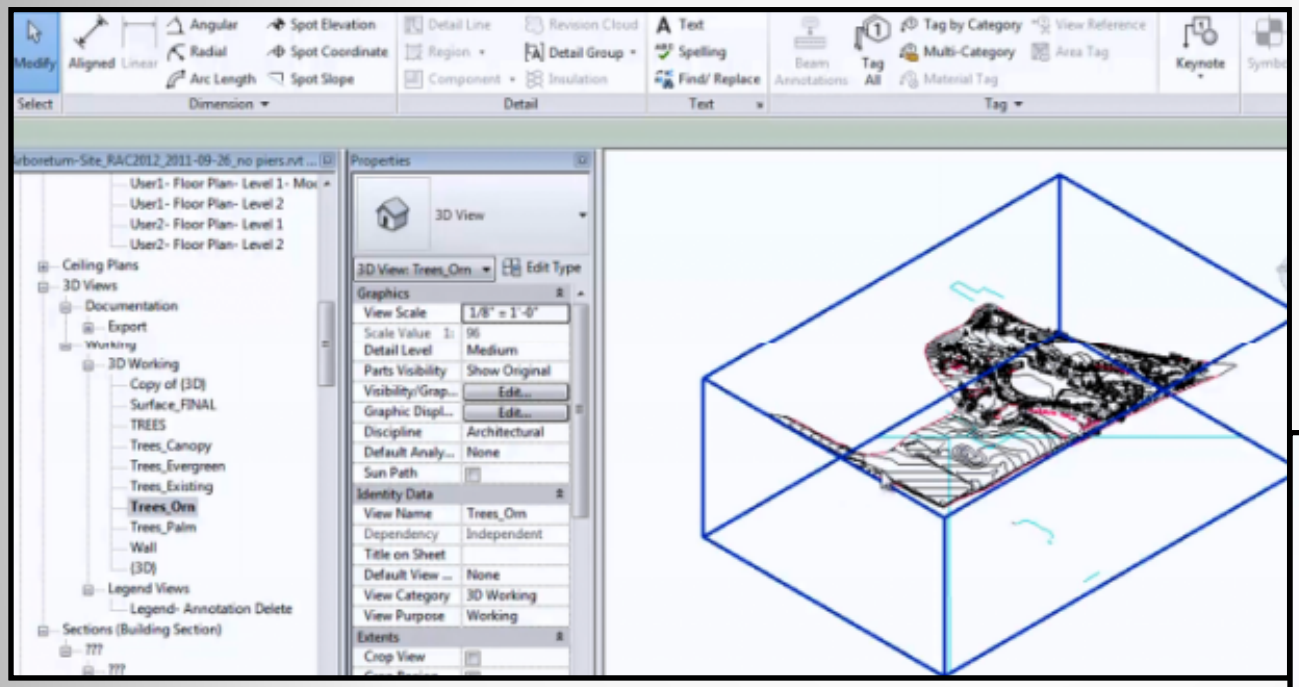


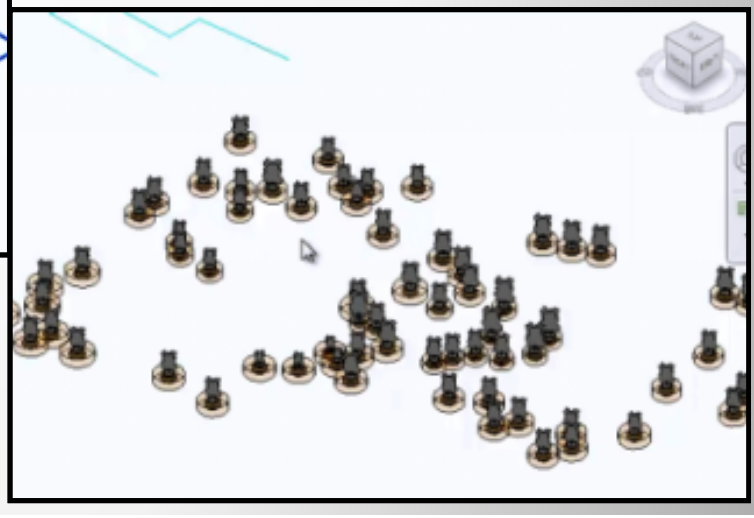



Z
X
Y

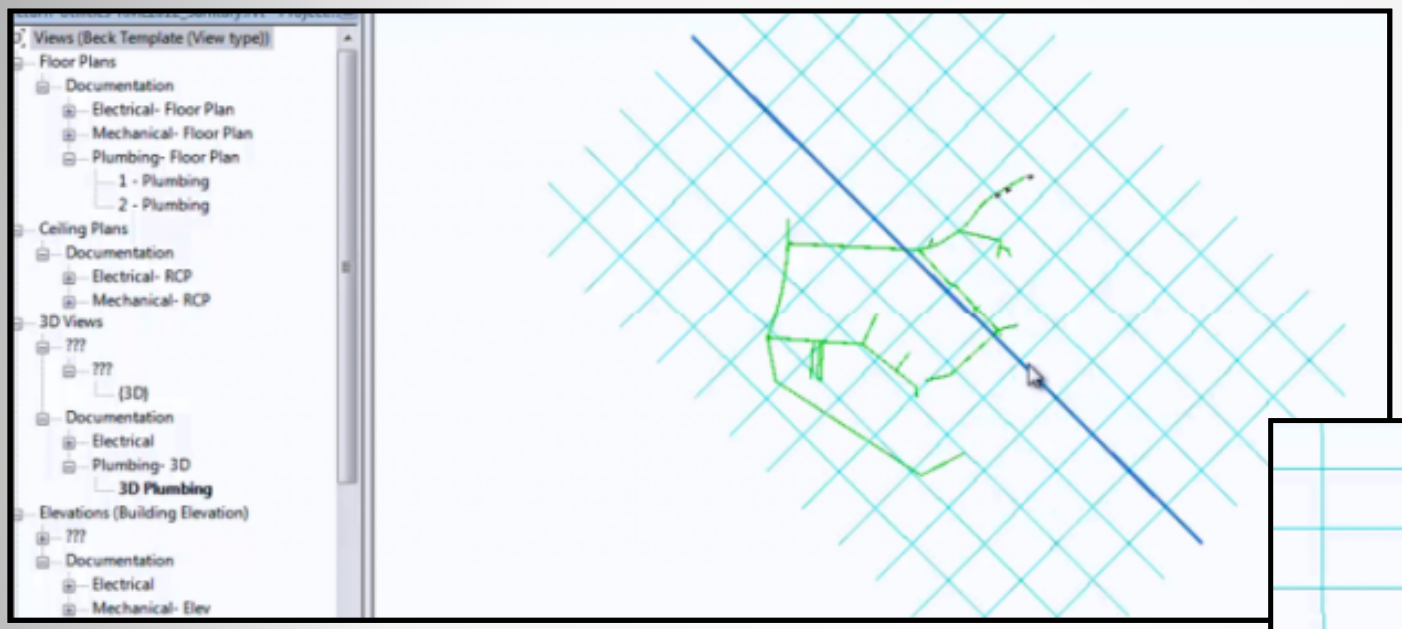

Z
Y
X

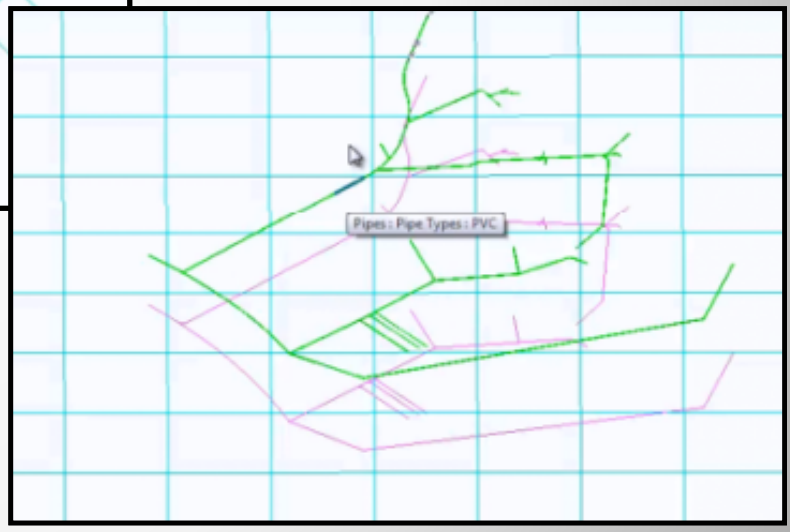
Landscape Coordinate System





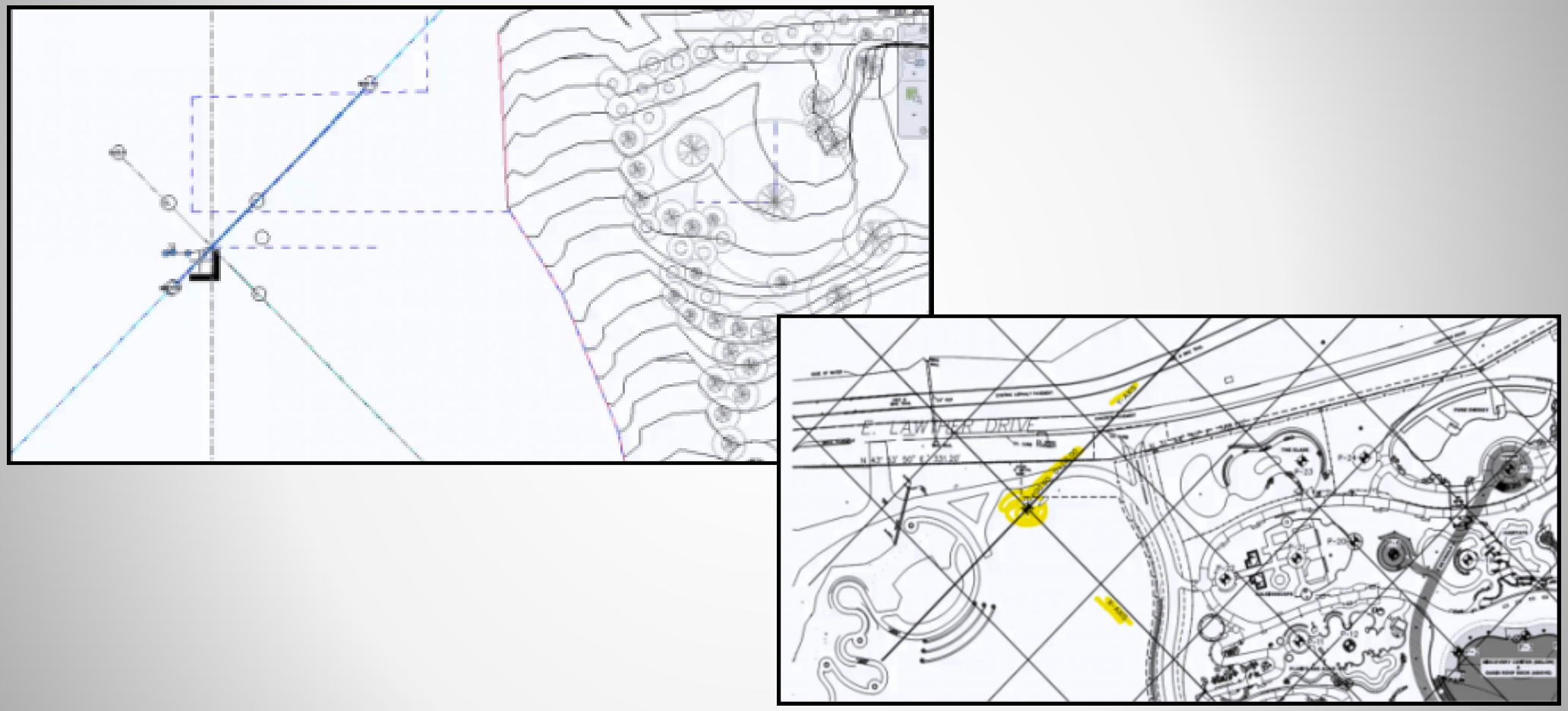
Utilities Coordinate System

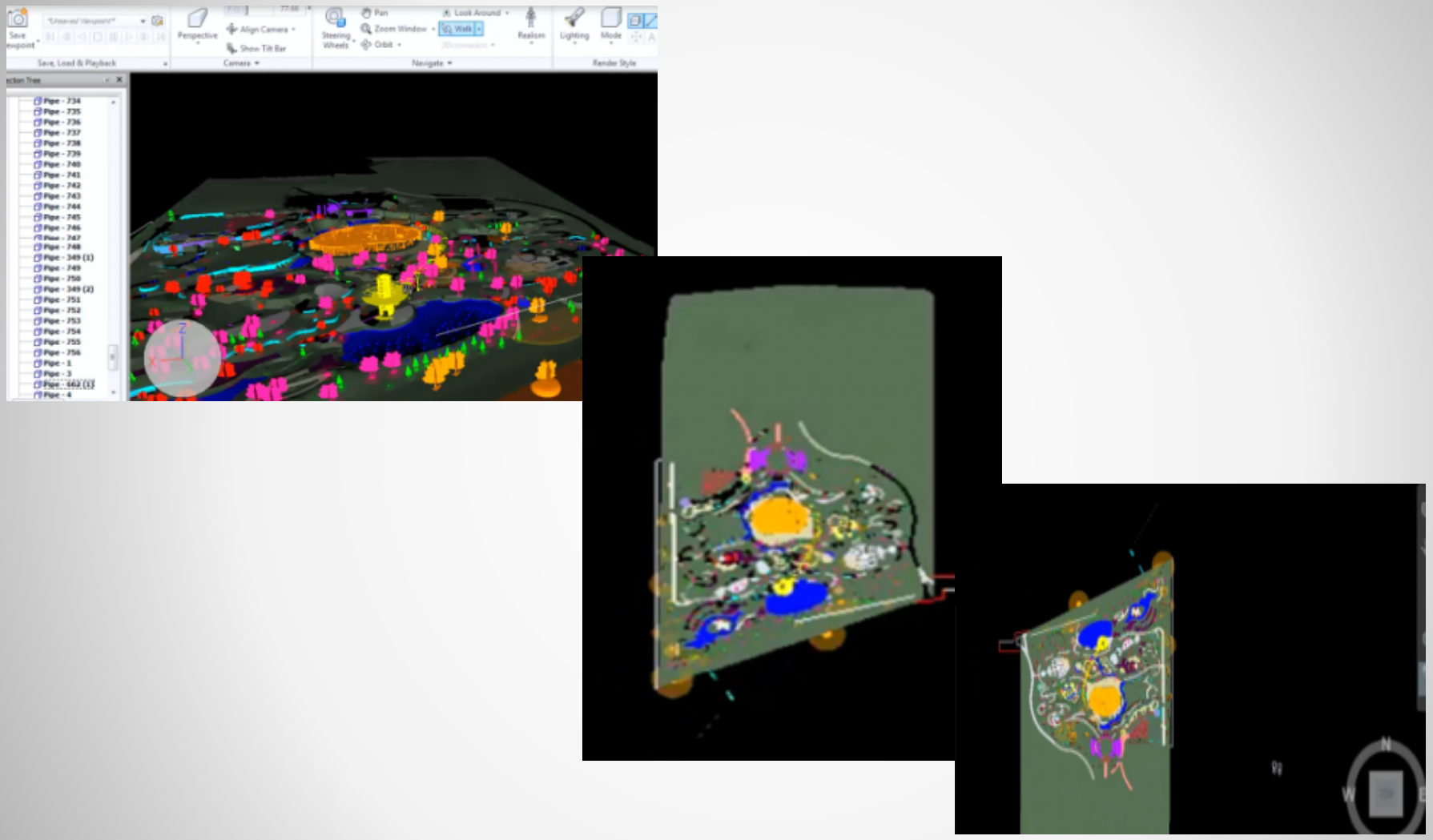


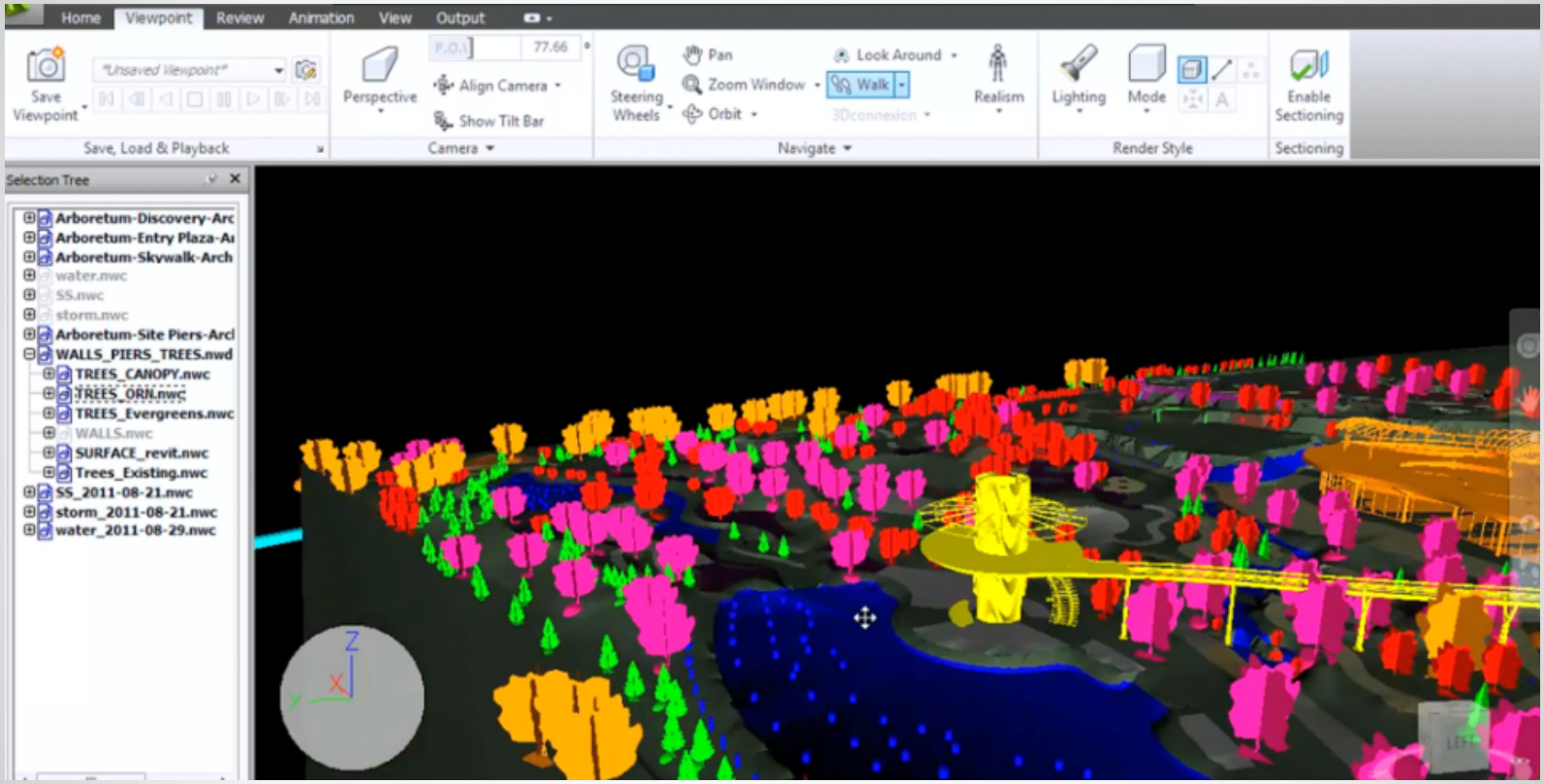


Civil 3D into Revit

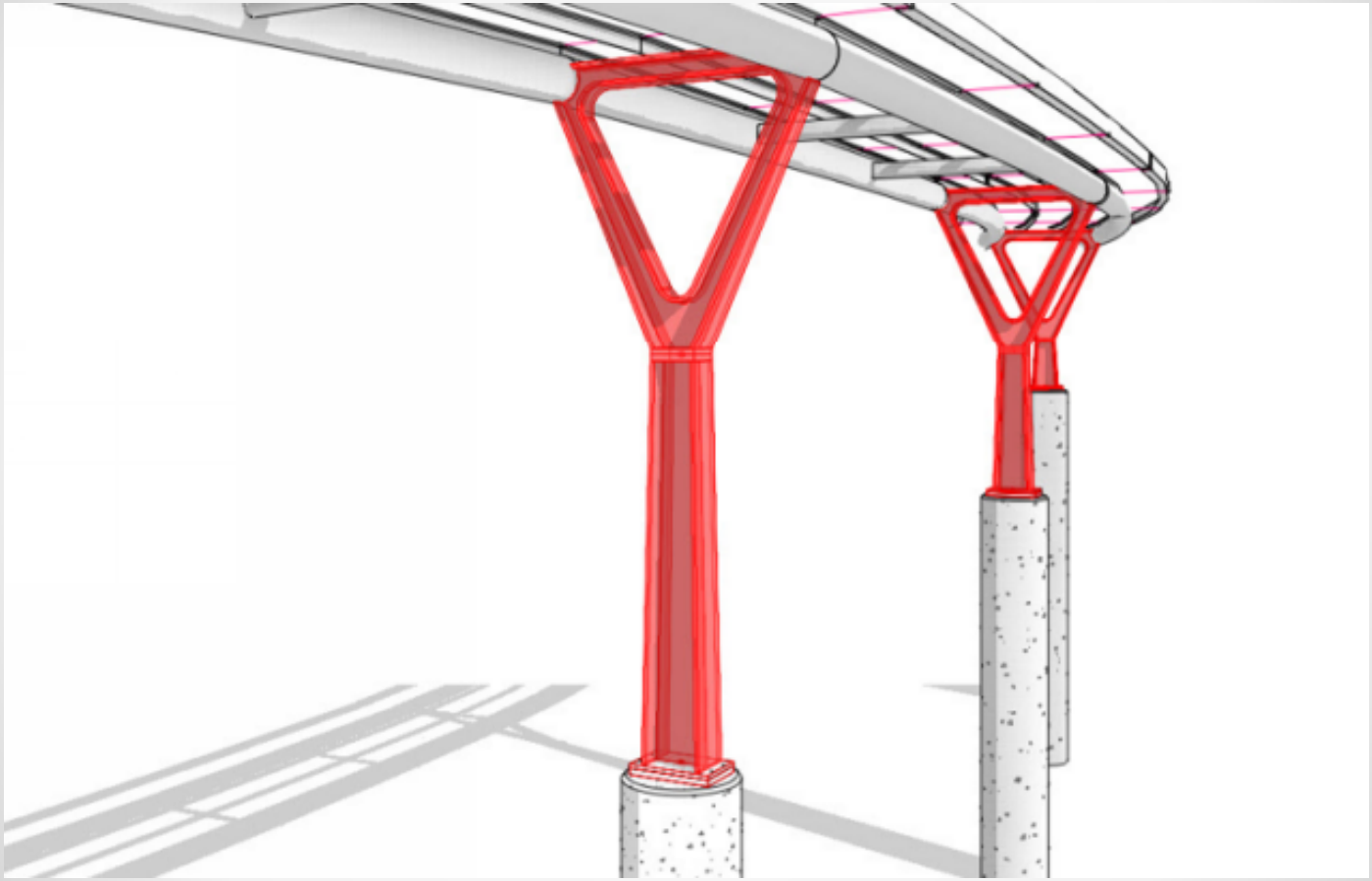
Coordinate System Relationship



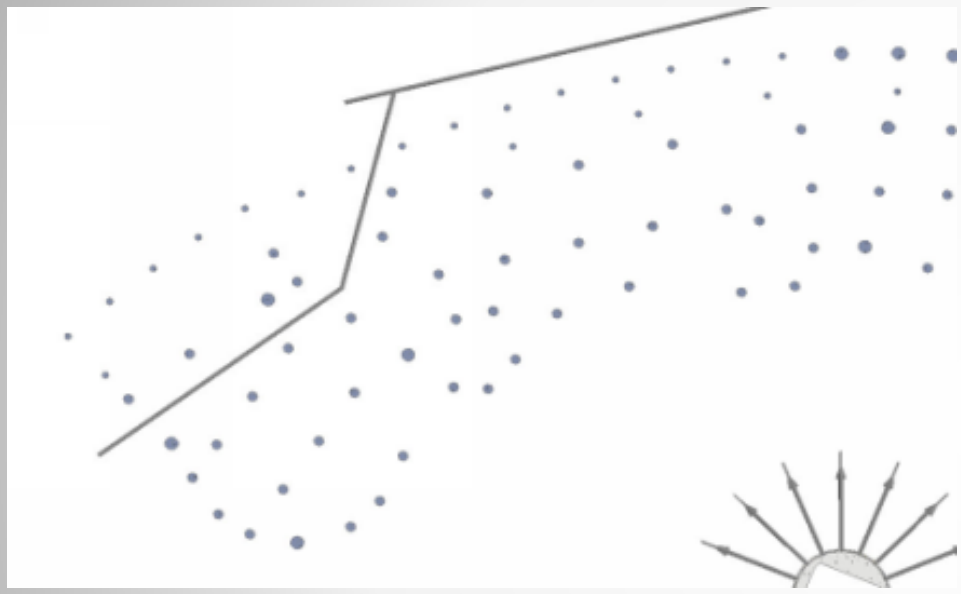

Save Viewpoint
Perspective
Align Camera
Show Tilt Bar
Steering Wheels
Pan
Zoom Window
Orbit
Look Around
Walk
Realism
Lighting
Mode
Save, Load & Playback
Camera
Navigate
Render Style
Pipe - 734
Pipe - 735
Pipe - 736
Pipe - 737
Pipe - 738
Pipe - 739
Pipe - 740
Pipe - 741
Pipe - 742
Pipe - 743
Pipe - 744
Pipe - 745
Pipe - 746
Pipe - 747
Pipe - 748
Pipe - 749
Pipe - 750
Pipe - 751
Pipe - 752
Pipe - 753
Pipe - 754
Pipe - 755
Pipe - 756
Pipe - 1
Pipe - 3
Pipe - 4
N
W

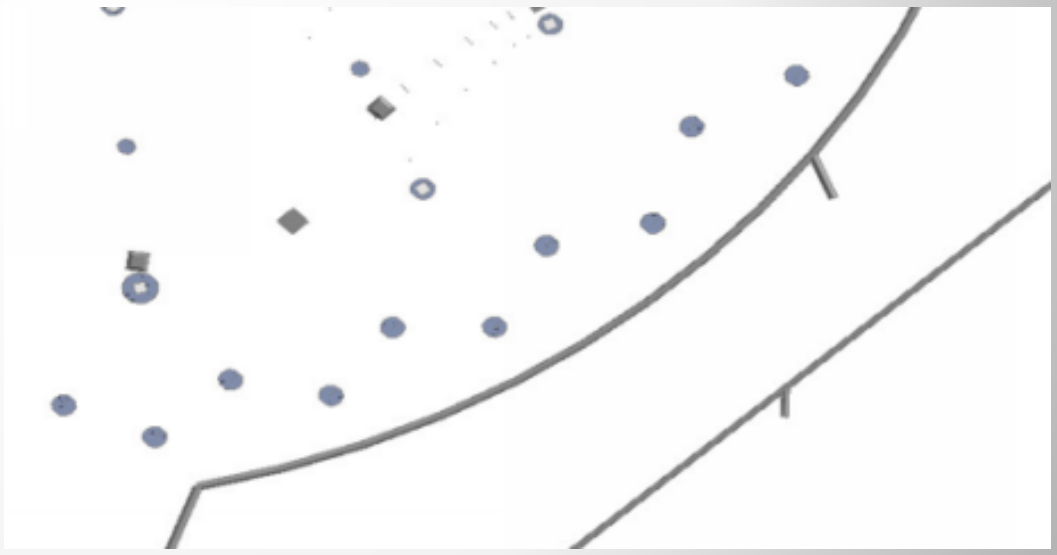

Home
Viewpoint
Review
Animation
View
Output
Save Viewpoint
"Unsaved Viewpoint"
Save, Load & Playback
Perspective
77.66
Align Camera
Show Tilt Bar
Camera
Steering Wheels
Pan
Zoom Window
Orbit
Look Around
Walk
3Dconnexion
Realism
Navigate
Lighting
Mode
Render Style
Enable Sectioning
Sectioning
Selection Tree
Arboretum-Discovery-Arc
Arboretum-Entry Plaza-Ar
Arboretum-Skywalk-Arch
water.nwc
SS.nwc
storm.nwc
Arboretum-Site Piers-Arcl
WALLS_PIERS_TREES.nwd
TREES_CANOPY.nwc
TREES_ORN.nwc
TREES_Evergreens.nwc
WALLS.nwc
SURFACE_revit.nwc
Trees_Existing.nwc
SS_2011-08-21.nwc
storm_2011-08-21.nwc
water_2011-08-29.nwc
Z
X
Y

Skywalk

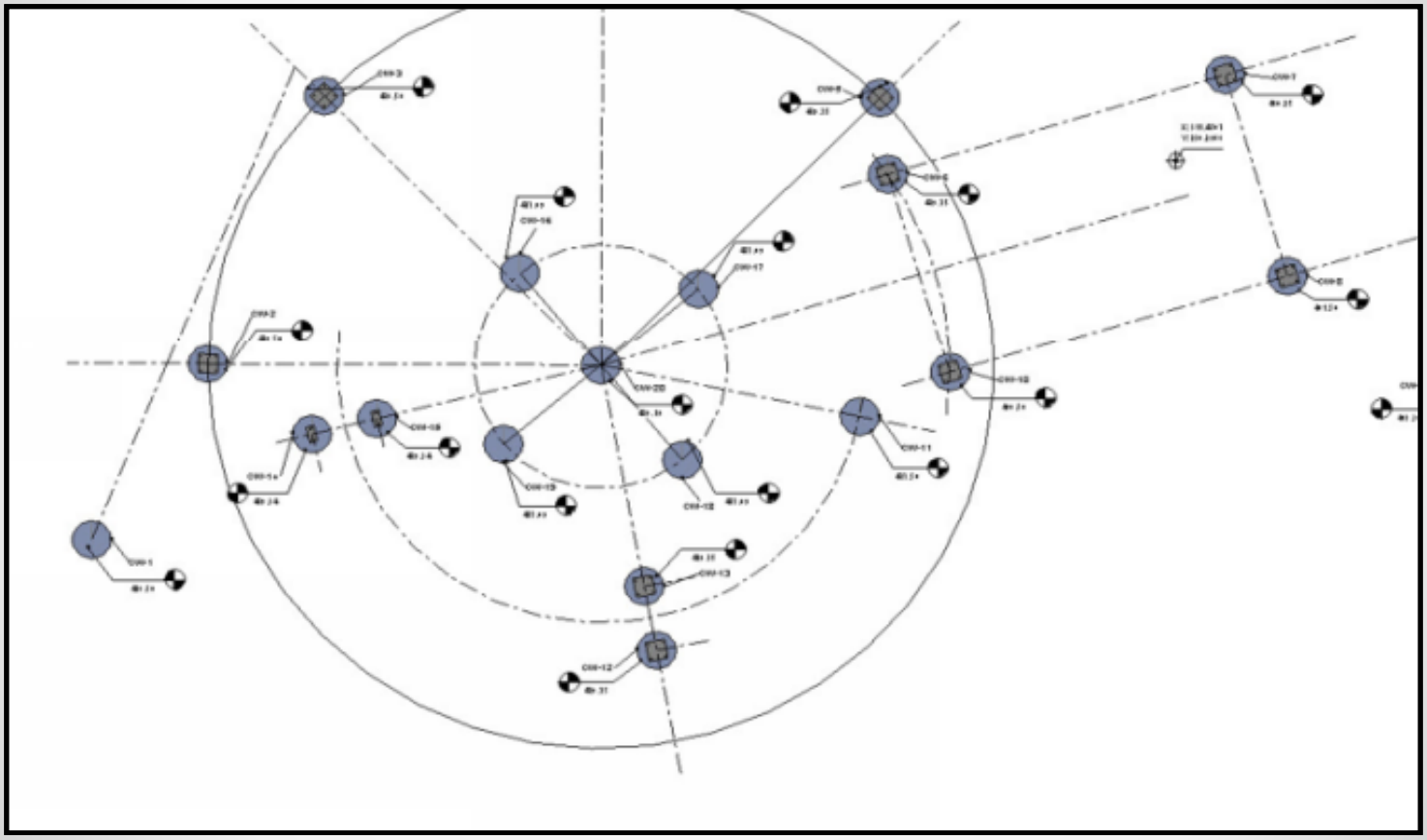


Solutions: Structure and Civil Coordinated

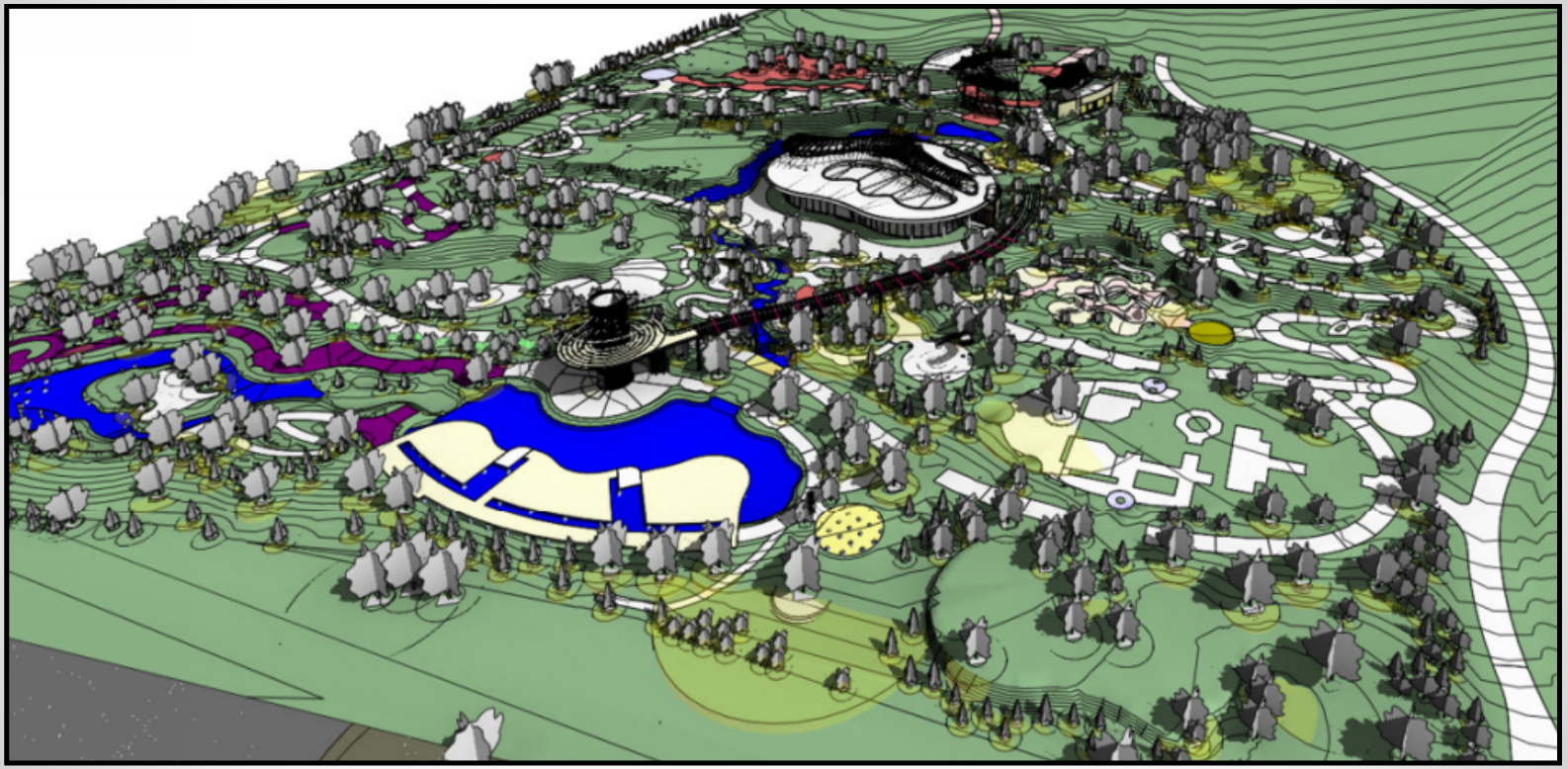


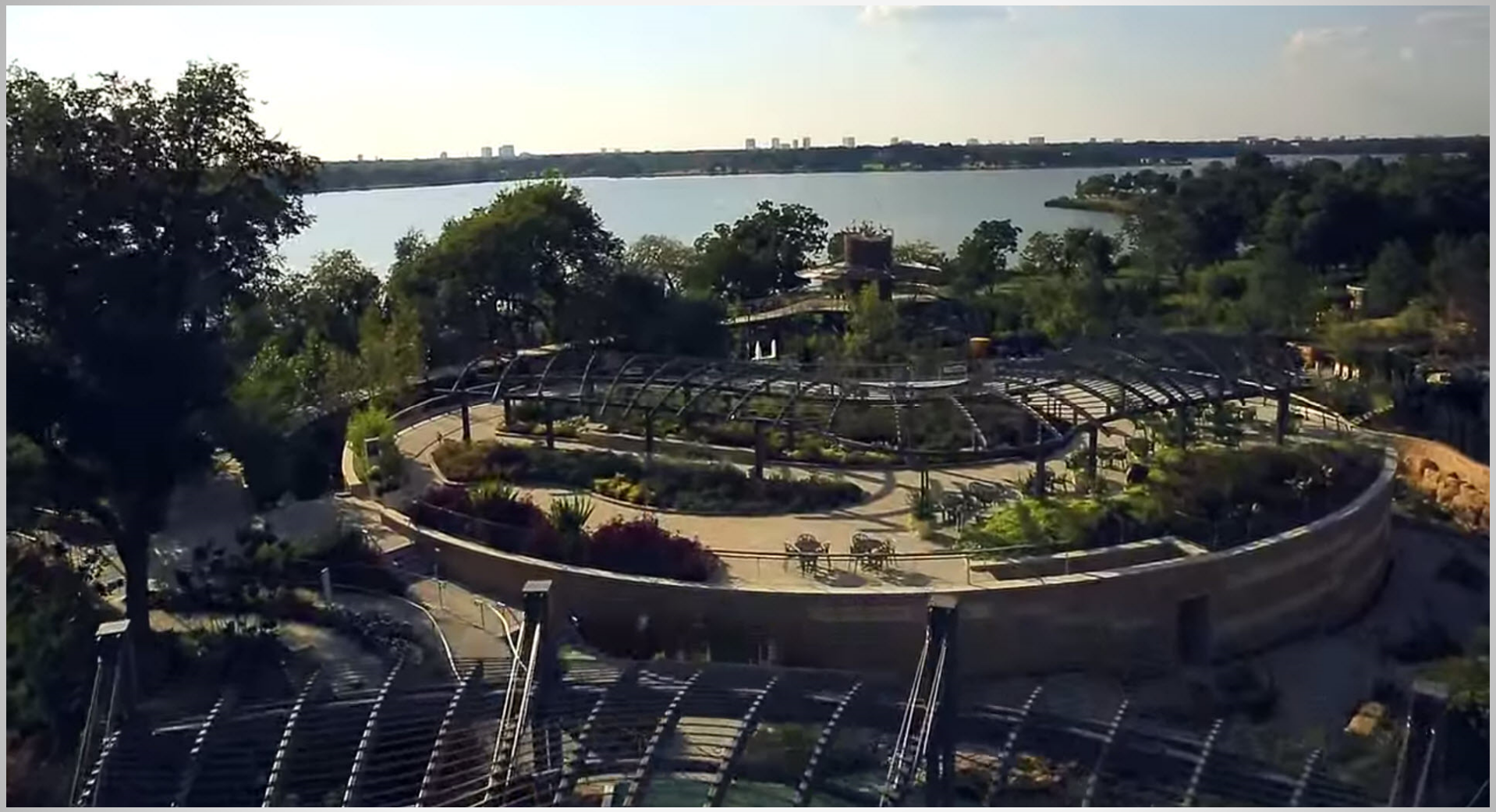


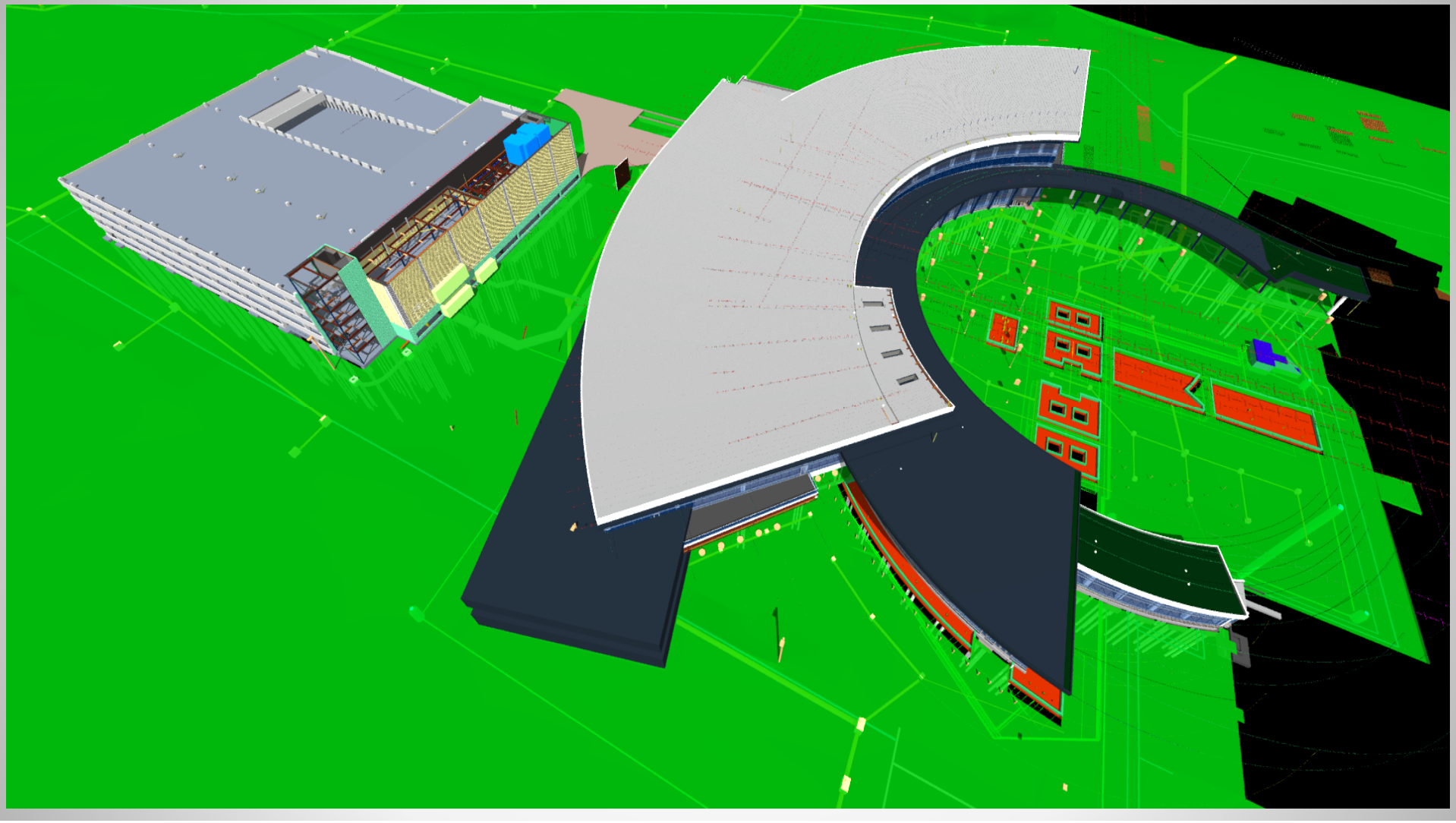
Structural Point Layout Extracted From Revit for Pier Location

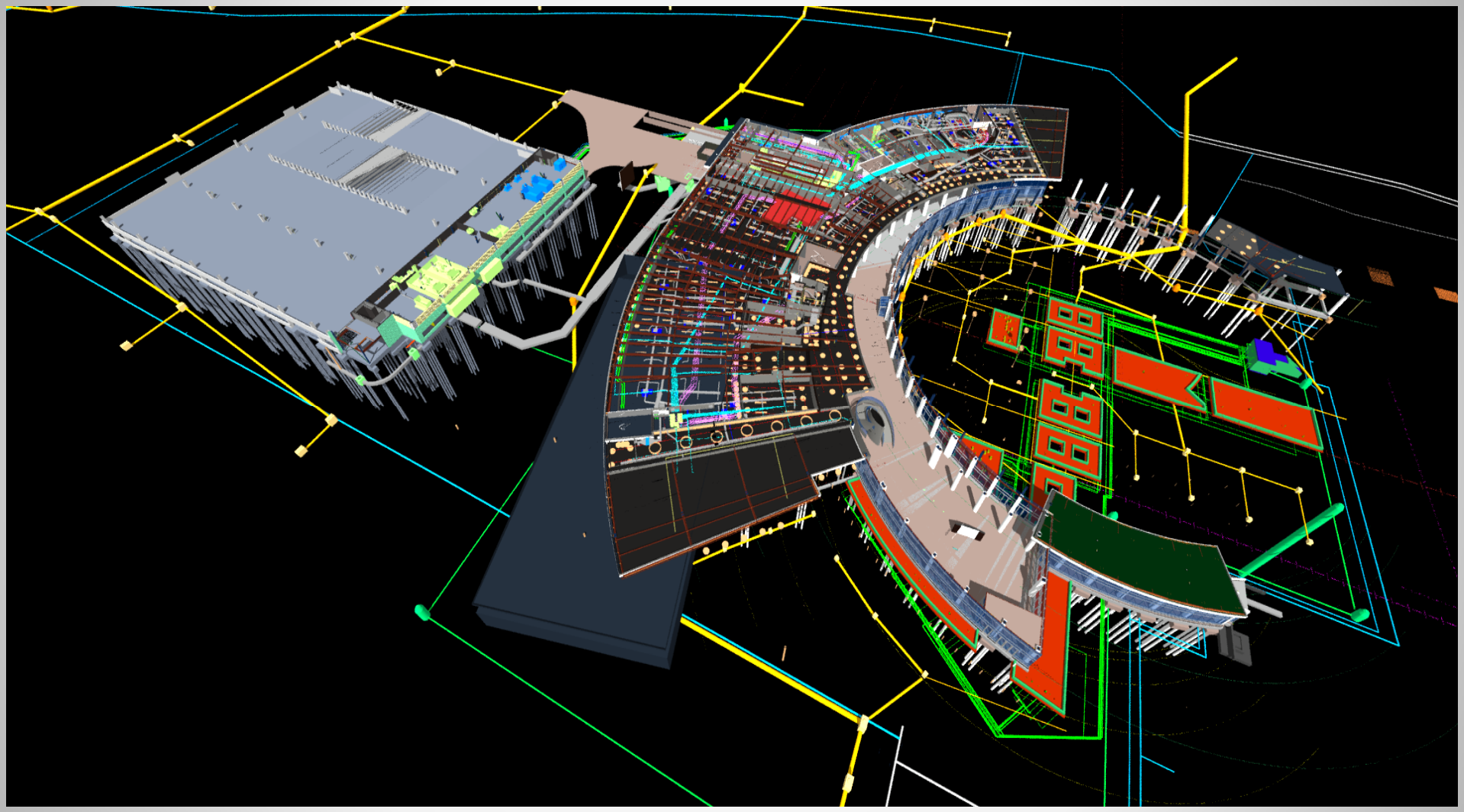


Site Overview

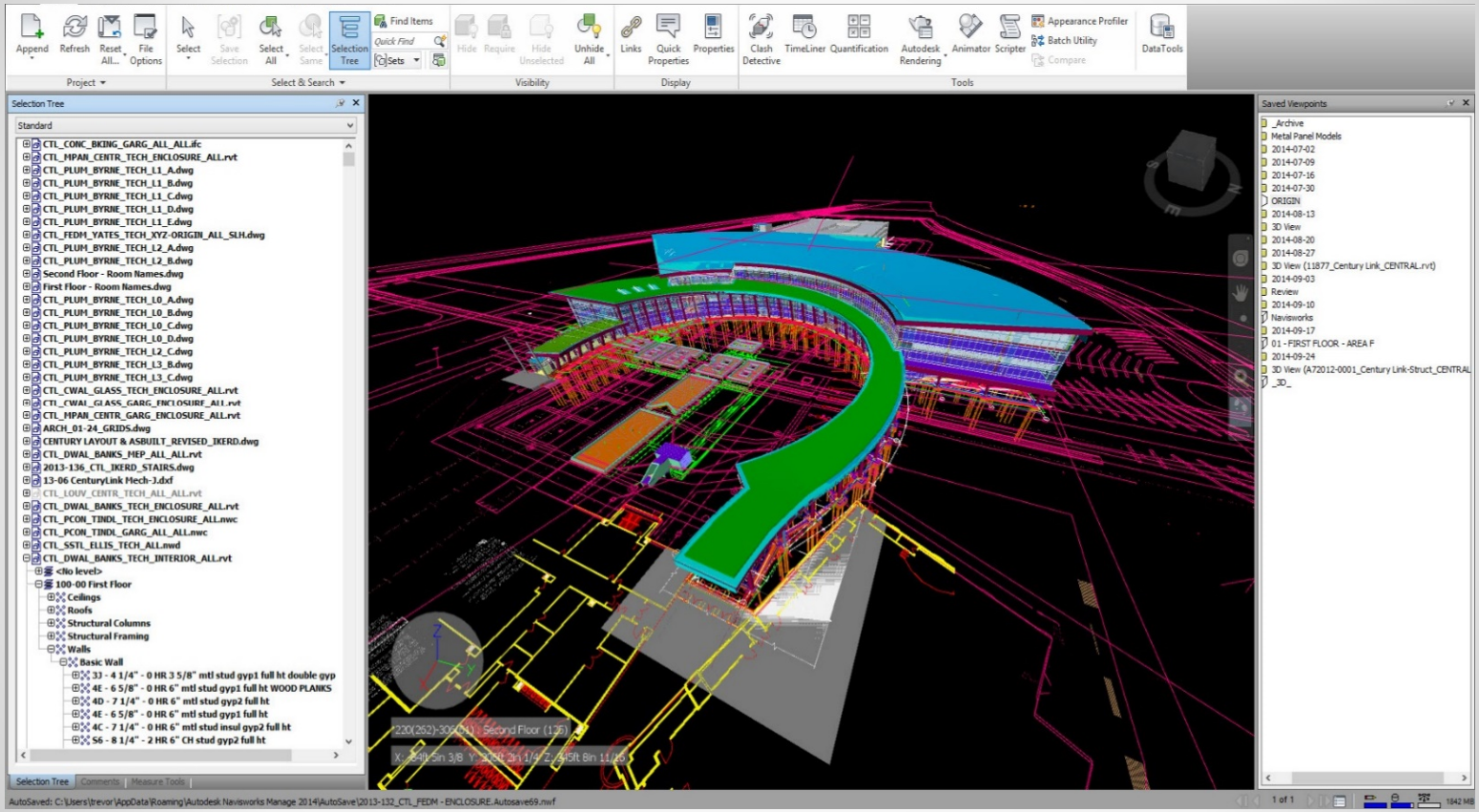








BIM Meetings



Documentation

Meeting Minutes

Date: March 19, 2014

To:	Cleet McHenry Project Executive	Yates	cleetmchenry@wgyates.com	
From:	Schaeffer Harris, EIT Project Coordinator	IKERD	sharris@IKERD.com	940-600-8428
CC:	Will Ikerd, PE, LEED AP Principal	IKERD	wikerd@IKERD.com	214-392-4056

Re: **IKERD # 2013-132 CenturyLink: MEP Coordination Meeting Minutes for 03/19/2014**

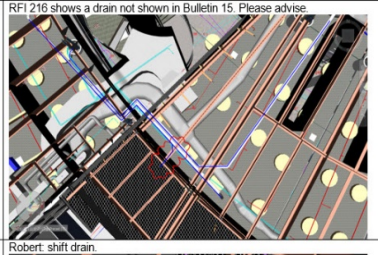
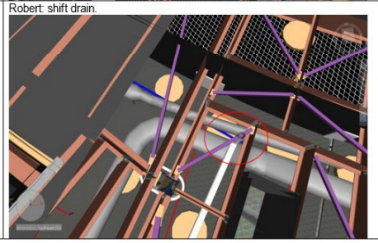
Mr. Cleet McHenry,

The purpose of this report is to give meeting minutes on the above referenced meeting. Please inform us of any items which are not outlined herein that require attention or clarification.

Interior systems (1pm-2pm):

1) No one from the design team was present on the call to provide an update on the new bulletins and answer the questions below.
2) Schedule
   a. The Penthouse duct is a high priority.
   b. IKERD is working to upload the changes from Bulletins 14 and 15 on Monday, March 24th
3) Bulletins:
   a. 14 and 15: IKERD approved for work by Cleet Tuesday, March 18th.
   b. 17-18: Uploaded to 4Projects Tuesday, March 18th.
   c. A conformance set is expected soon
4) MEP Building Duct
   a. The outside air duct for AHU-1 is already installed. CEC instructs that duct to be changed in Bulletin 18. Can the installed duct and damper size be maintained outside the restroom?
   b. Exhaust Air is not installed yet. Johnny has requested coring the beam.
5) MEP Building Drains: An open RFI requests adjusted routing on the drains in generator room.
6) Lowering Ceilings for Lights:
   a. Noah will confirm that these RFI's have been answered.
7) Penthouse Ductwork: Nick is providing plenum designs for the Supply and Return Air. IKERD is assisting him with special coordination.
8) Installing future equipment is still to be coordinated by Moody Nolan
9) West chase size: Nick will review size.
10) IKERD requested an updated schedule from Yates.
11) IKERD will upload a model with viewpoints of fire sprinkler clashes and notify Justin Rader.

Model Review: See screen shots on the following page. The item numbers correlate to the view-point numbers saved in the federated model dated March 19, 2014.

Name	Image	Sheet
Monumental Stair Drains	RFI 216 shows a drain not shown in Bulletin 15. Please advise. 	RFI 216 PSK-11
Drain in Bracing	Robert: shift drain. 	

MOODY•NOLAN
RESPONSIVE ARCHITECTURE

YATES
CONSTRUCTION

LOD Specification

BIM is visual – Use Pictures!!!

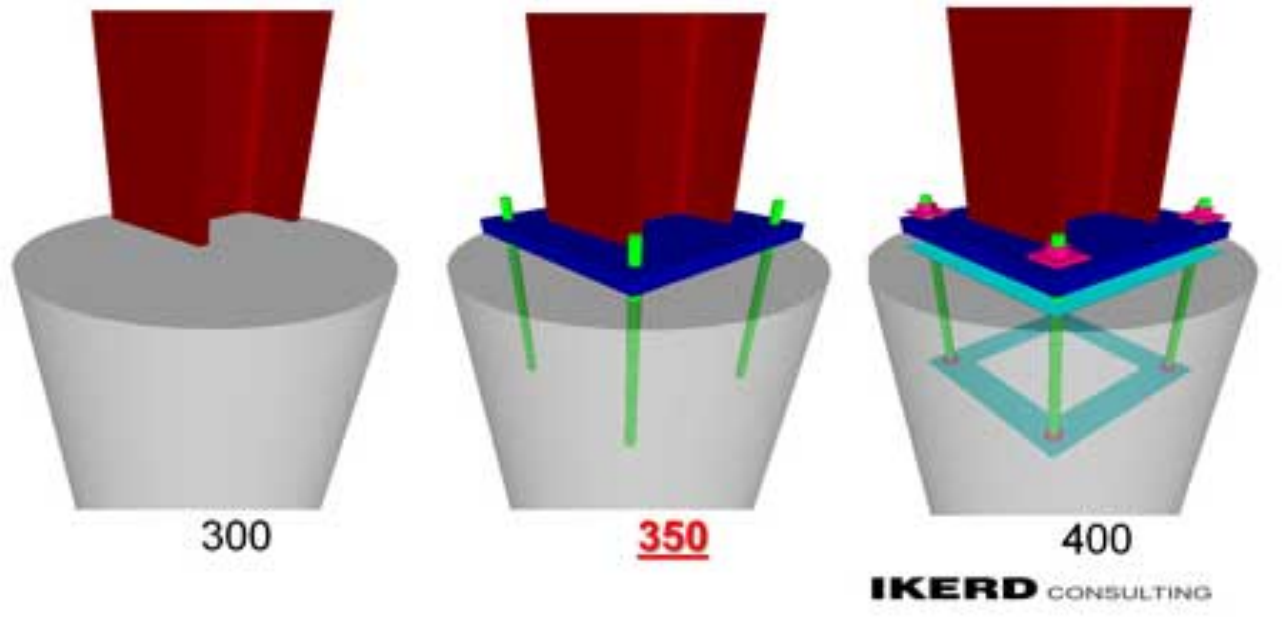
Mechanical Ductwork: Ducts, equipment, and accessories, be sure to include outside dimensions of insulation and supports.

Mechanical Piping: The model detail will vary based on elements, Small diameter (less than 1-1/2" NPS) field-routed piping is not required, but connection points and access should be allowed for.

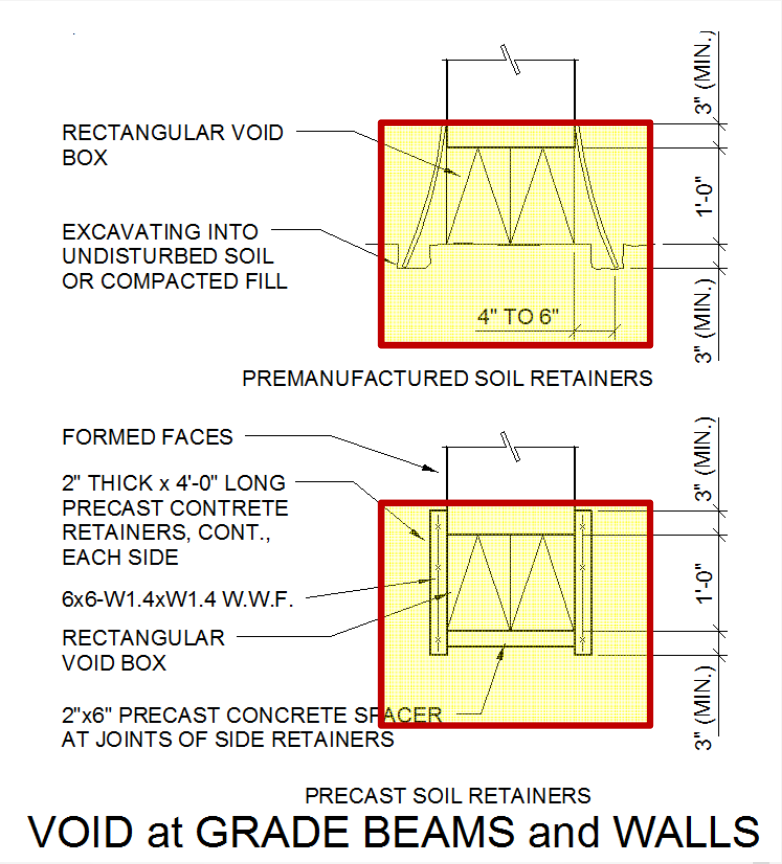
Electrical: Conduit/MC cabling (2" outside diameter and larger), homeruns and mass conduits occupying more than 4 sq. in., light fixtures, junction boxes, all connections to other trades even if smaller than 2" outside diameter and include wire sizes,

Plumbing: Piping, slope requirements, fixtures, insulation and equipment.

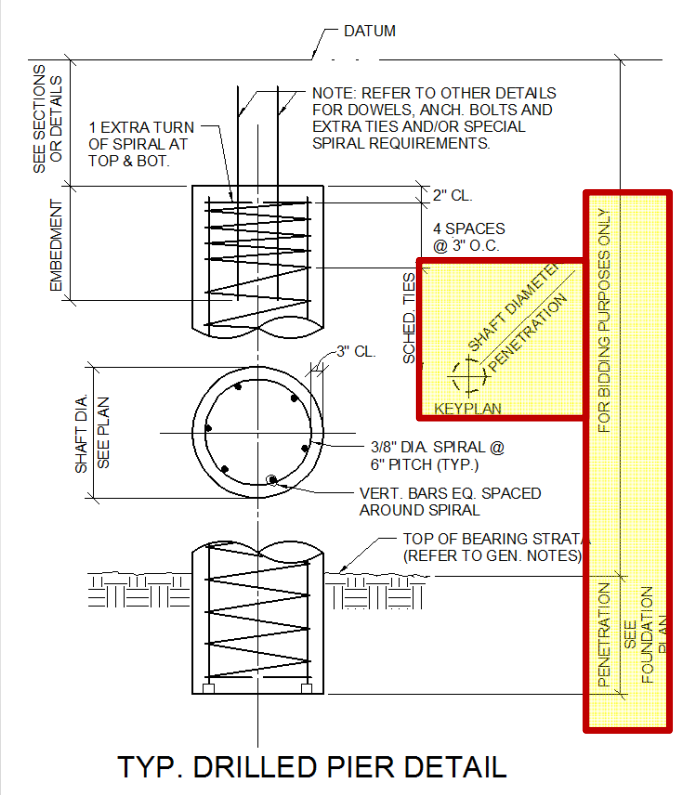
LOD 350 vs 400 - Learning



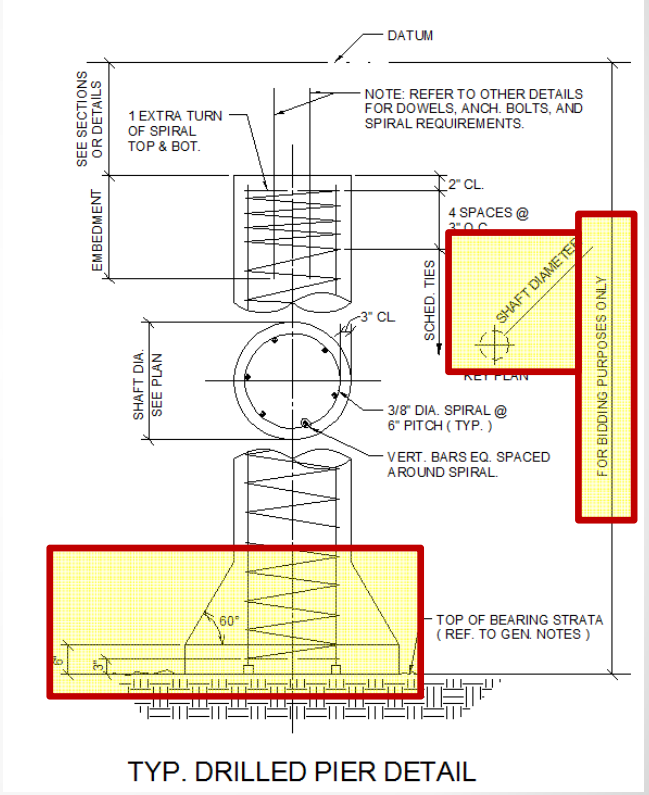
350 LOD Grade Beam Content



300 LOD Foundation

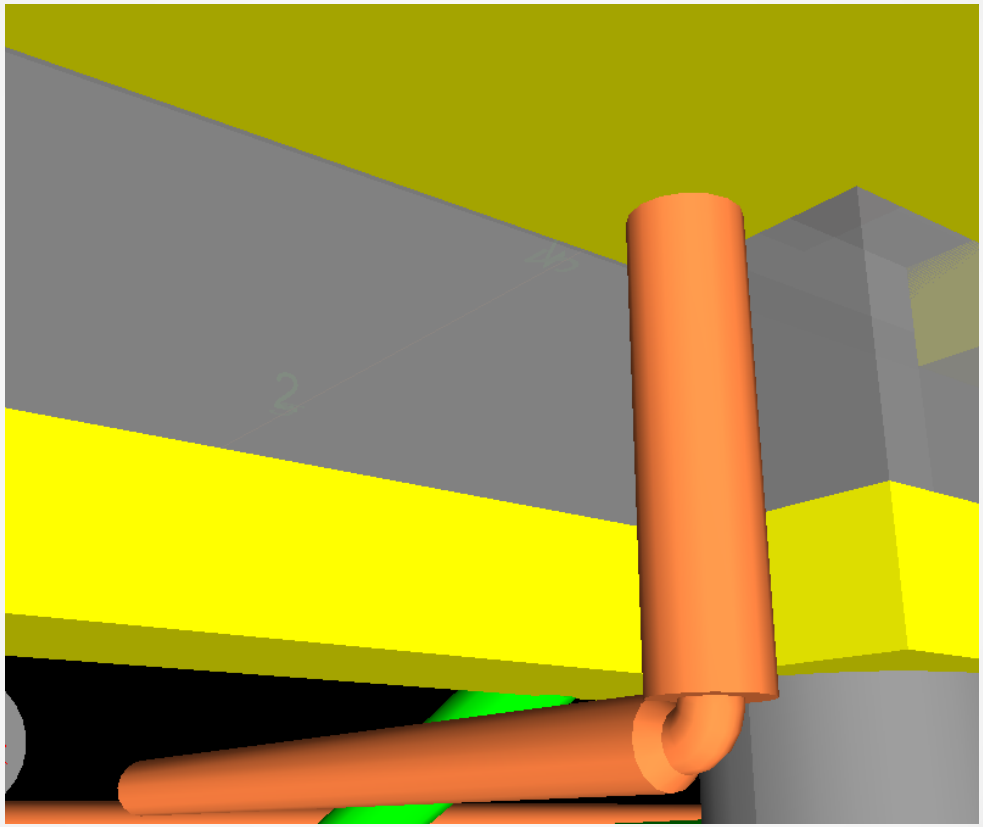


TYP. DRILLED PIER DETAIL

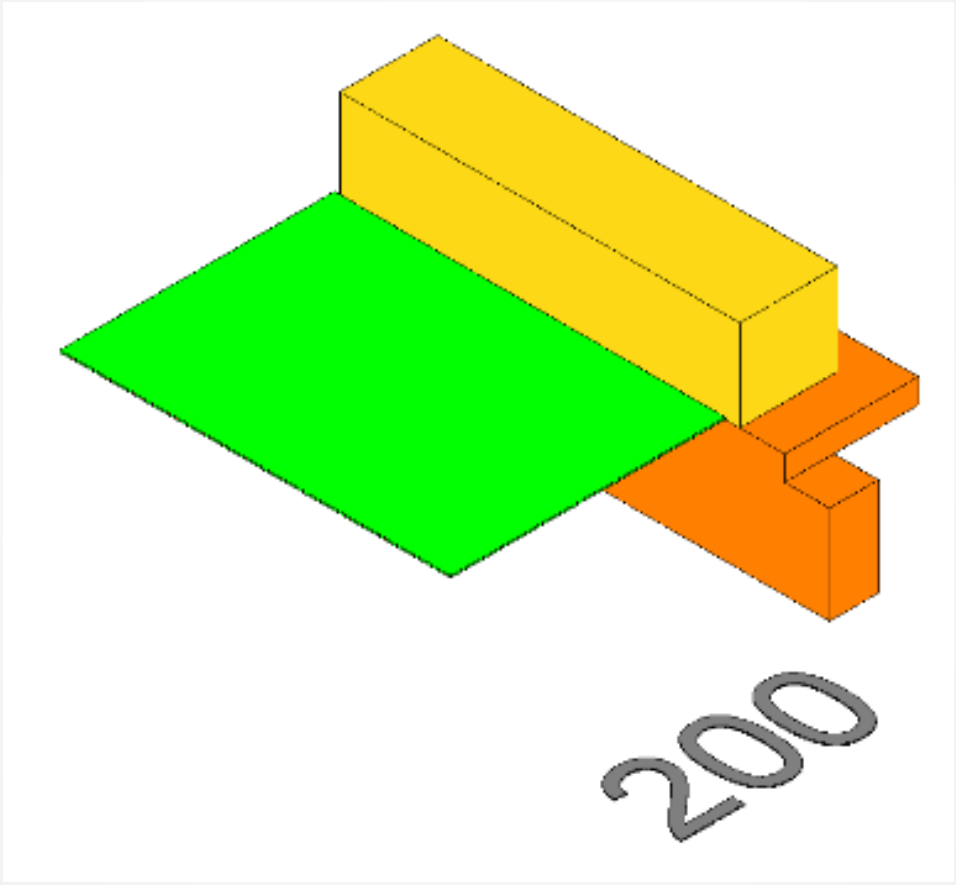


TYP. DRILLED PIER DETAIL

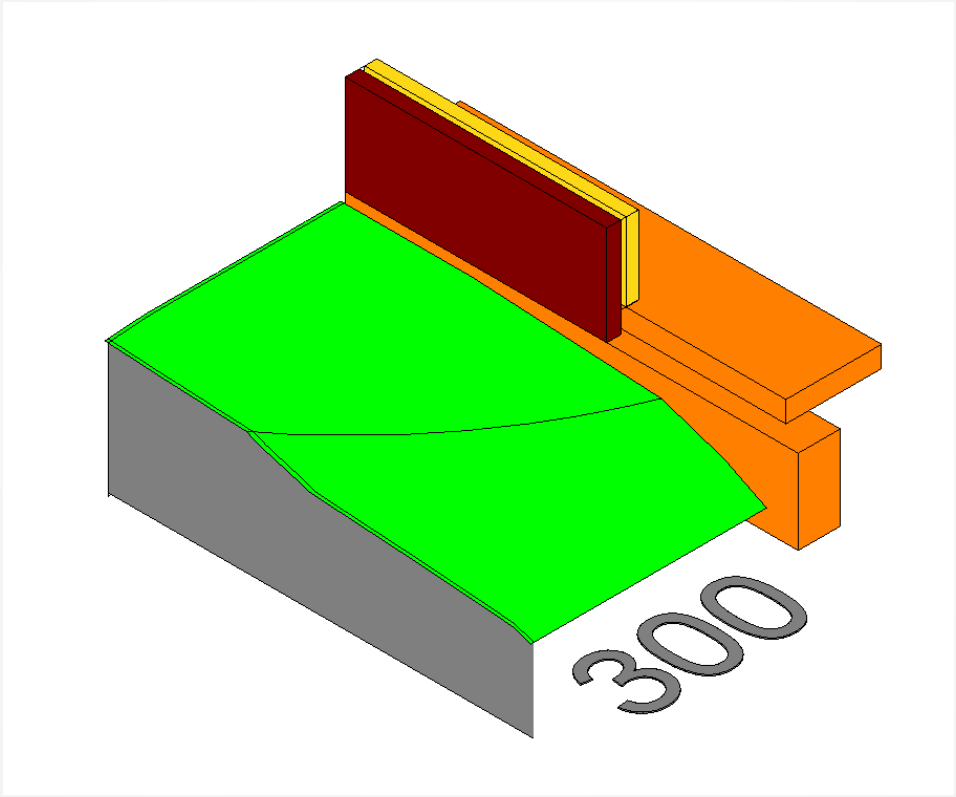
PLUMBING RISERS THRU STRUCTURE



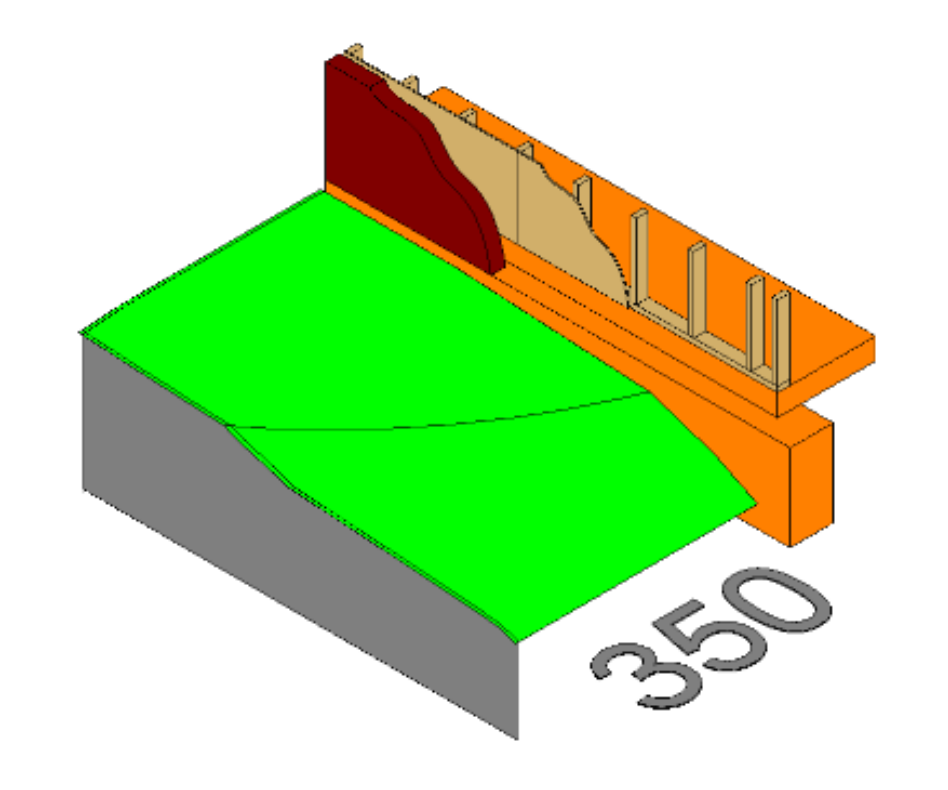
LOD 200

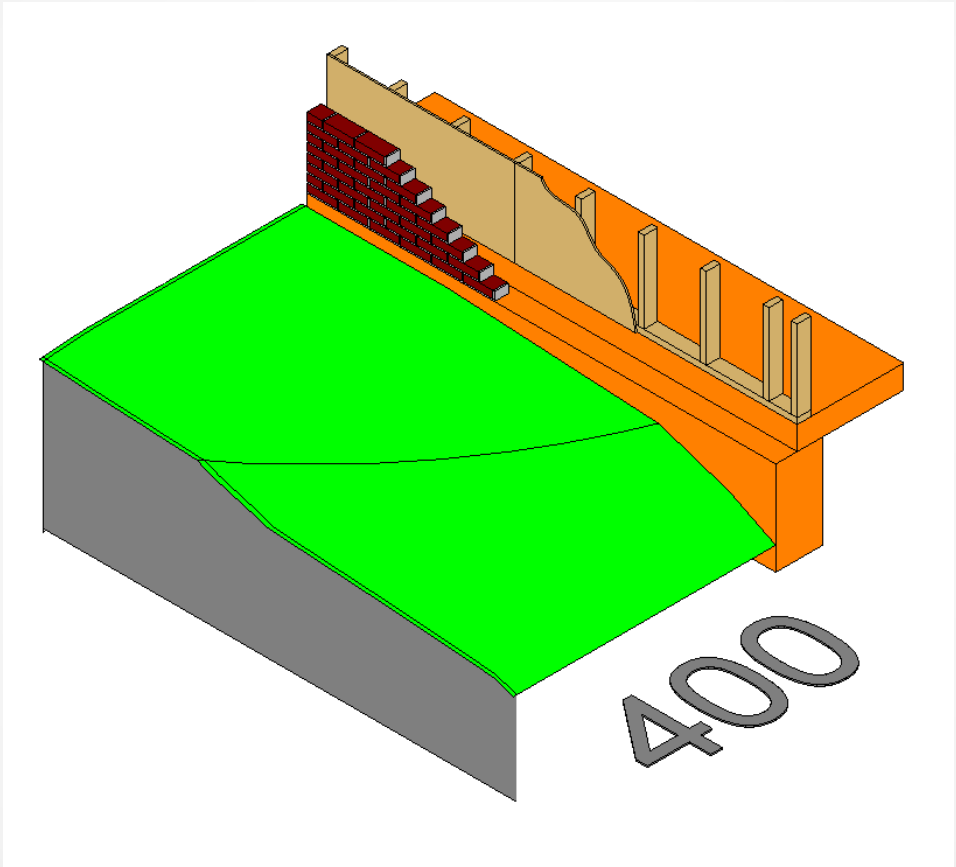


LOD 300

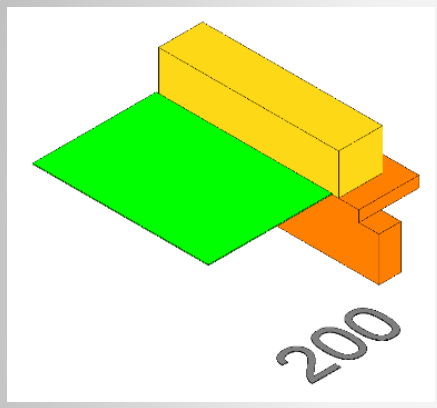


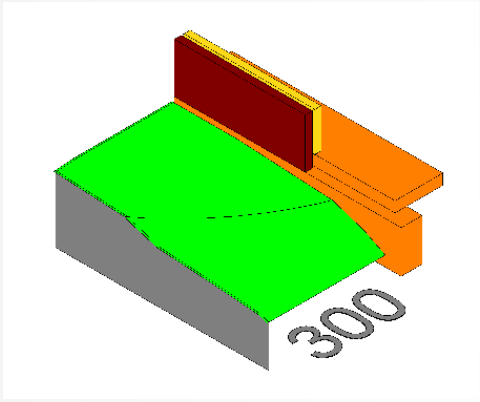
LOD 350

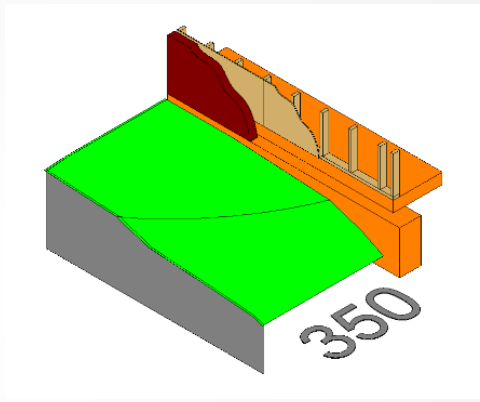


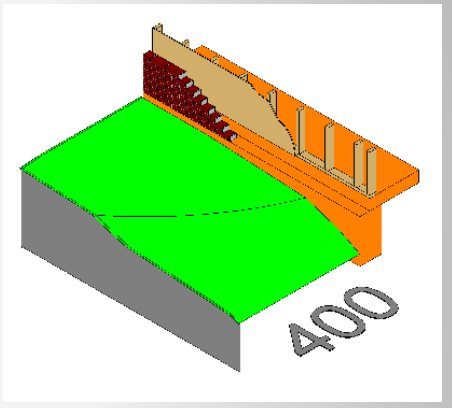

400

LOD With Civil Surfaces

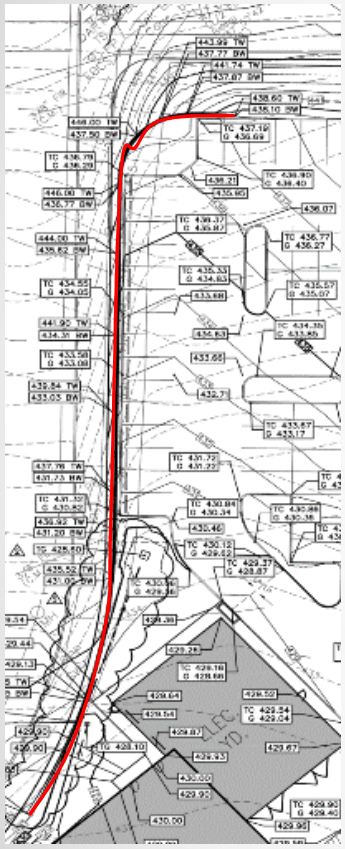


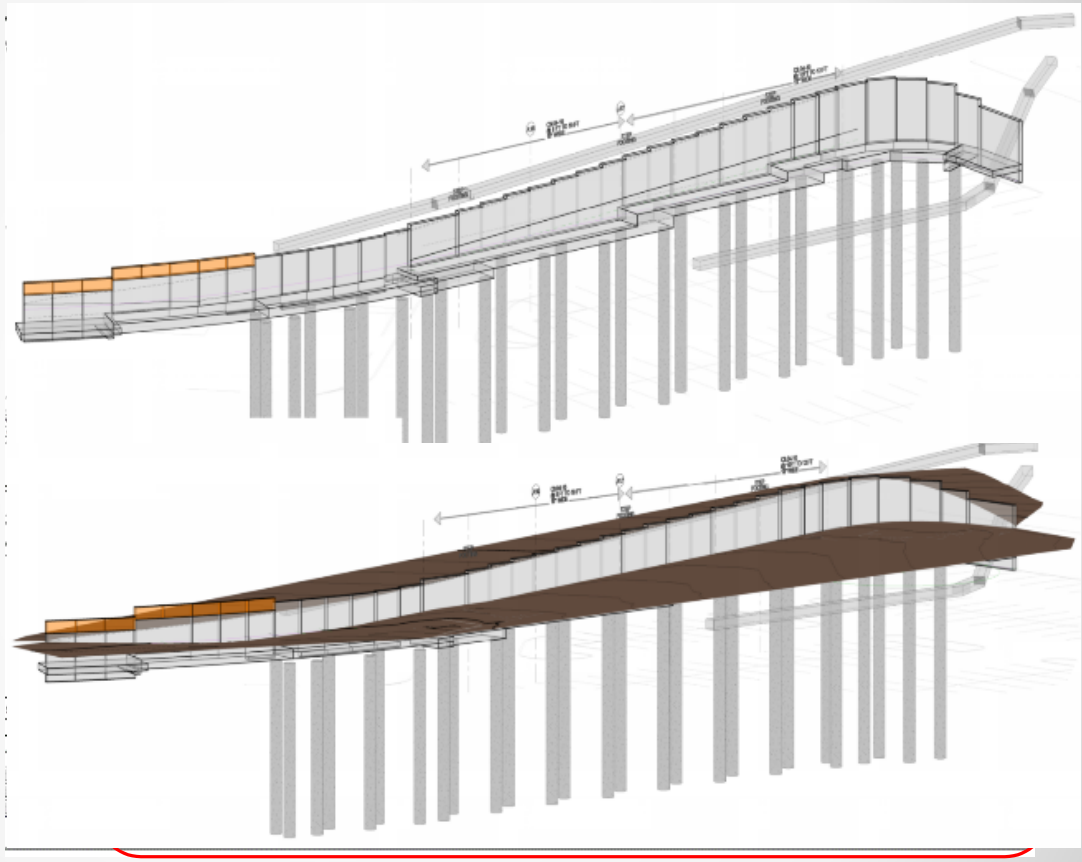




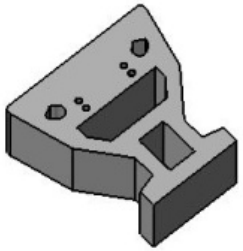


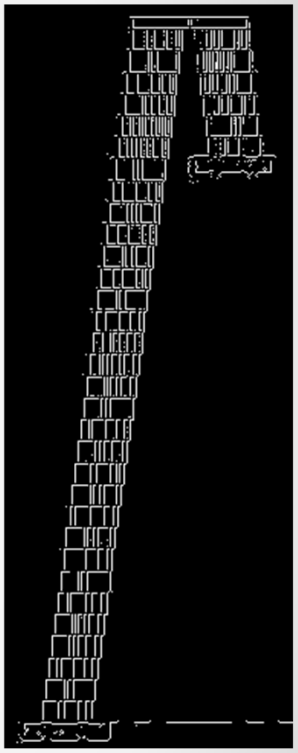
LOD 350 RETAINING WALLS W/ POUR JOINTS





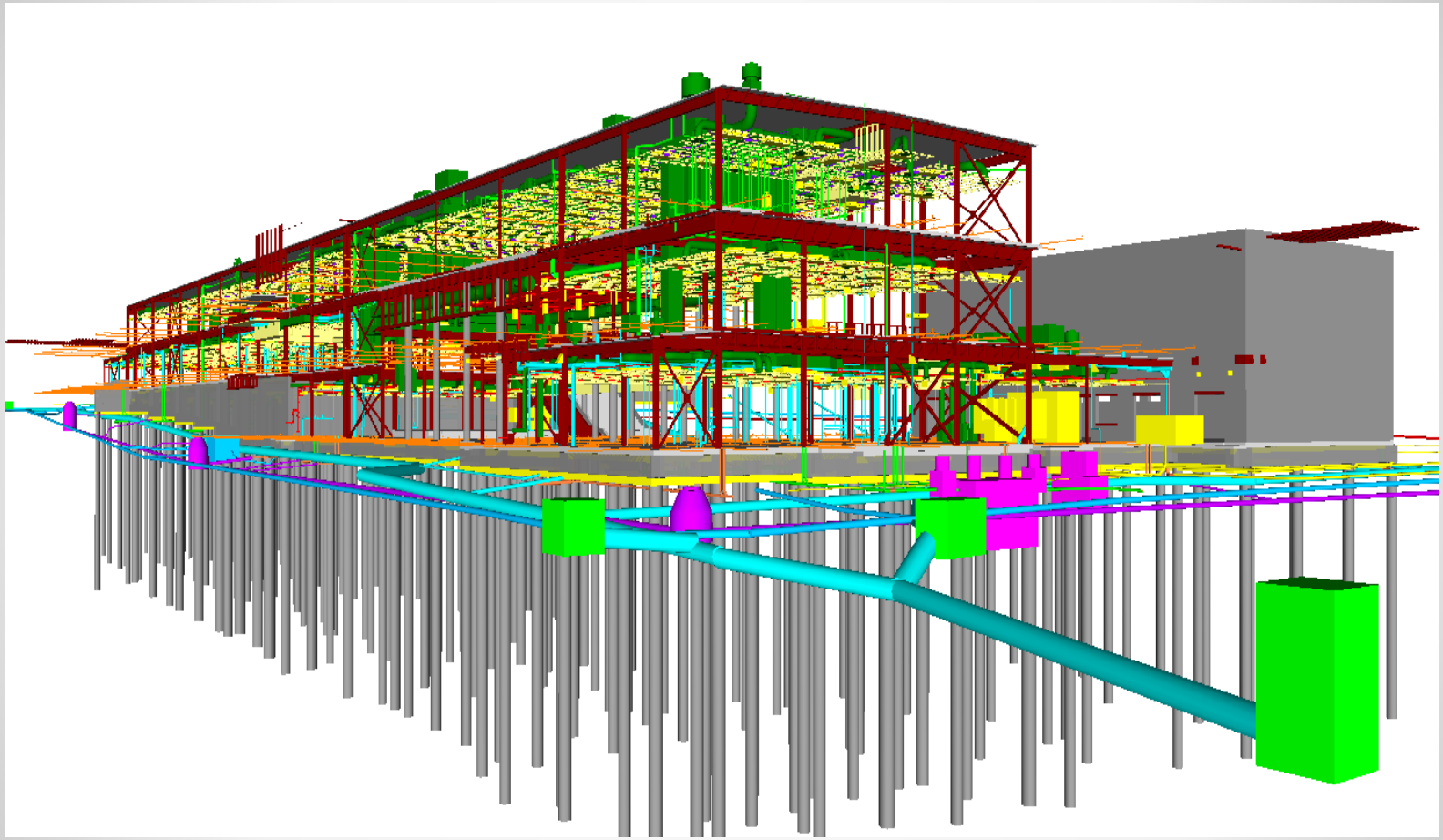
RETAINING WALL EXAMPLE

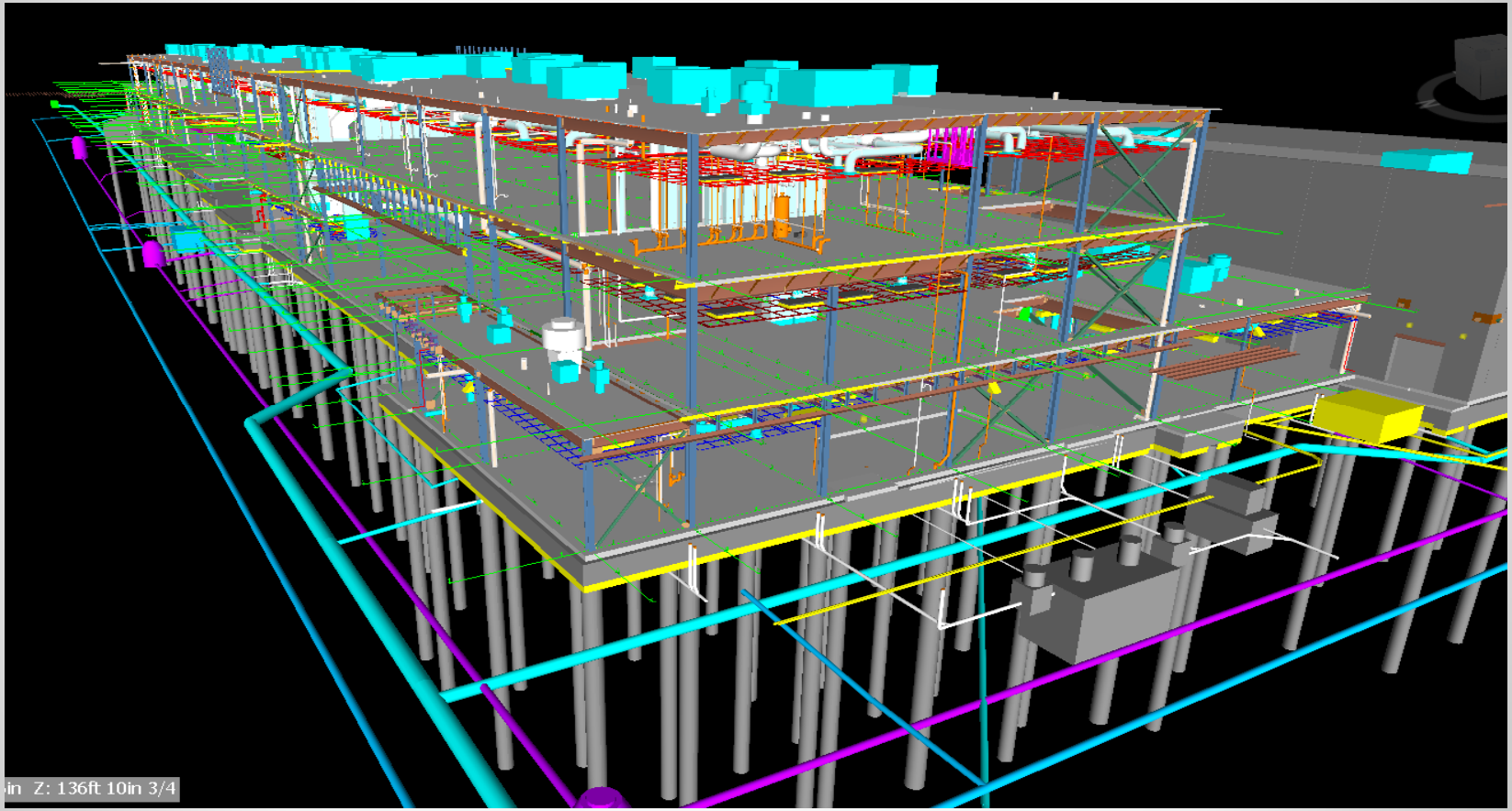




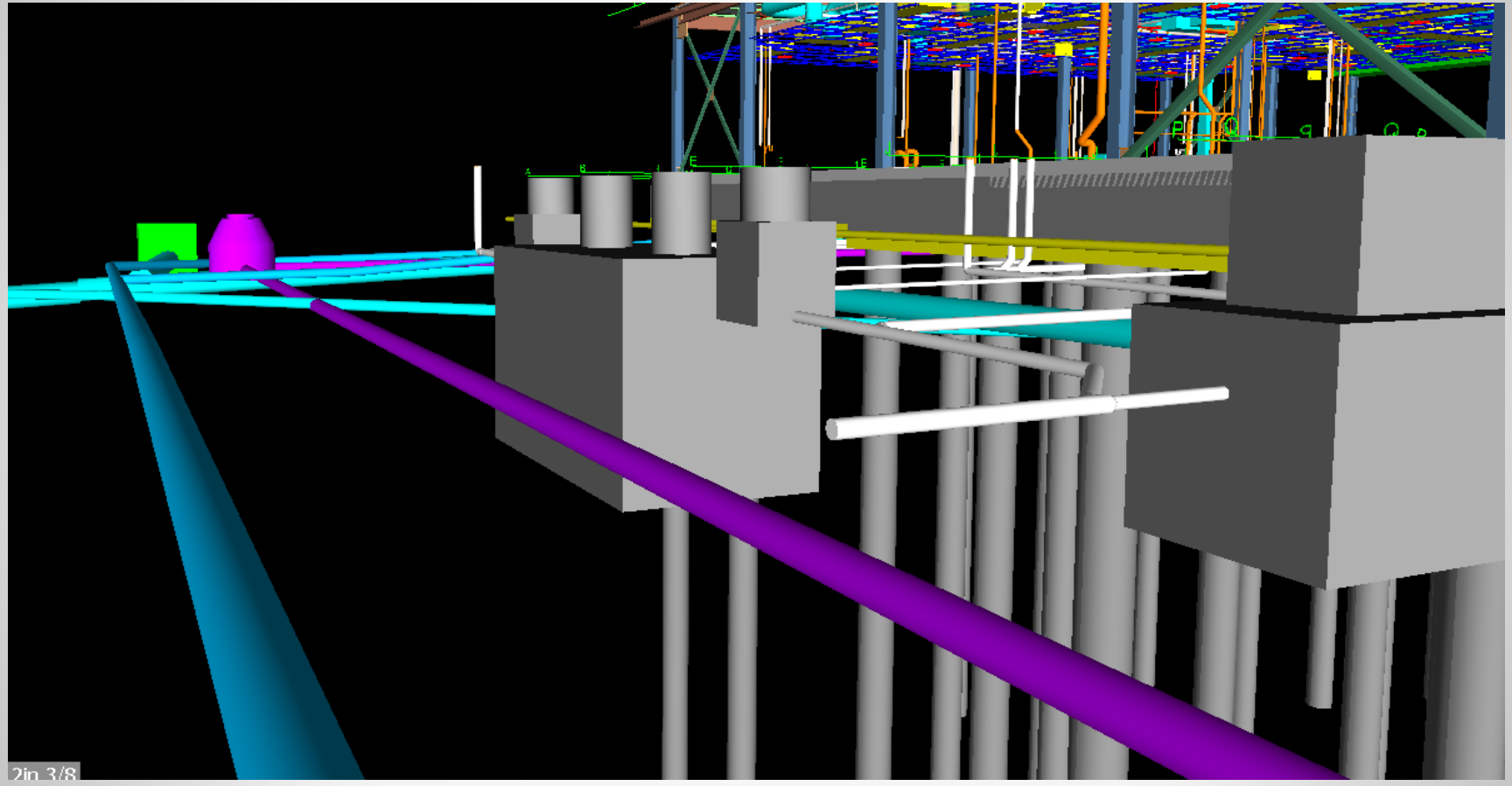
LOD 300

LOD 350



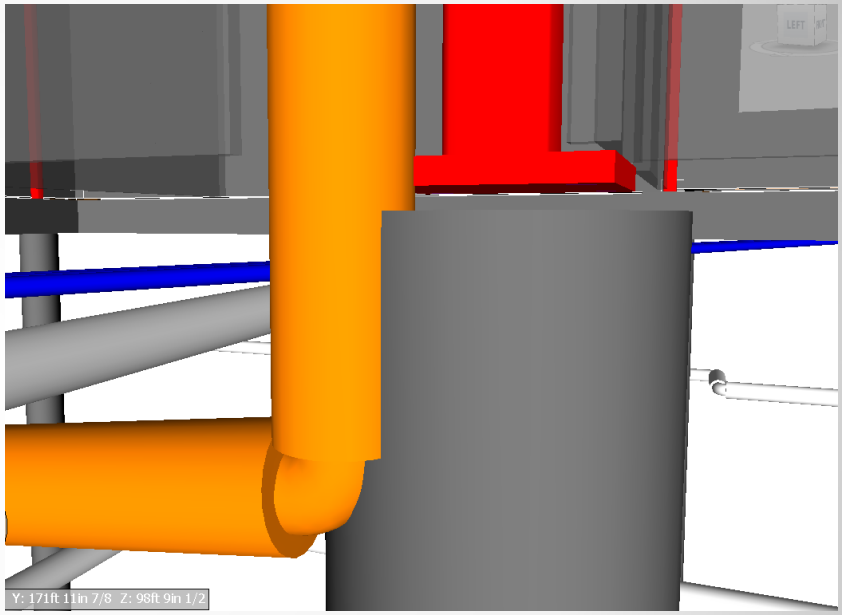

in Z: 136ft 10in 3/4

JOB DESCRIPTION & SERVICES



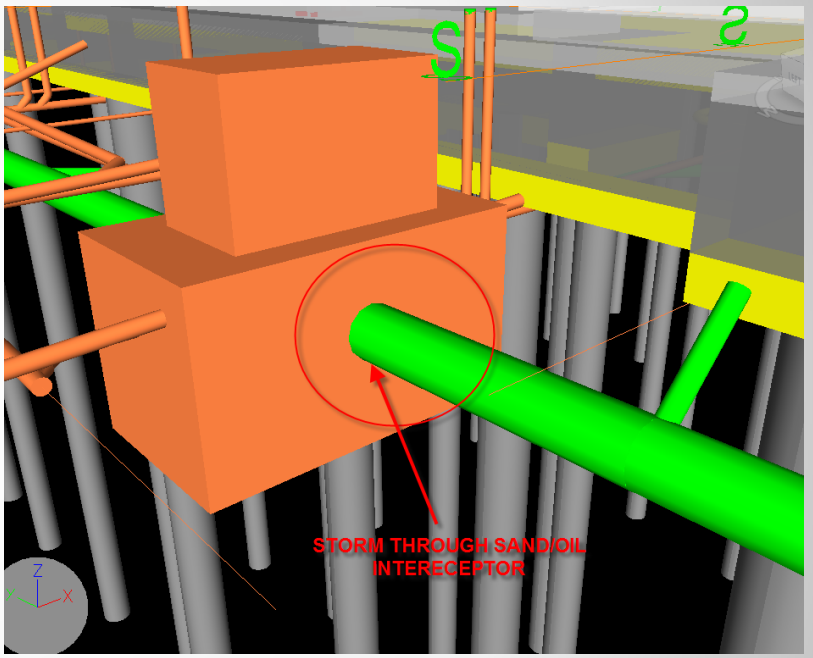
TYPICAL DESIGN ISSUES

- EASY TO CATCH
- MAY STILL REQUIRE RFI'S
- SOLUTIONS TYPICALLY COME QUICKLY (LITTLE TO NO EFFECT ON OVERALL COORDINATION SCHEDULE)



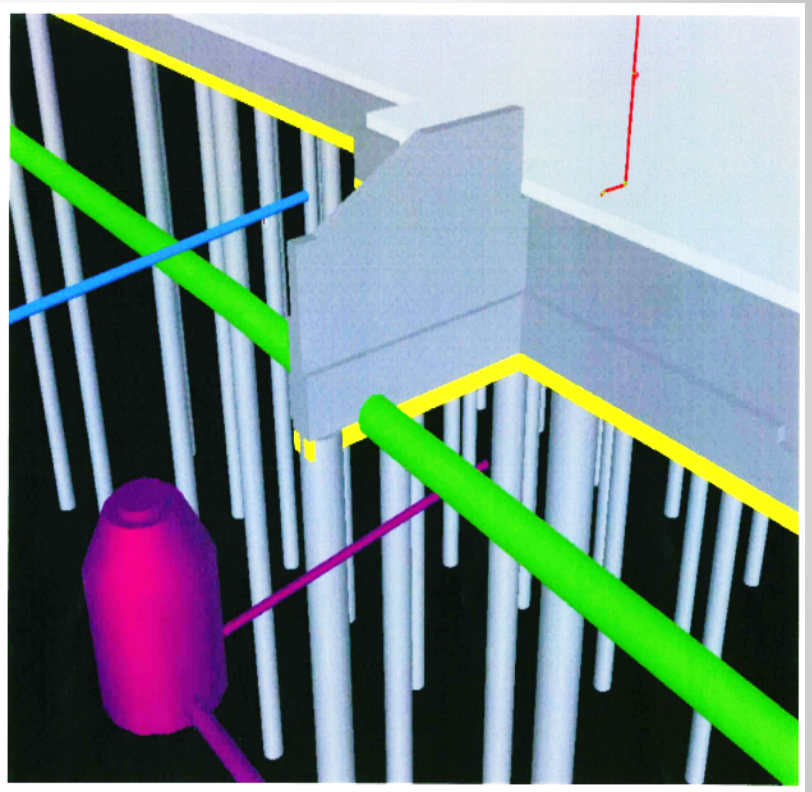
CHECK SUBGRADE STRUCTURES

- THE TRUE SIZE OF THINGS LIKE SUMP PITS, GREASE TRAPS, ACID WASTE TRAPS, OR SAND/OIL INTERCEPTORS ARE NOT ALWAYS REPRESENTED
- WHEN THEIR TRUE SIZE IS ACCOUNTED FOR, THERE ARE TYPICALLY INTERFERENCES WITH CIVIL UTILITIES



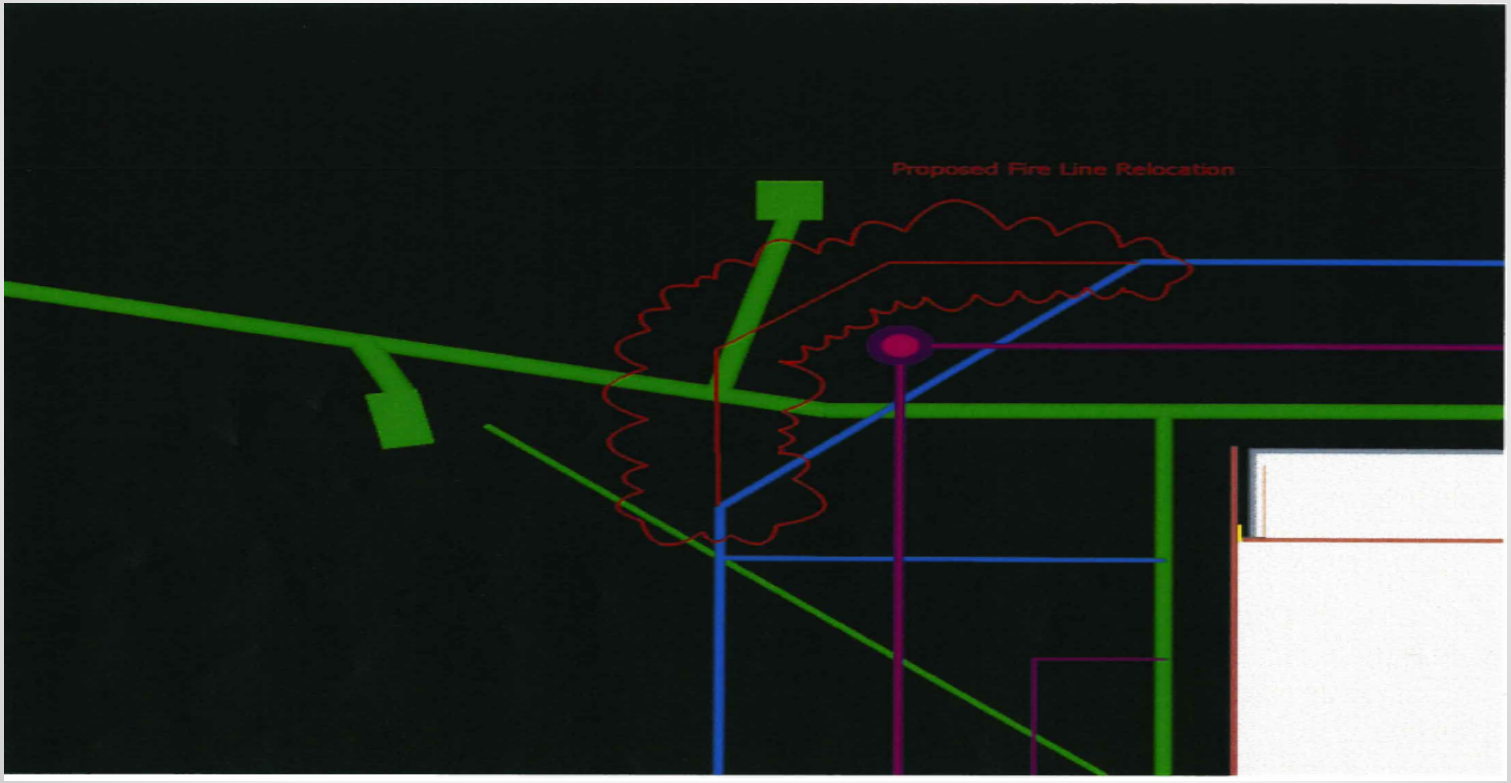
CIVIL UTILITY INTERFERENCES

- UTILITIES WERE NOT DEEP ENOUGH IN AREAS AND WERE HITTING STRUCTURE



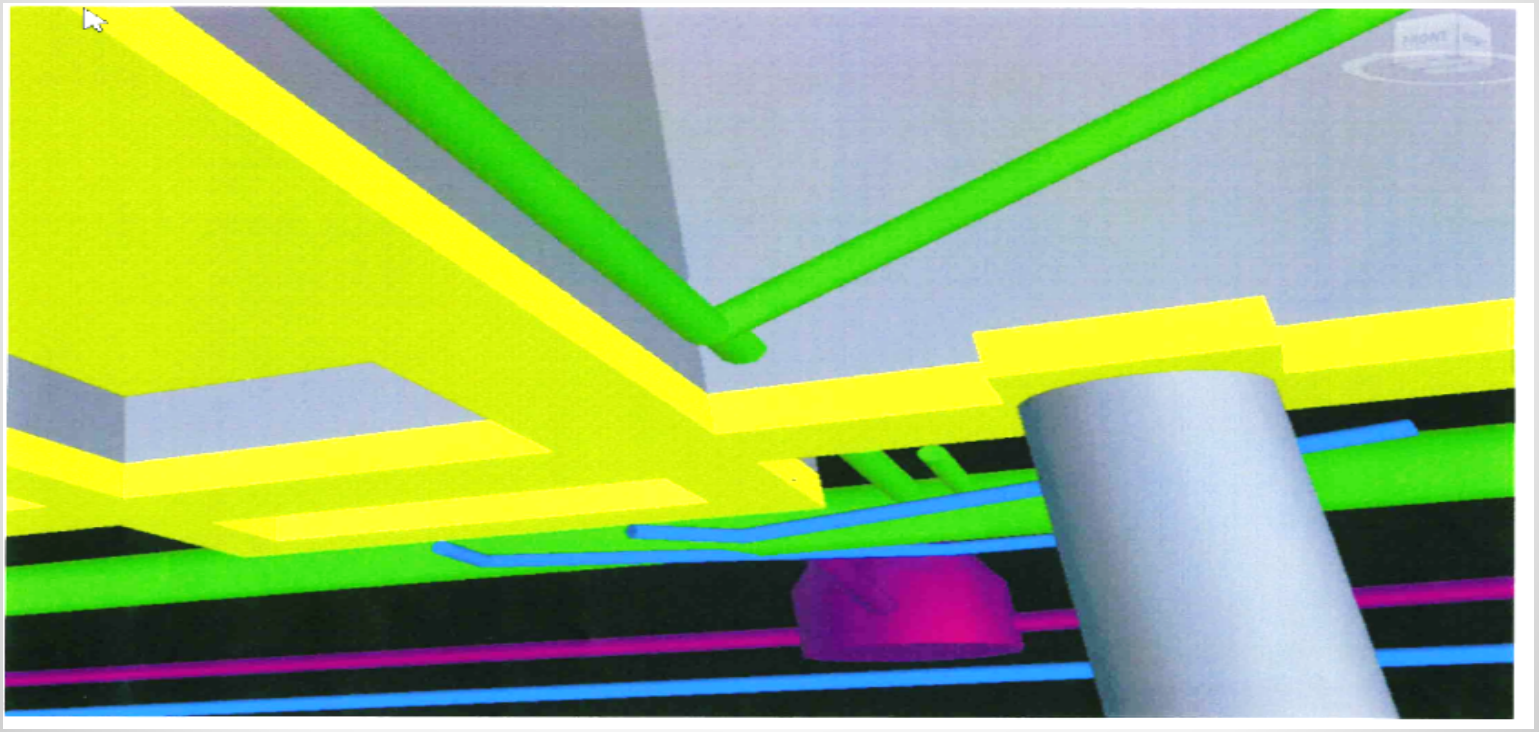
CIVIL UTILITY INTERFERENCES

- CIVIL UTILITIES WERE INTERFERING WITH THEMSELVES



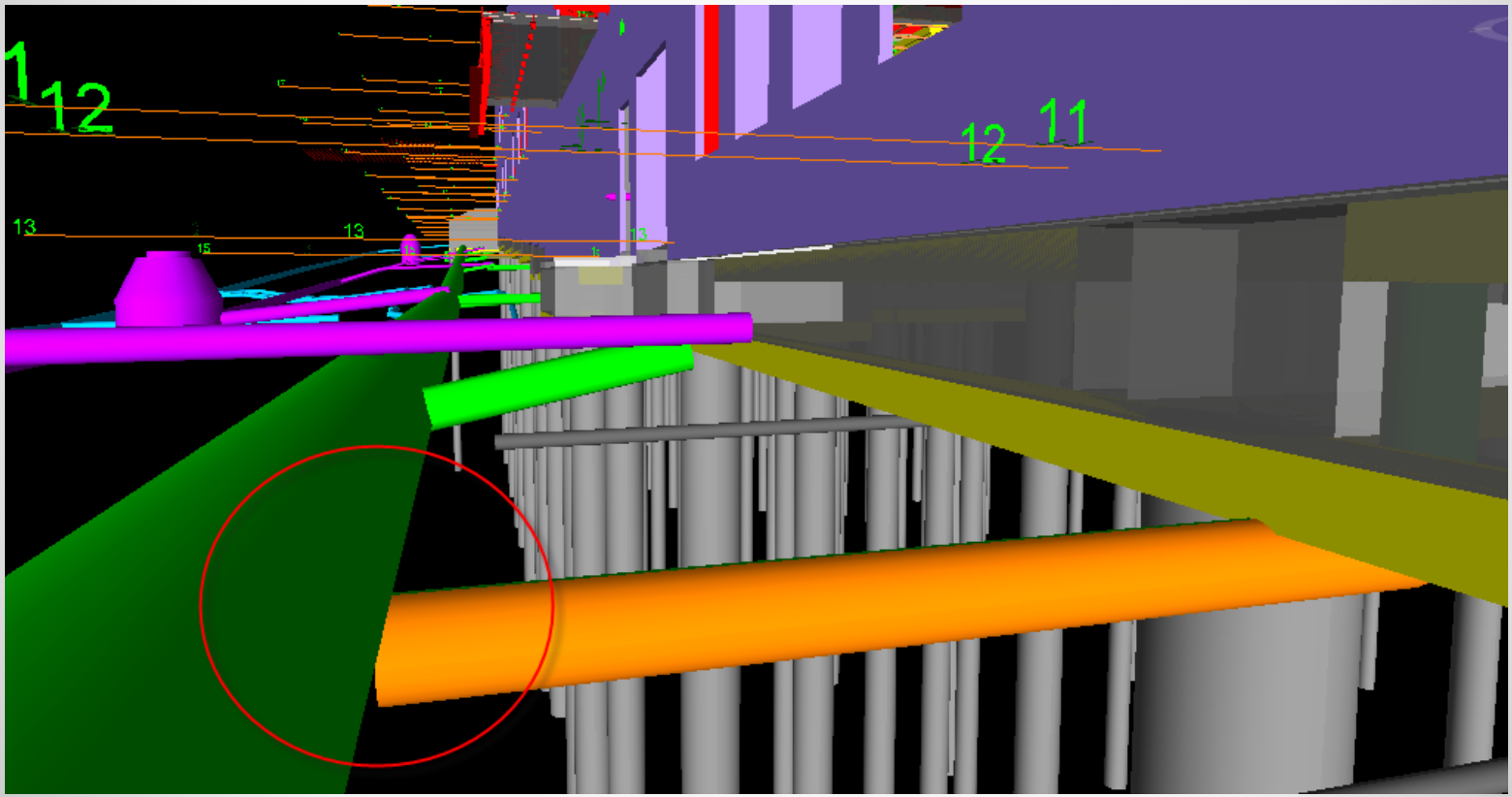
CIVIL UTILITY INTERFERENCES

- UTILITIES WERE NOT DEEP ENOUGH IN AREAS AND WERE HITTING STRUCTURE



PLUMBING AND CIVIL NOT COORDINATED

- ORIGINAL INVERT ELEVATIONS REQUIRE SLEEVE



Recap

- Civil 3D and Revit Interaction
- Global and state plane coordinate system
- Level of Development (LOD) for design, construction, and FM in civil and foundation modeling.