CES322236 - Connected BIM Interoperability

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Parsons Corporation

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Autodesk

AUTODESK. UNIVERSITY

About the speaker

Tushar Talele, BIM Engineer

Based in Denver, Colorado.

BIM Specialist with Masters degree in Construction Management and Tushar’s goal in BIM is to bring new technology into daily practice by creating procedures and tools that can be used by everyone.

Assisting team Parsons Construction Group for integrated BIM and Digital Twin delivery.

6 plus years in Construction Industry

About the speaker

Sean Hulbert

Is a registered professional engineer in the state of Oregon, and a Designated Support Specialist at Autodesk, Inc., (supporting Infrastructure Design Tools).

Learning Objectives

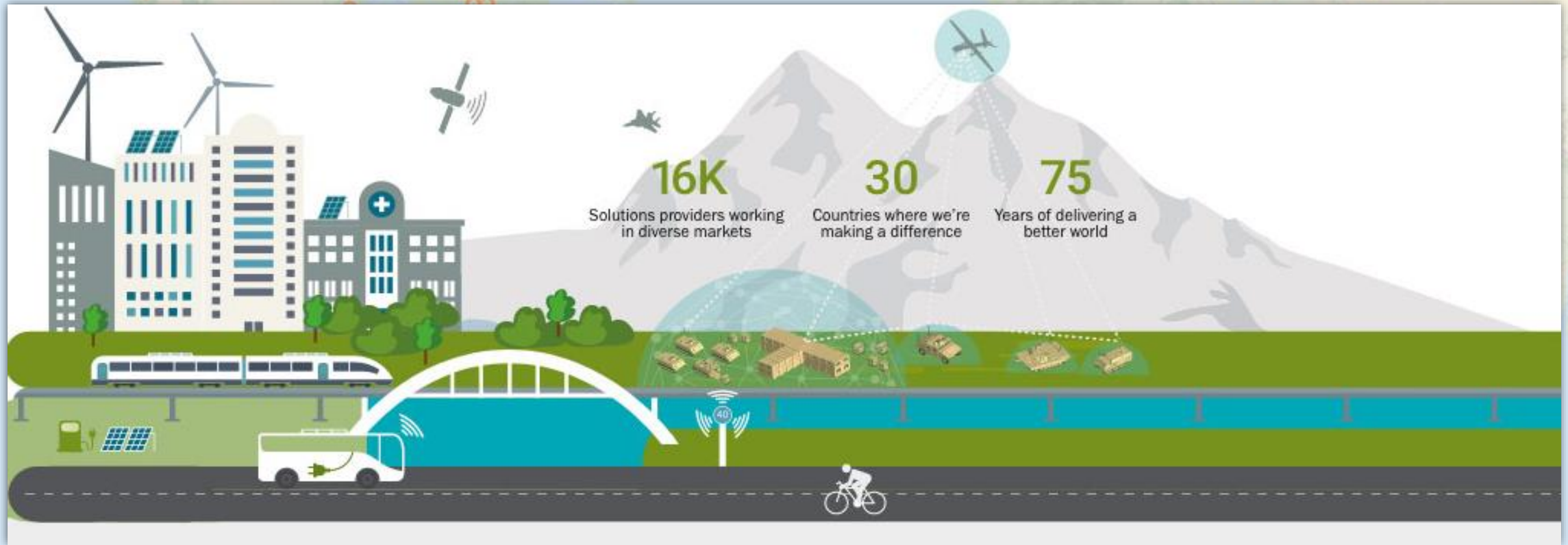
- ✓ Discover the workflow for using InfraWorks, Autodesk Civil 3D, Inventor, Revit and Navisworks
- ✓ Discover the process of Transportation Modeling
- ✓ Learn about interoperability challenges and preparing data for consumption
- ✓ Lessons learned: solutions

Class Summary

- ✓ Model Centric Workflow
- ✓ Preparing Data for consumption
- ✓ Data Translation – Alignment Design Data For InfraWorks
- ✓ Modeling Custom Bridge Components using Inventor
- ✓ Detailed Construction Planning in Navisworks
- ✓ Future Advancement Wishlist

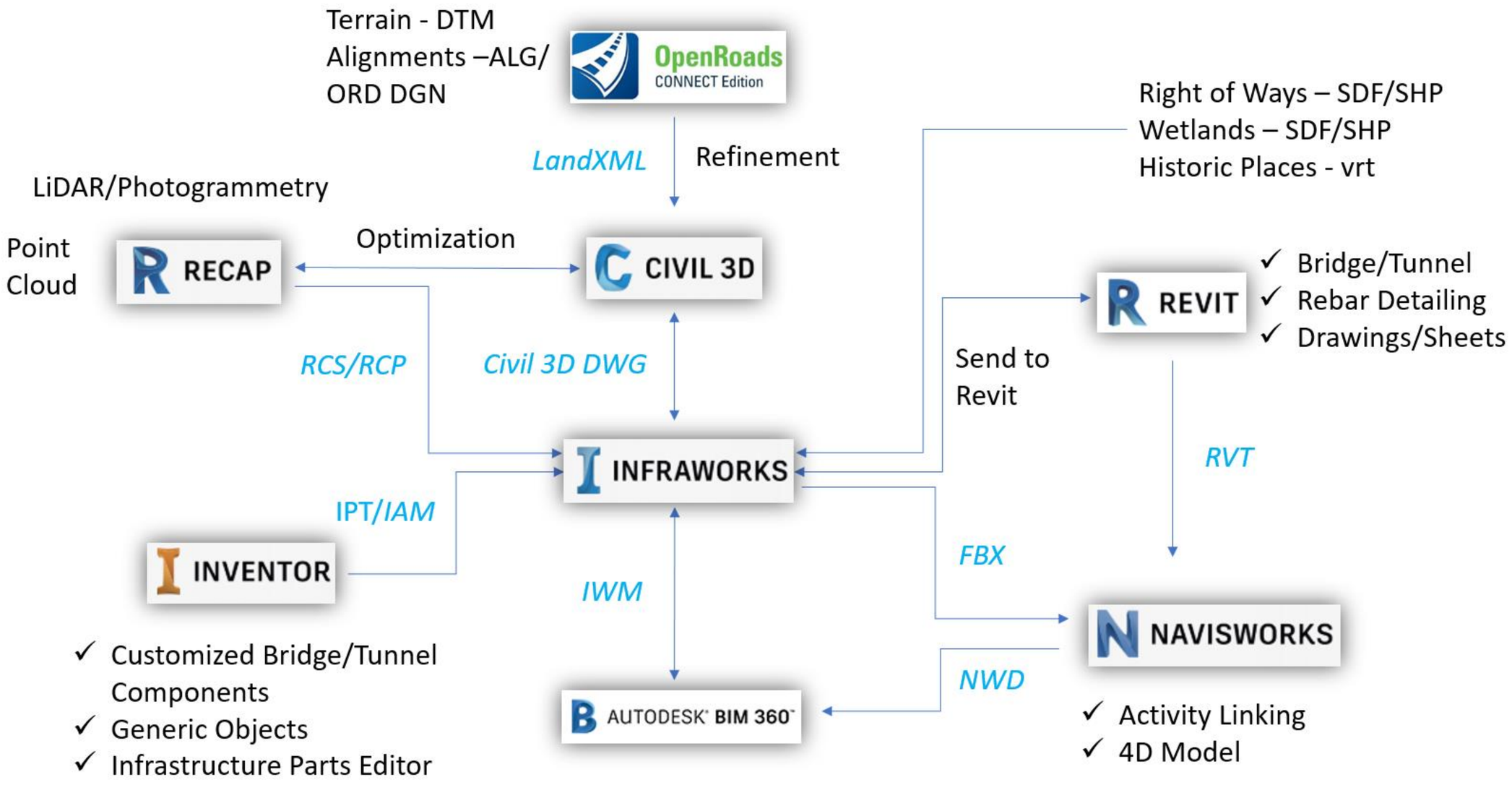
Parsons In Brief

"Global solutions provider focused on the defense, intelligence, and critical infrastructure markets"



Model Centric Workflow

InfraWorks Led Workflow for Transportation Modeling

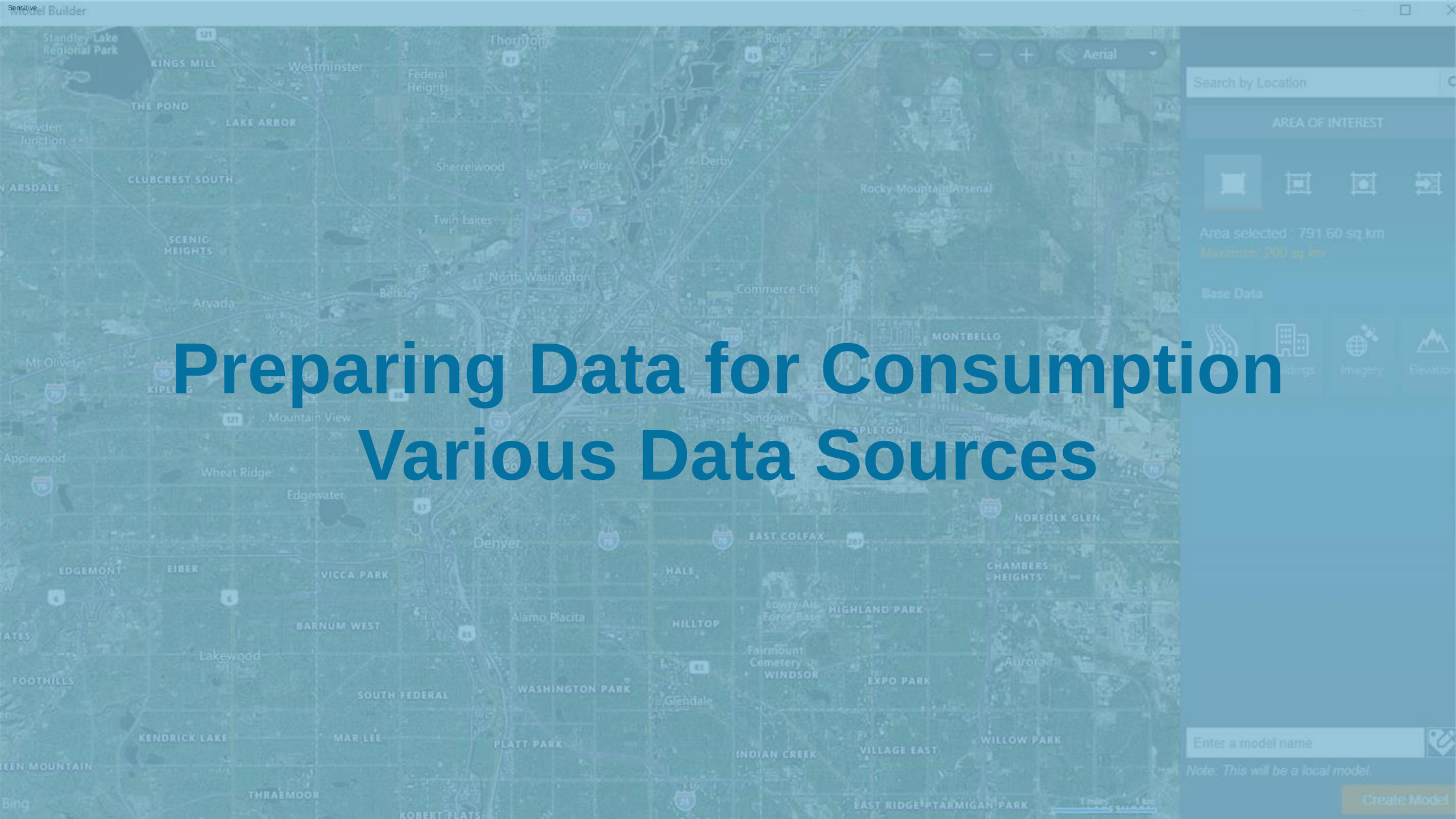


InfraWorks Led Workflow for Transportation Modeling

Why InfraWorks?

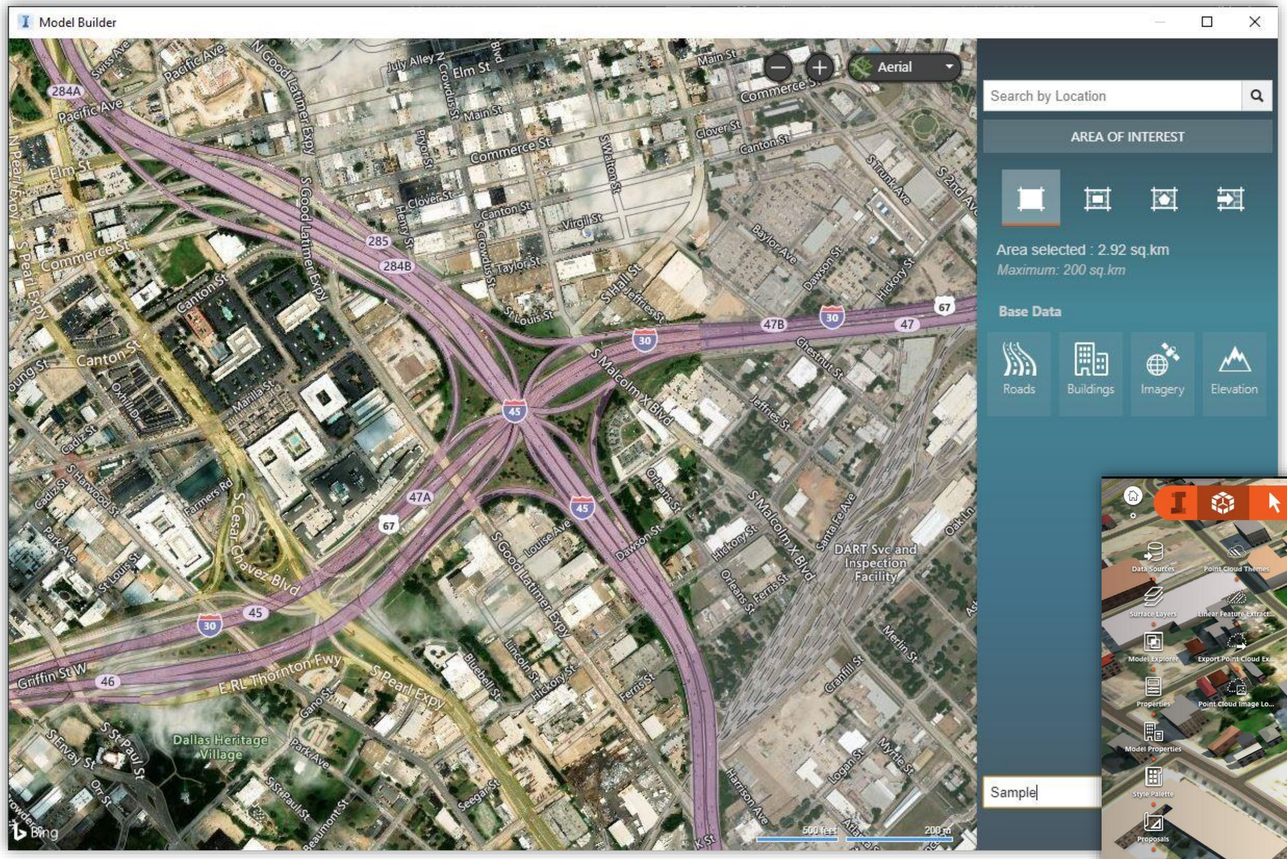
Selection Criteria and Point of View from contractor’s perspectives

- ✓ Easy to use Interface
- ✓ Learning Curve
- ✓ Conceptual iteration of design ideas
- ✓ Enhancing Meetings
- ✓ 3D Visualizations
- ✓ Leveraging available AEC tools



Preparing Data for Consumption
Various Data Sources

Preparing Data for Consumption



Model Builder Creating New Project

Model Builder Data

Preparing Data for Consumption

Terrain - DTM
Alignments –ALG/
ORD DGN

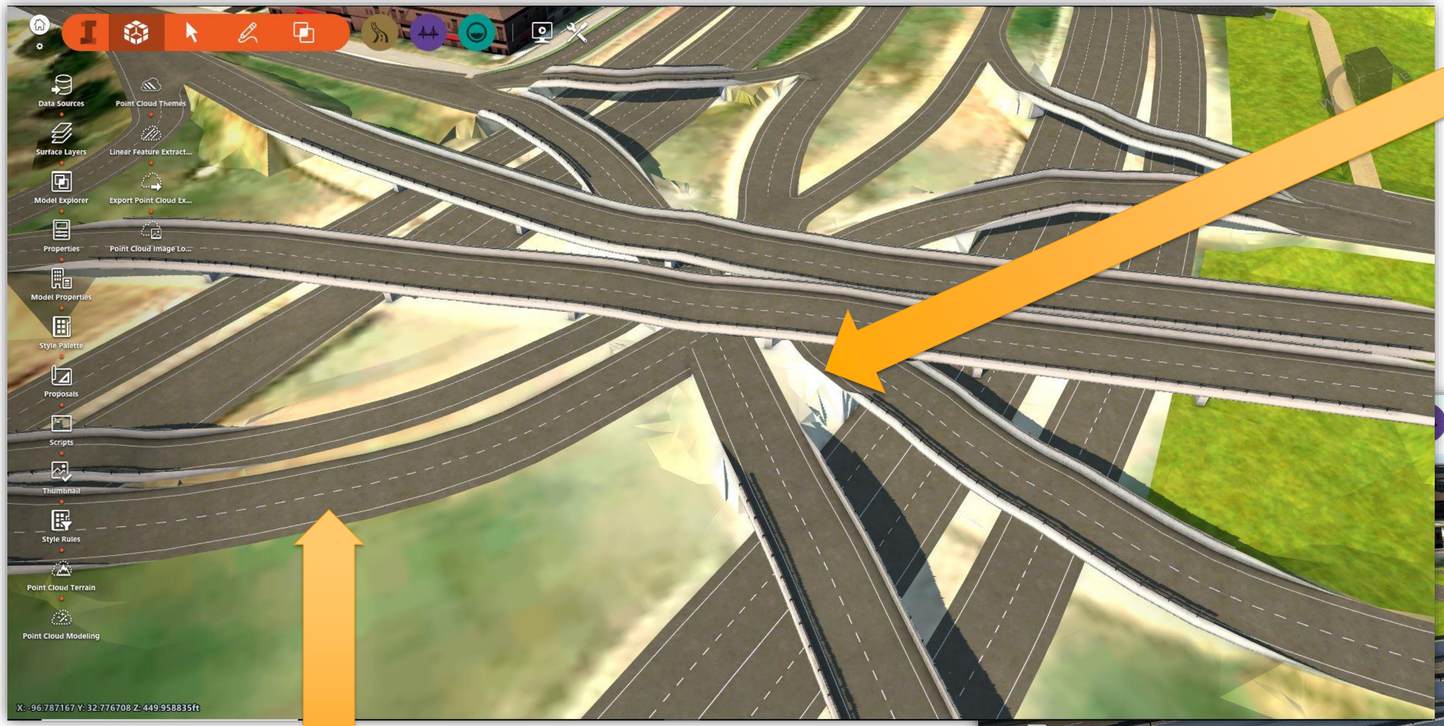
OpenRoads CONNECT Edition

LandXML

CIVIL 3D

Civil 3D DWG

INFRAWORKS



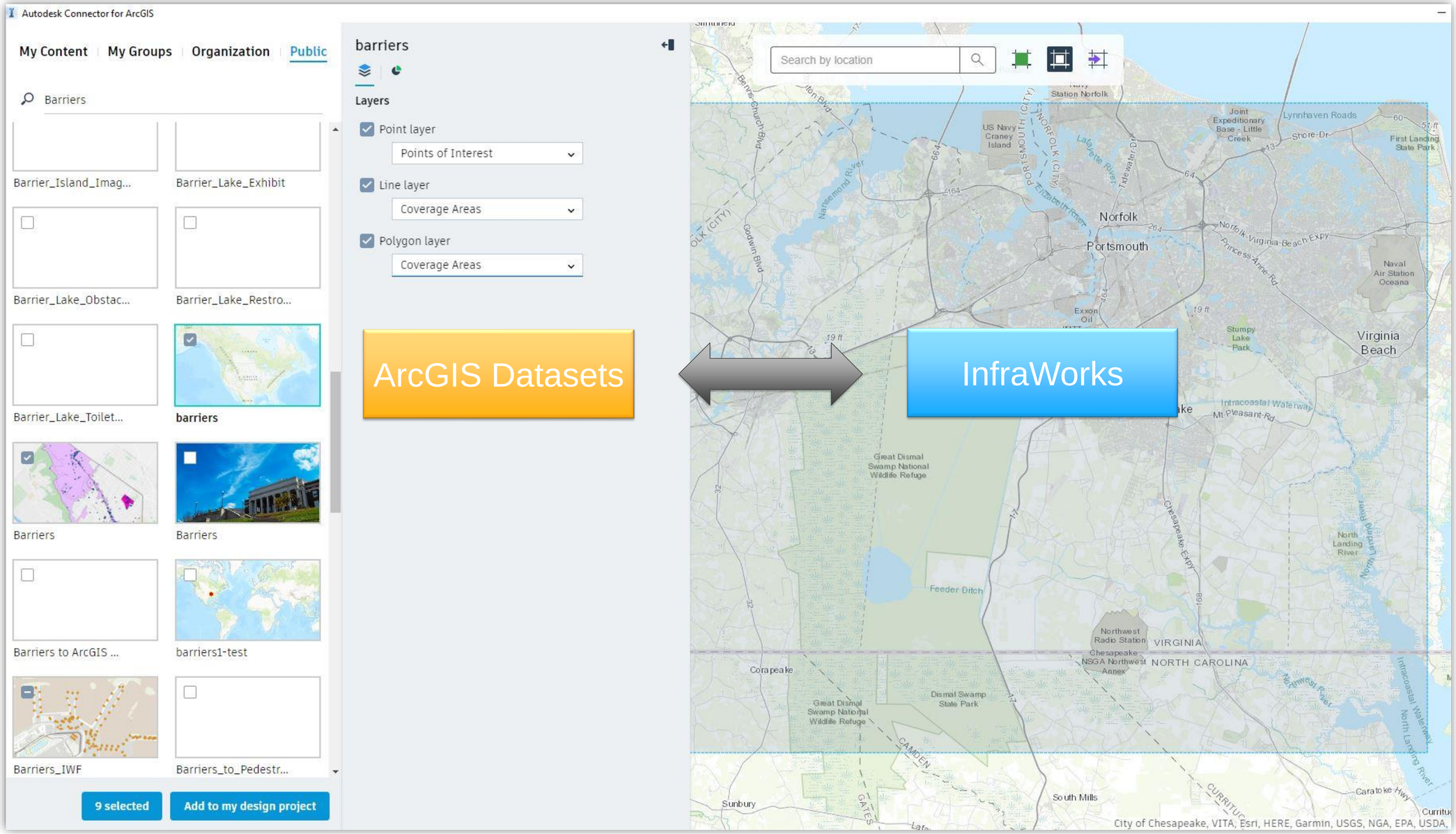
Requires Topography Enhancement

Bridges refinement to fulfil design requirements

Road refinement – Planning Roads to Component Roads

Design Alignment, Profiles and Grading

Preparing Data for Consumption – ArcGIS Connector



Data Translation
Design Data for Use in InfraWorks

Technical Challenges

1

Data Interoperability

- ❖ Design Iterations and Updated Design Files

2

Following State DOT’s design requirement for Horizontal and Vertical Alignment in InfraWorks

- ❖ InfraWorks alignments are always centerline – InfraWorks Traffic Direction
- ❖ Alignment location to get correct lanes configuration and traffic flow for analysis
- ❖ Intersection attributes

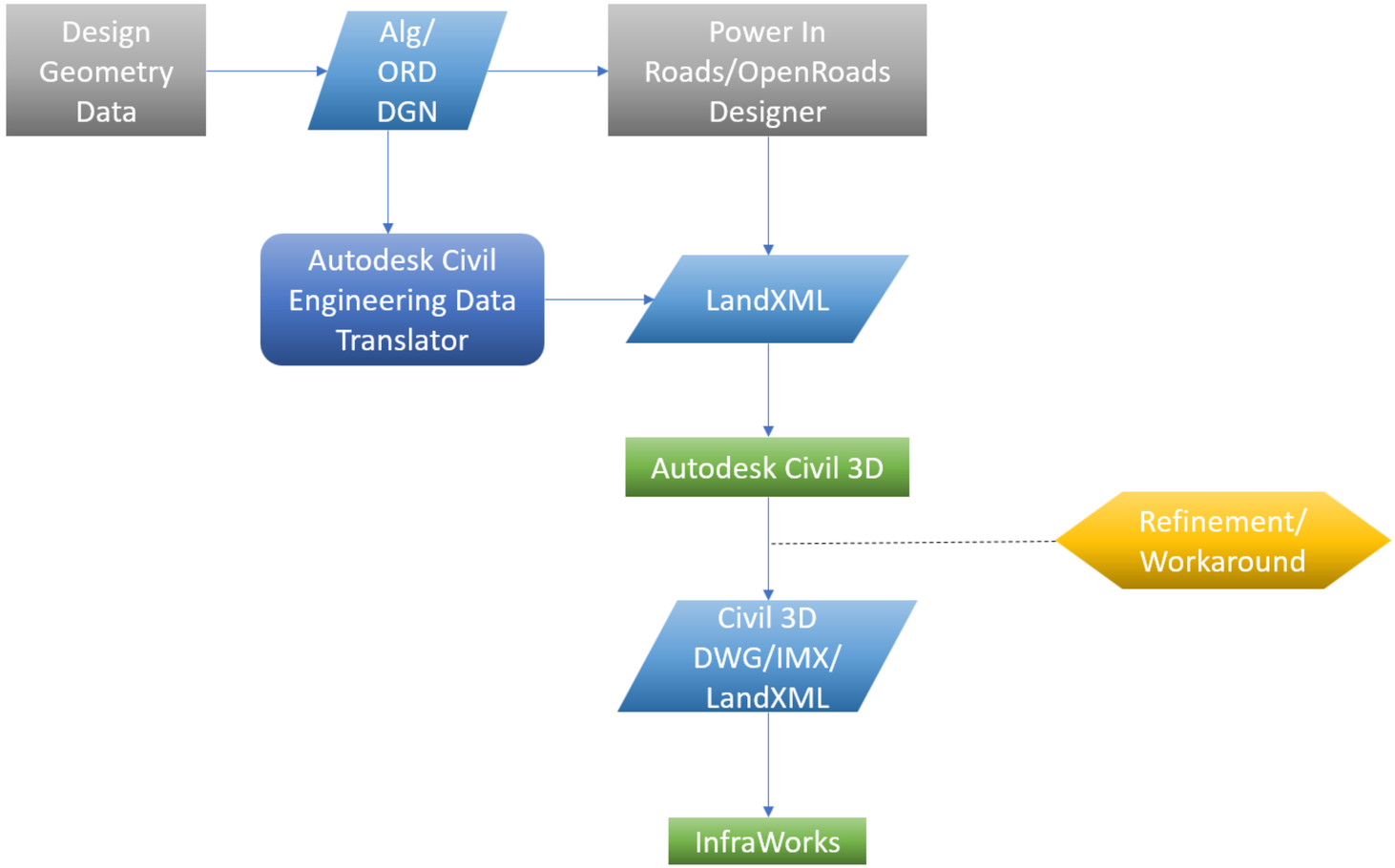
Two bridges for one design alignment

3

Solutions

- ✓ Offset alignments for Mainline depending number of lanes each way traffic and Intersection Design
- ✓ Offset alignments for Ramp Entrance and Exit
- ✓ Connected alignments for Ramp Entrance and Exit

Data Translation Workflow



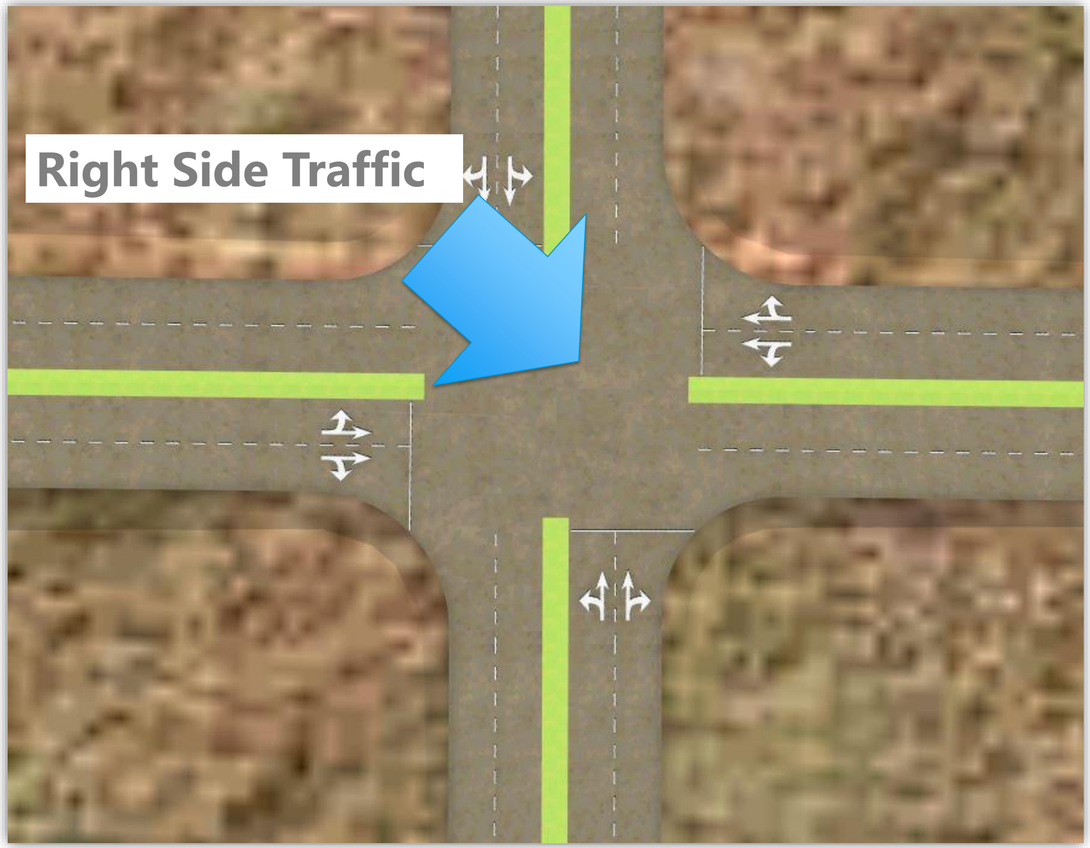
1

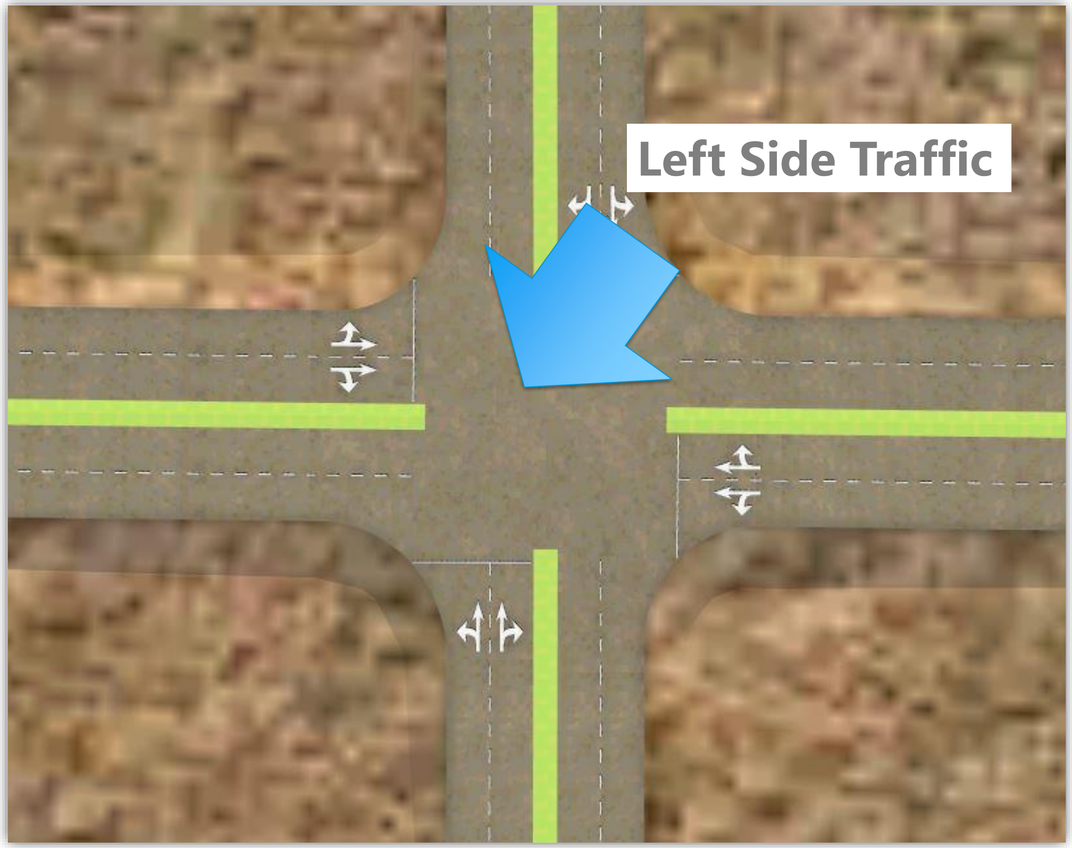
Points to consider

2

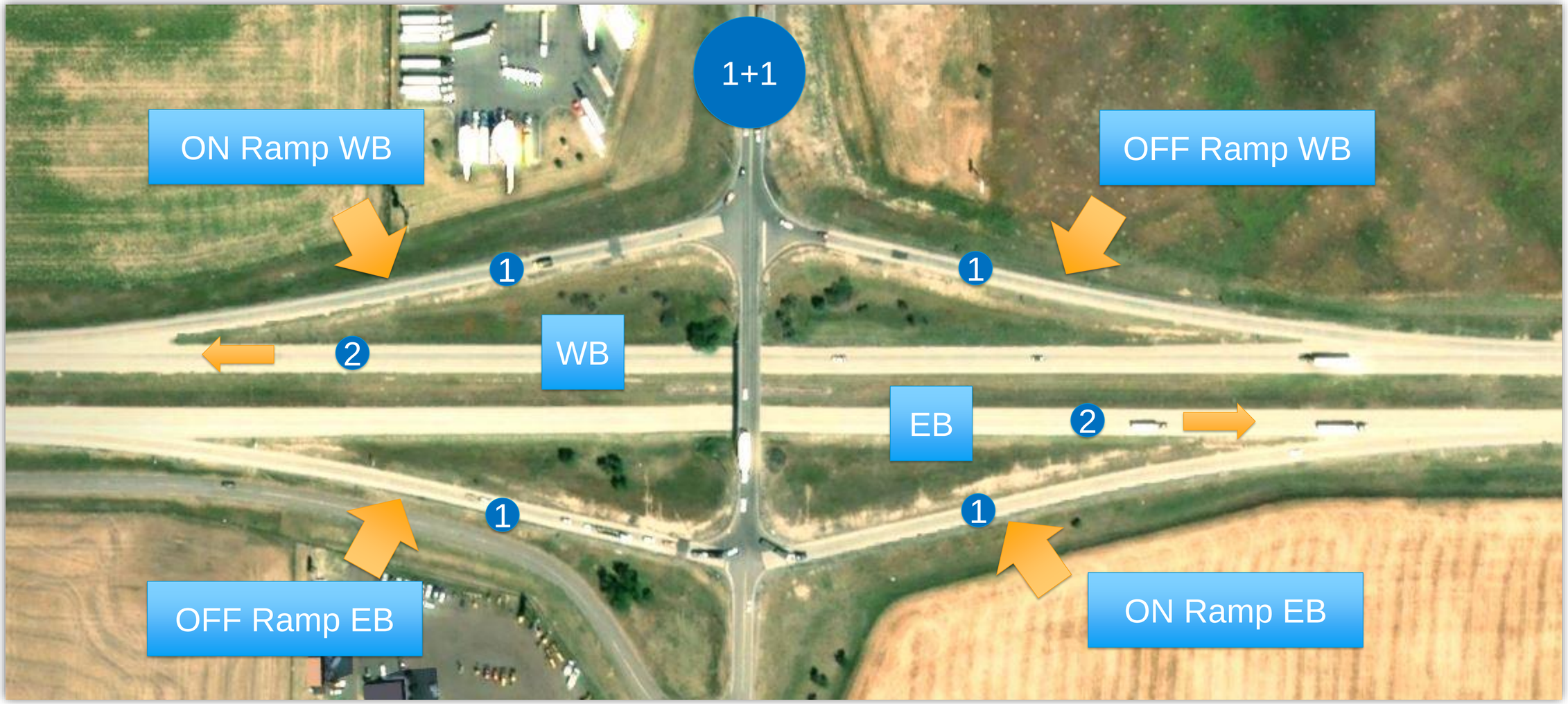
InfraWorks Traffic Direction

- ✓ How it Works?
- ✓ Why it is important?



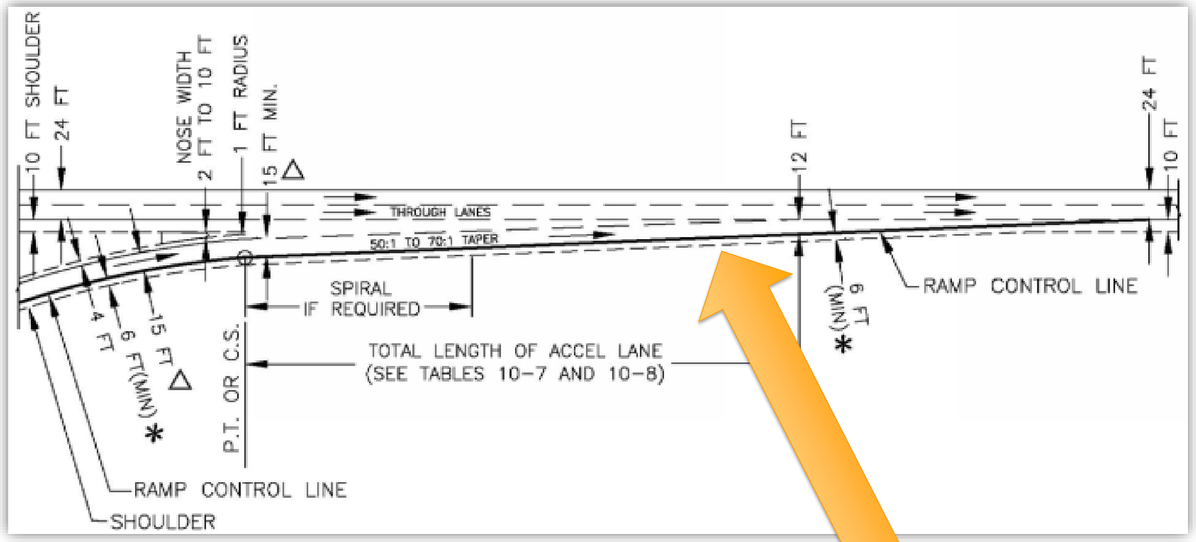


Sample Intersection Scenario

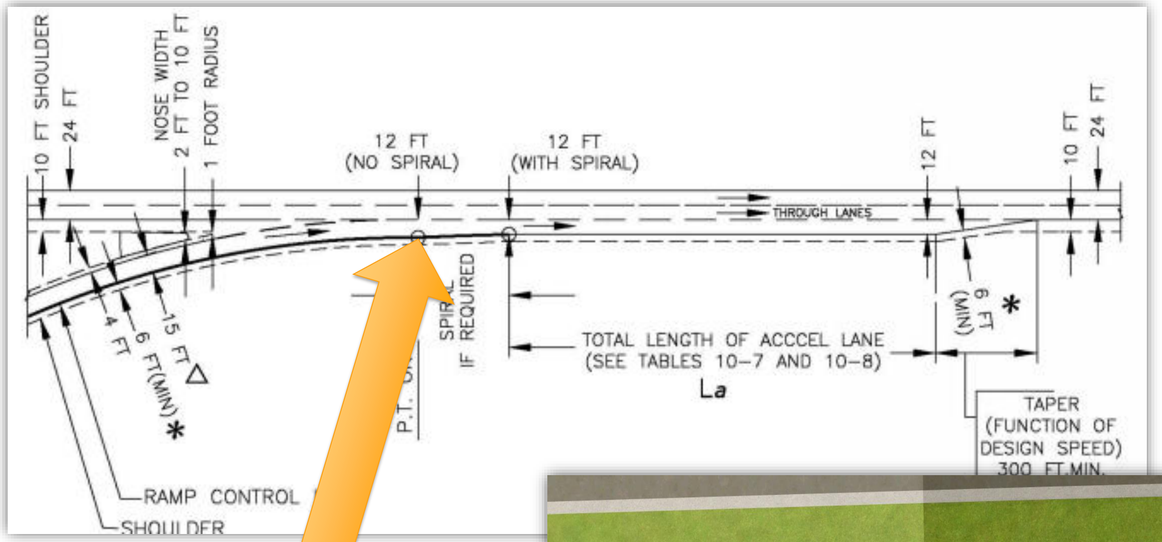


Typical Freeway Entrance Terminal

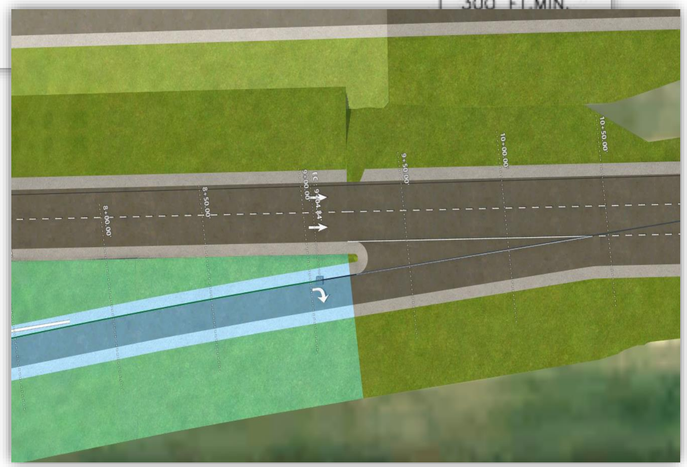
Case 1: Taper Type



Case 2: Parallel Type



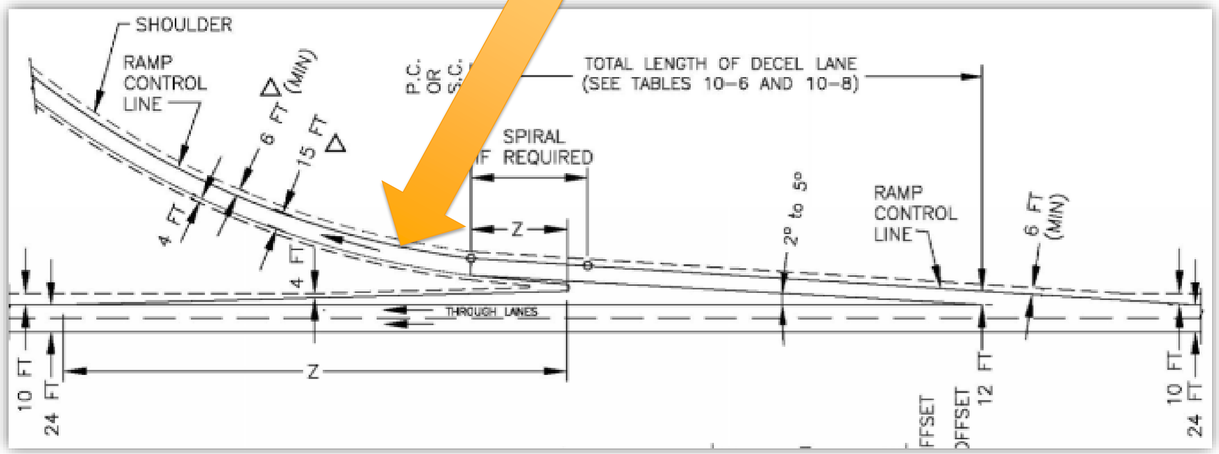
Ramps control alignments are at outer shoulder



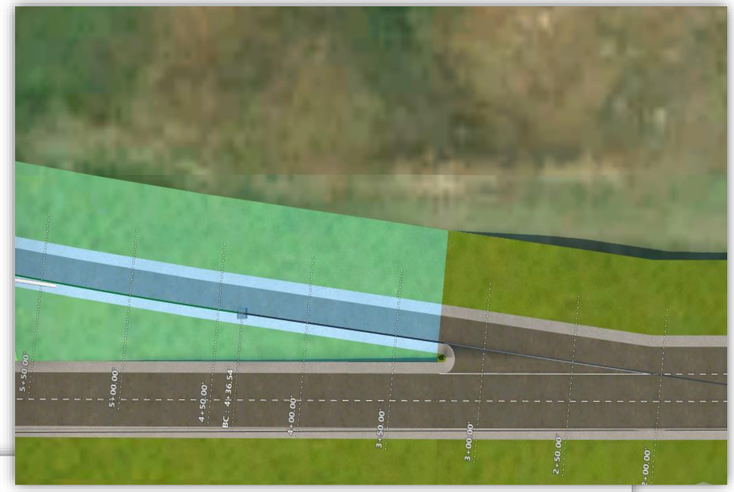
2

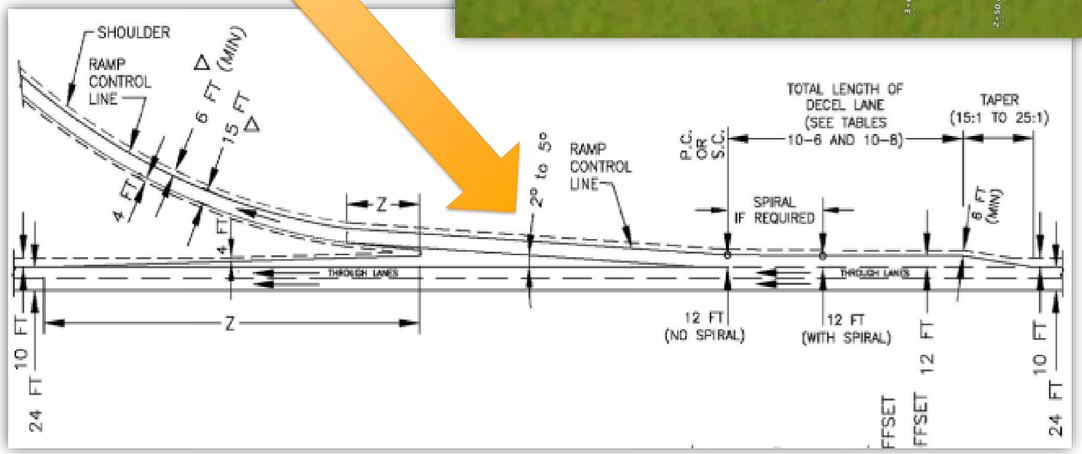
Typical Freeway Exit Terminal

Ramps control alignments are at outer shoulder



Case 1: Taper Type



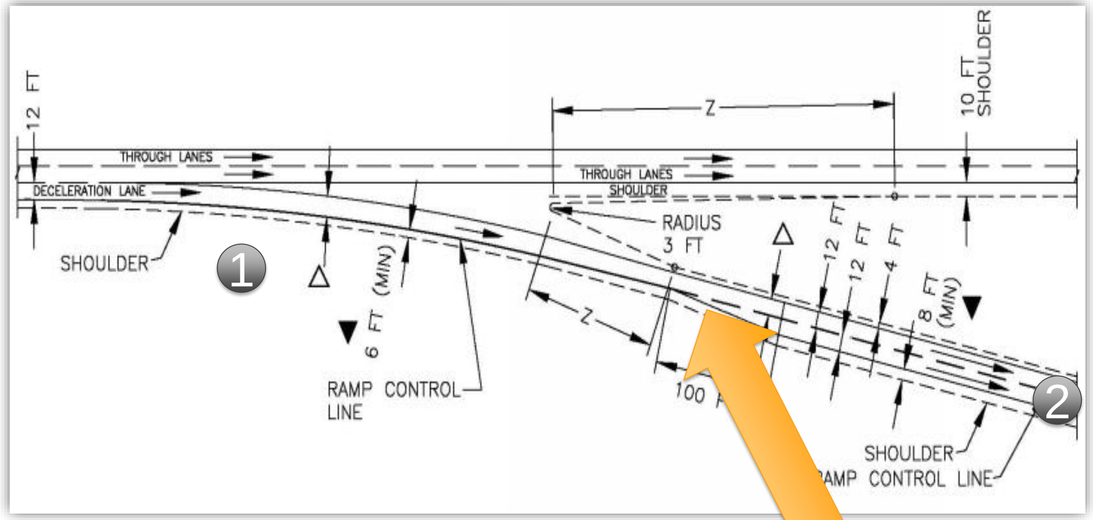


Case 2: Parallel Type

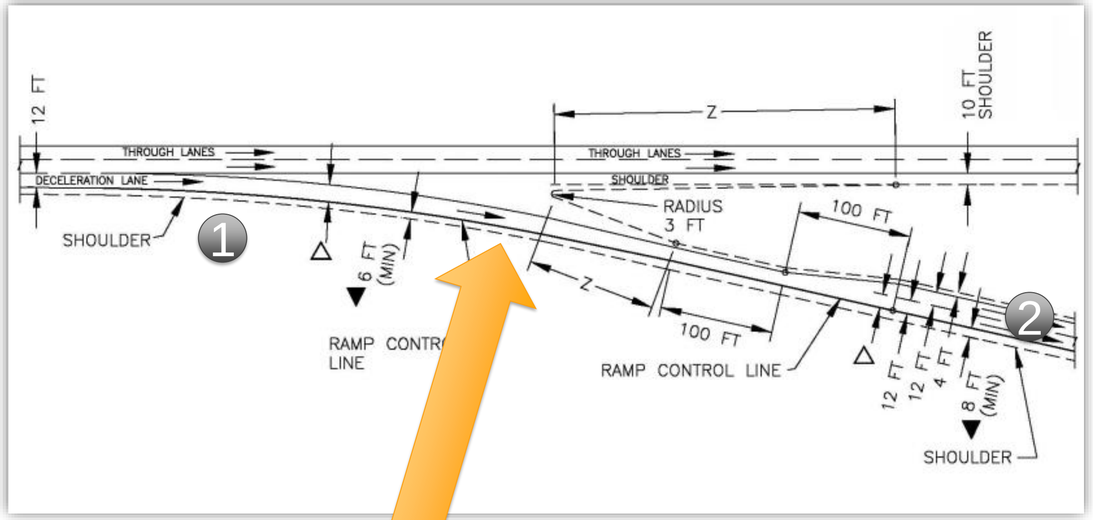
2

Typical Freeway Exit Terminal

Case 1



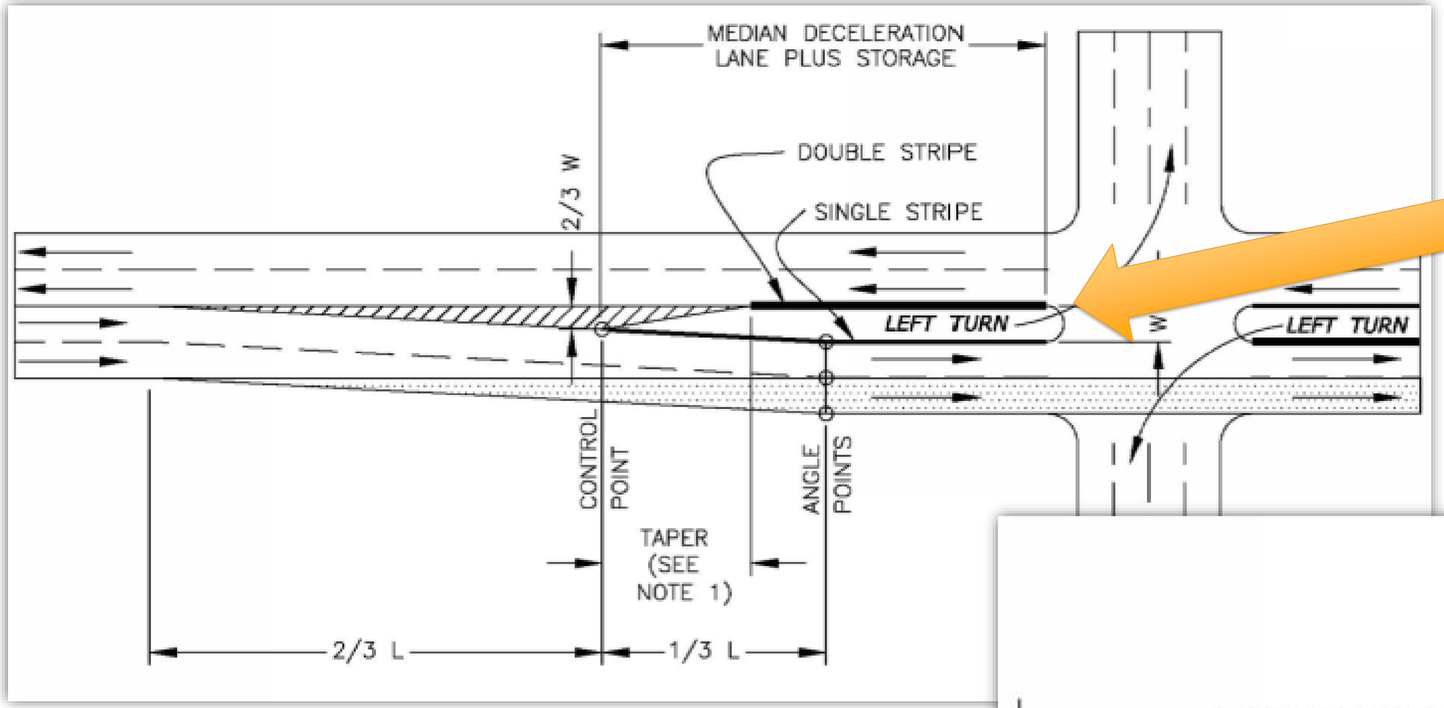
Case 2



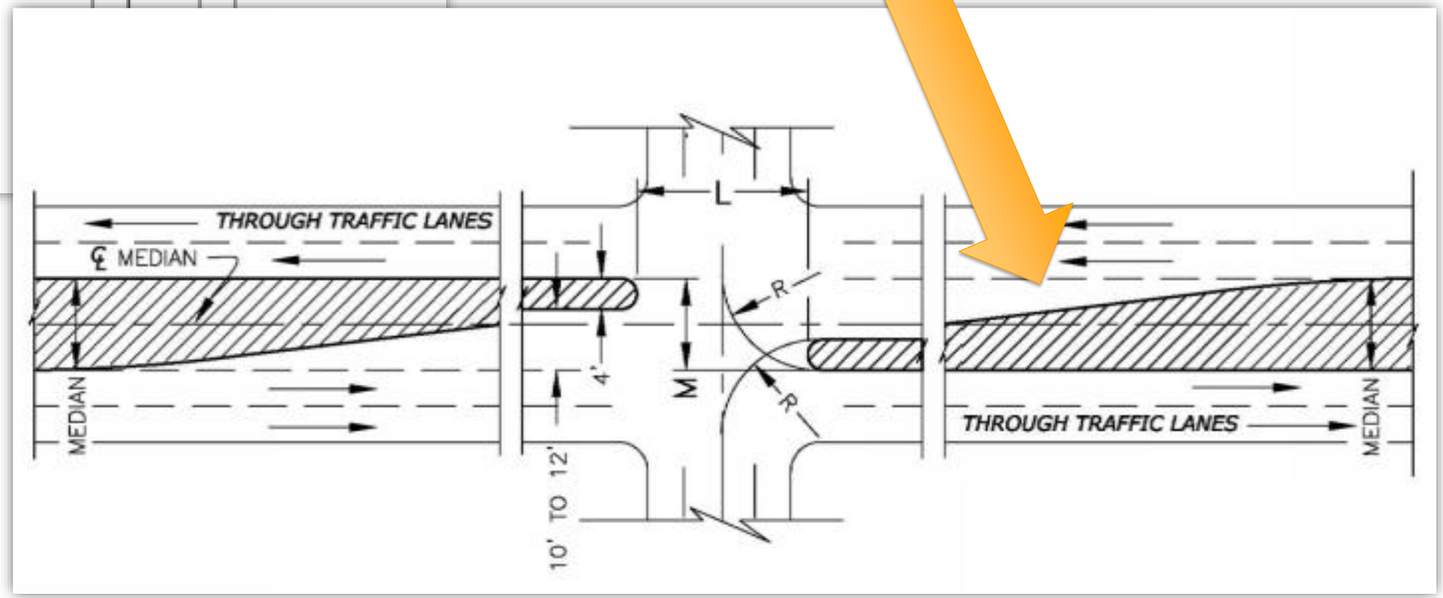
Single lane ramp exit transition to two lane

2

Median Left And Right Turn Design

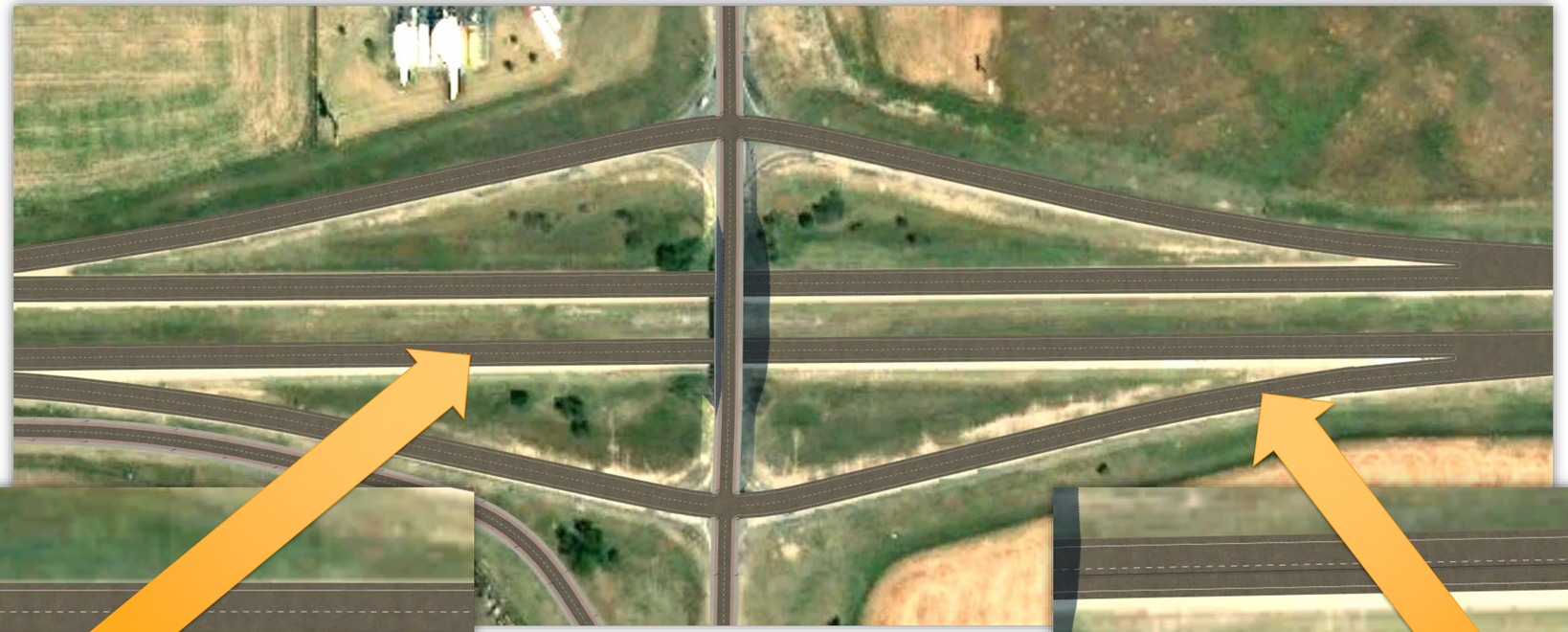


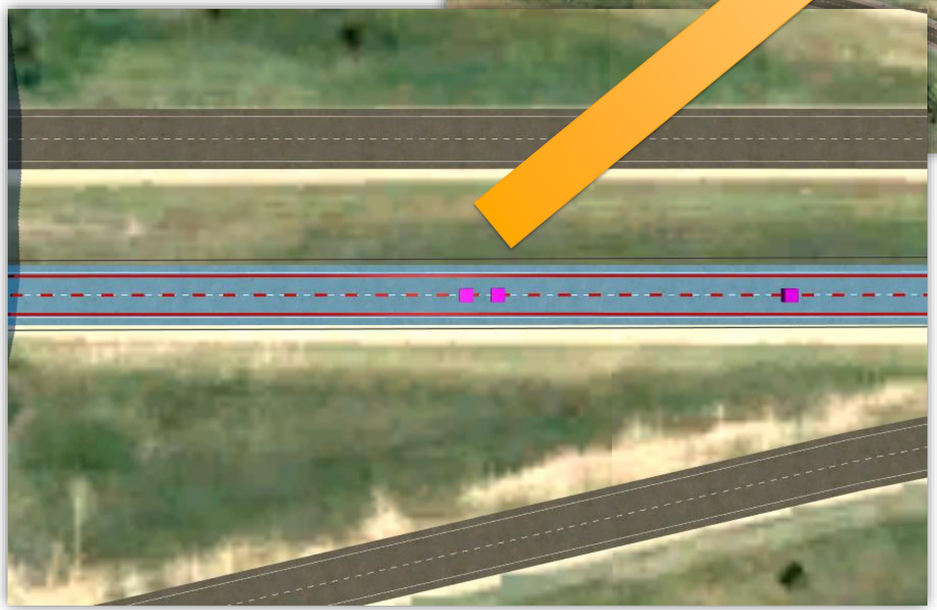
Challenges for alignments in InfraWorks for highlighted design



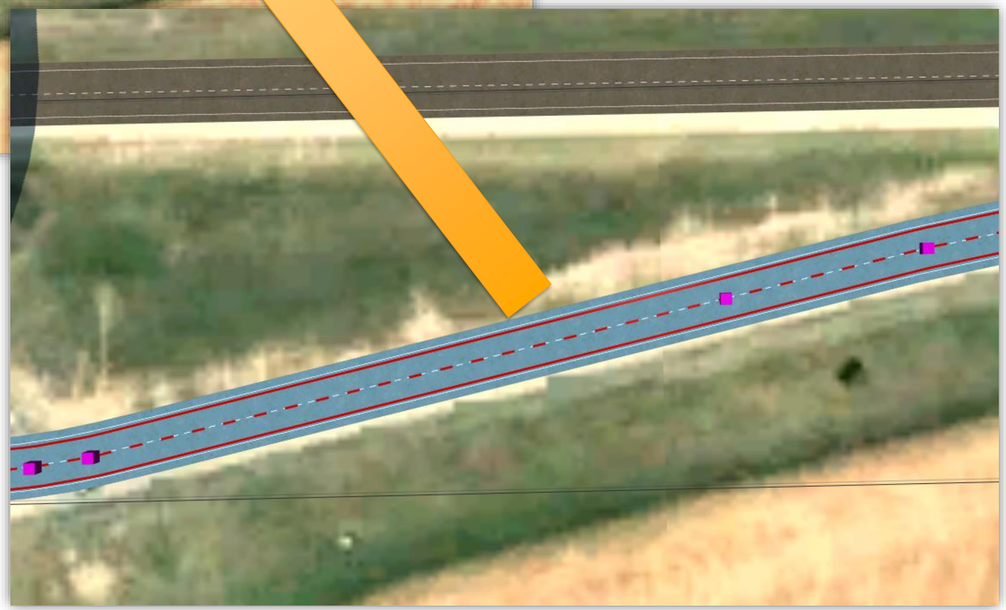
2

Alignments based on centerline design (two-way traffic)

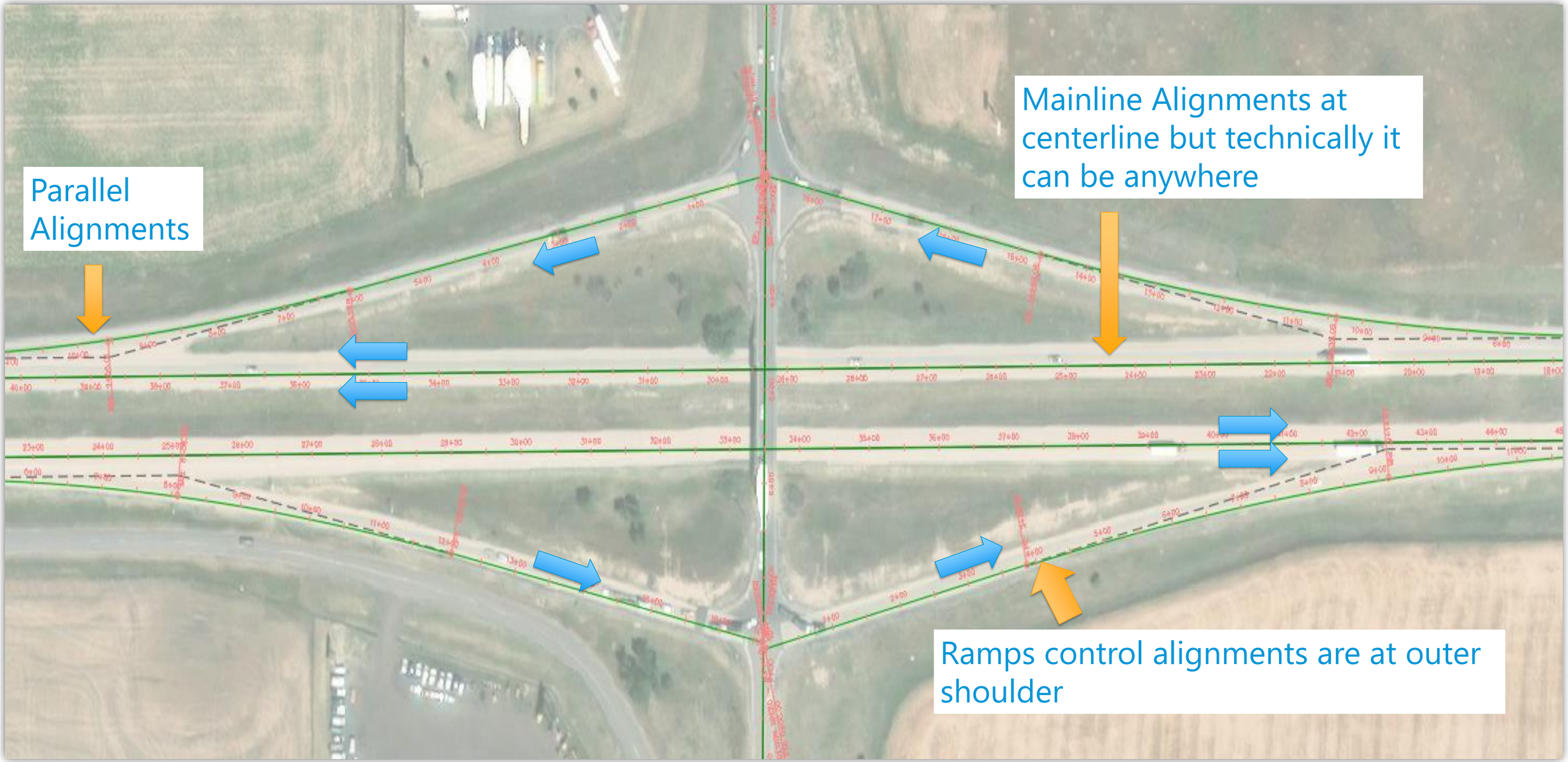




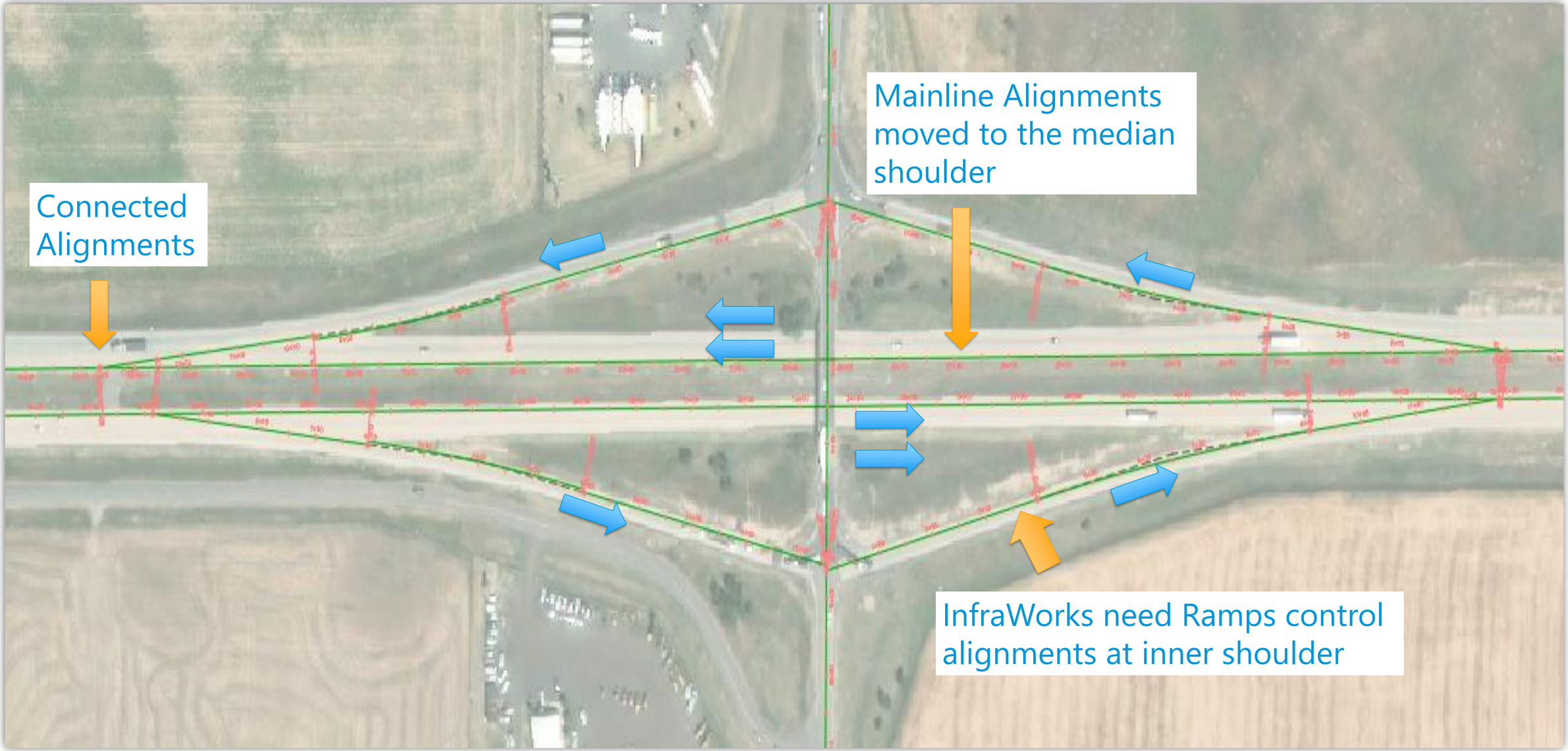
InfraWorks Model Builder Alignments



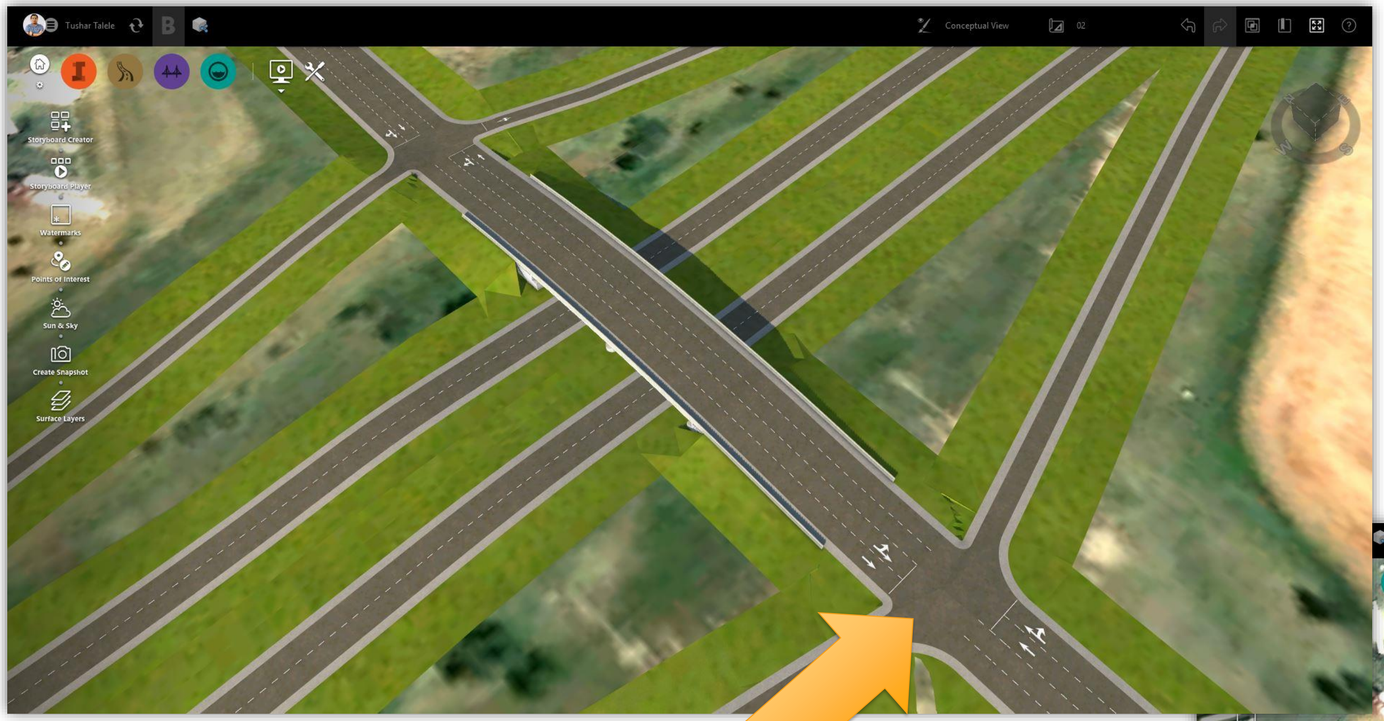
Alignments per Department of Transportation Standards

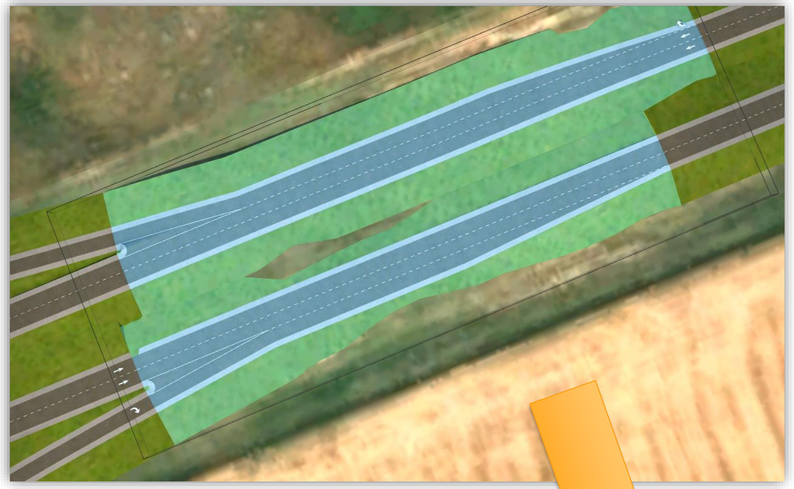


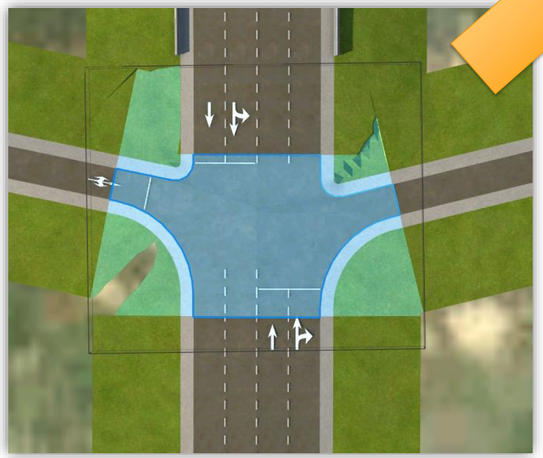
Alignments need for InfraWorks Modeling



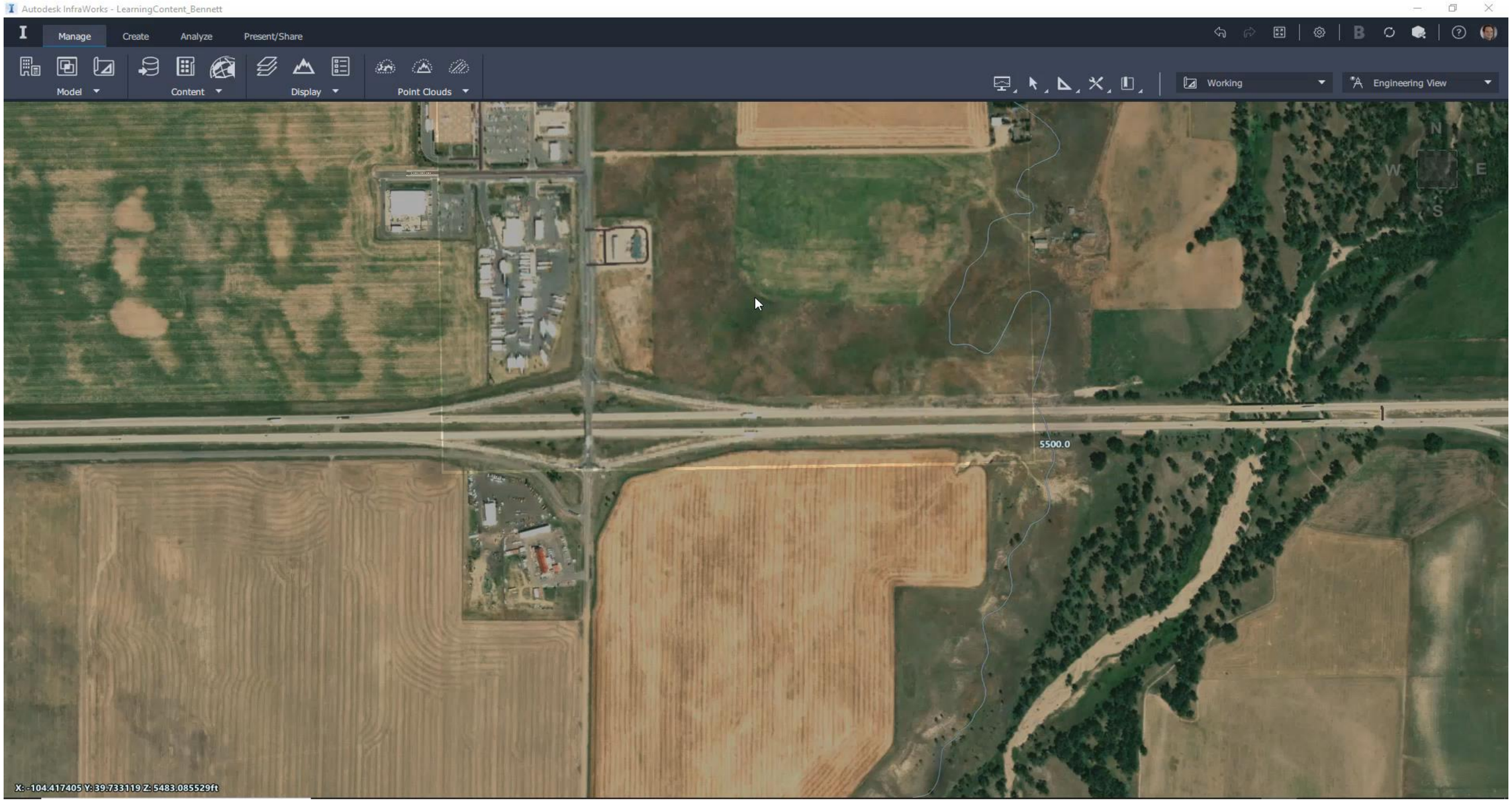
Finished InfraWorks Modeling







InfraWorks Roadway Intersection Model

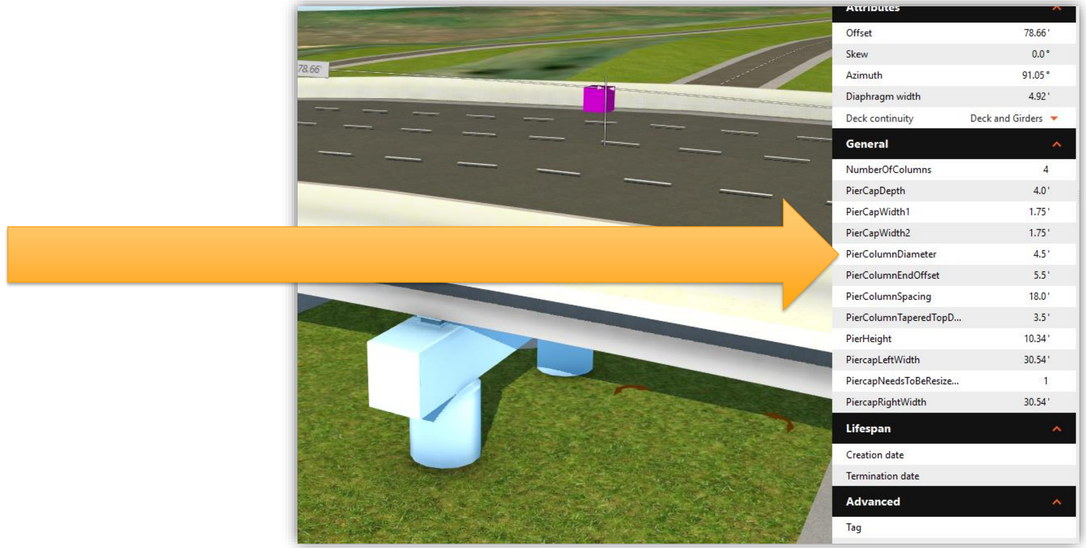


Modeling Custom Bridge Components Leveraging Inventor

Why Inventor?

Parametric Modeling

Parameter Name	Consumed by	Unit/Ty
Model Parameters		
PierDia	Sketch1	ft
PierHeight	Extrusion1	ft
d2	Extrusion1	deg
PiercapRightWidth	Sketch2	ft
PiercapLeftWidth	Sketch2	ft
PierDepth	Extrusion2	ft
d6	Extrusion2	deg
User Parameters		

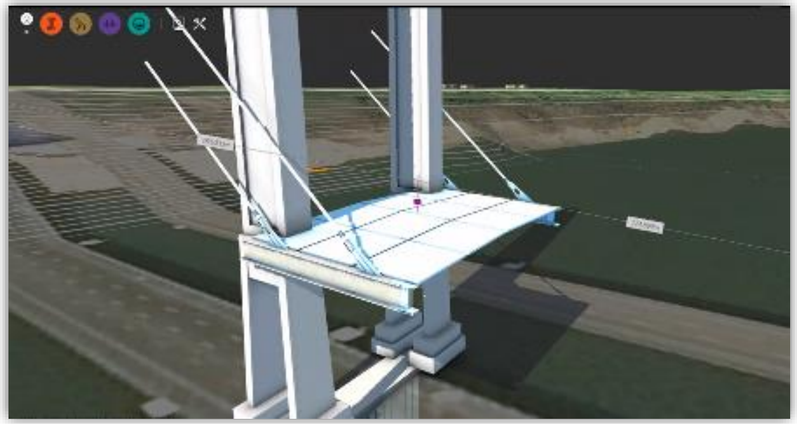


To be more civil friendly

Flexibility to fulfil design requirements

Custom Bridge Components

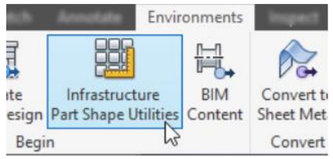
Generic Objects



Modeling Custom Bridge Components and Generic Objects

Customized Bridge Components/ Generic Objects

Inventor



Infrastructure Part Shape Utility

IPT/IAM

Style Palette (Parametric Models)

InfraWorks

IPT/*IAM*

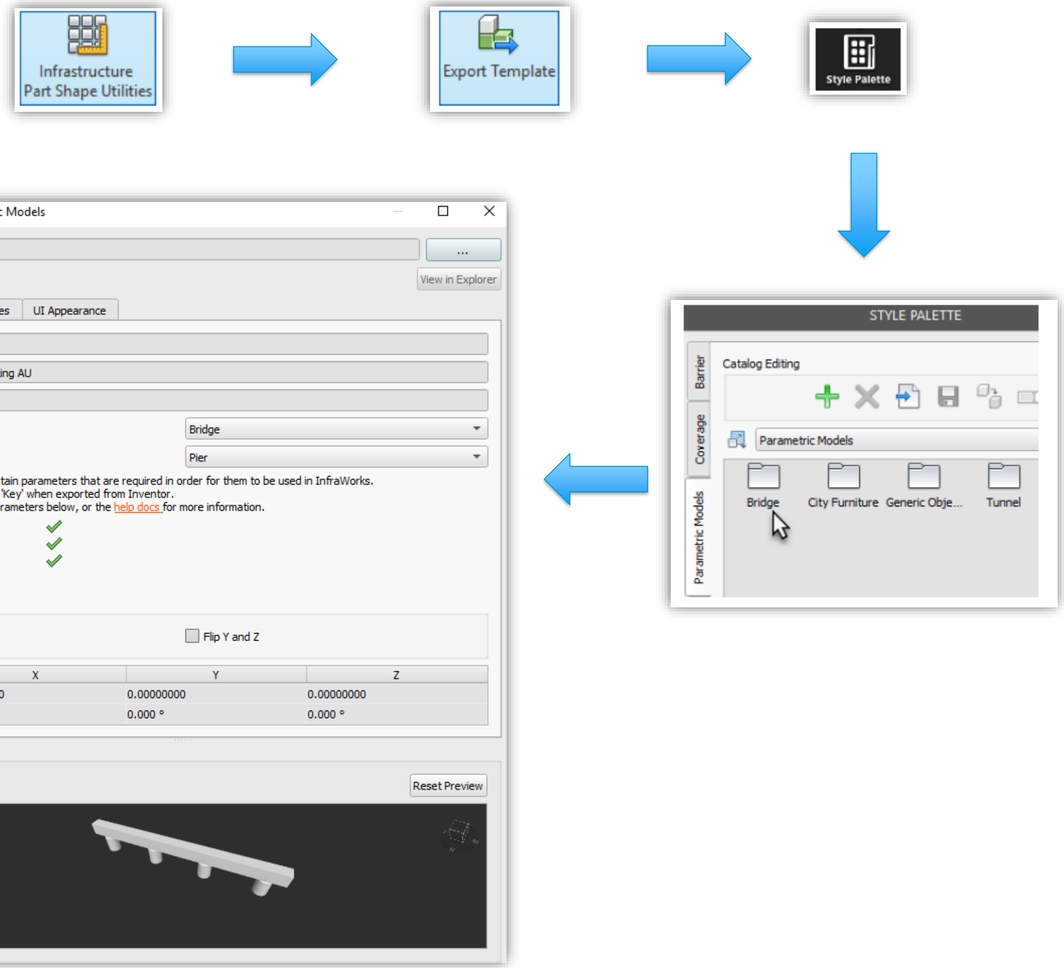
INVENTOR → INFRAWORKS

- ✓ Customized Bridge/Tunnel Components
- ✓ Generic Objects
- ✓ Infrastructure Parts Editor

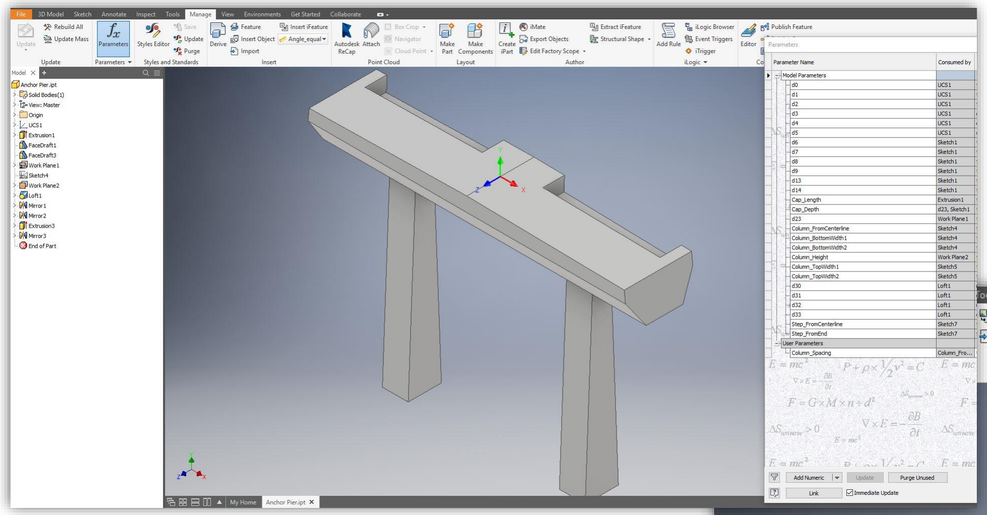
Share Custom Assembly between models

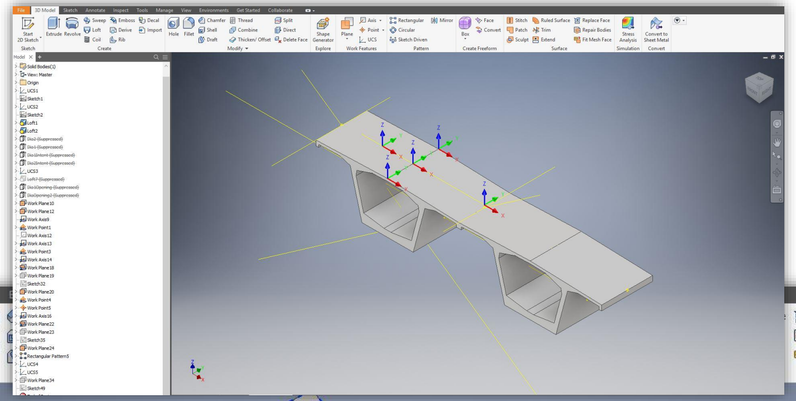
Modeling Custom Bridge Components and Generic Objects

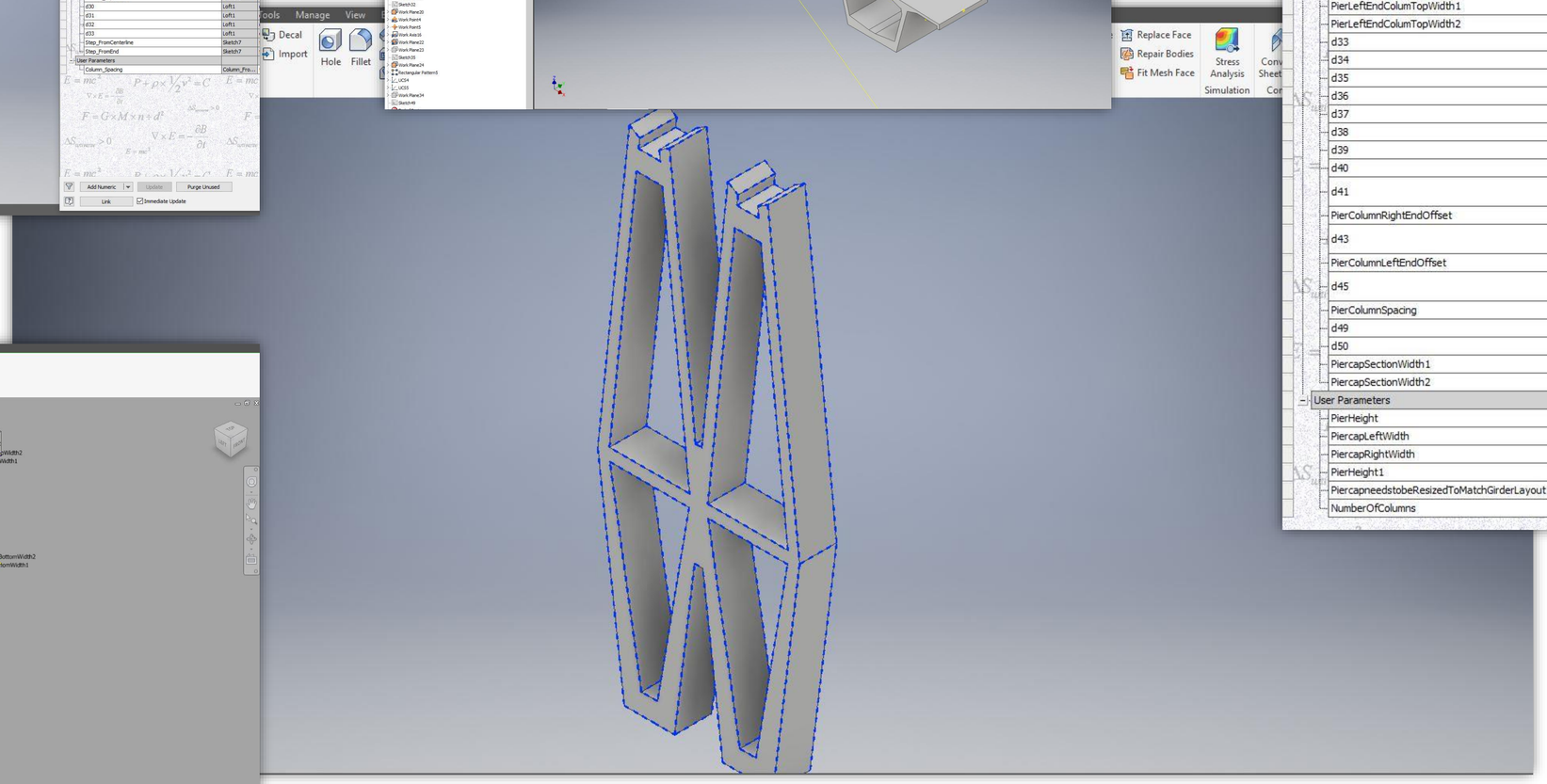
- ✓ Model Inventor Parts and Assemblies
- ✓ Add InfraWorks required Parameters – Case sensitive
- ✓ Publish Parts for InfraWorks - Use the Infrastructure Part Utilities in Inventor to export the templates for InfraWorks
- ✓ Import these templates into InfraWorks – Use Parametric Models Tab under Style Palettes
- ✓ Assign the custom parts to InfraWorks Bridge Model
- ✓ Send bridge model to Revit
- ✓ Use Civil 3D to import the bridge model as 3D solids

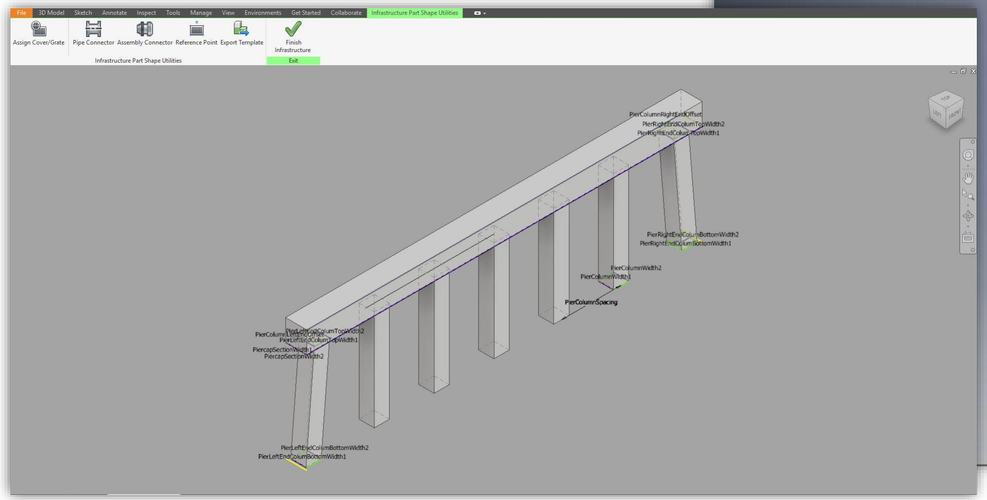


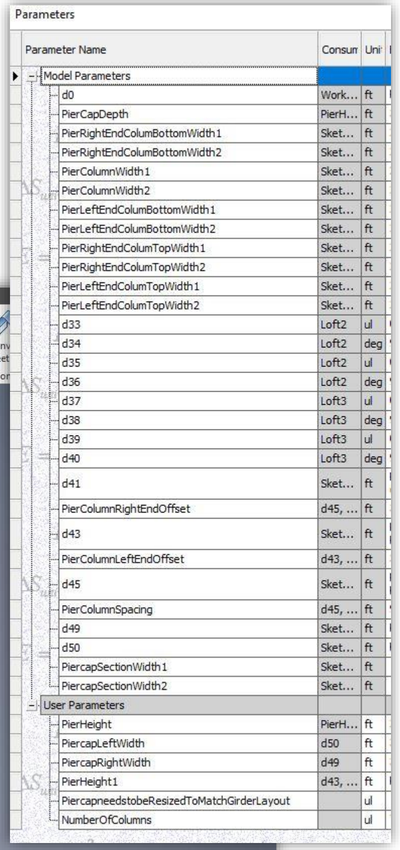
Modeling Custom Bridge Components and Generic Objects



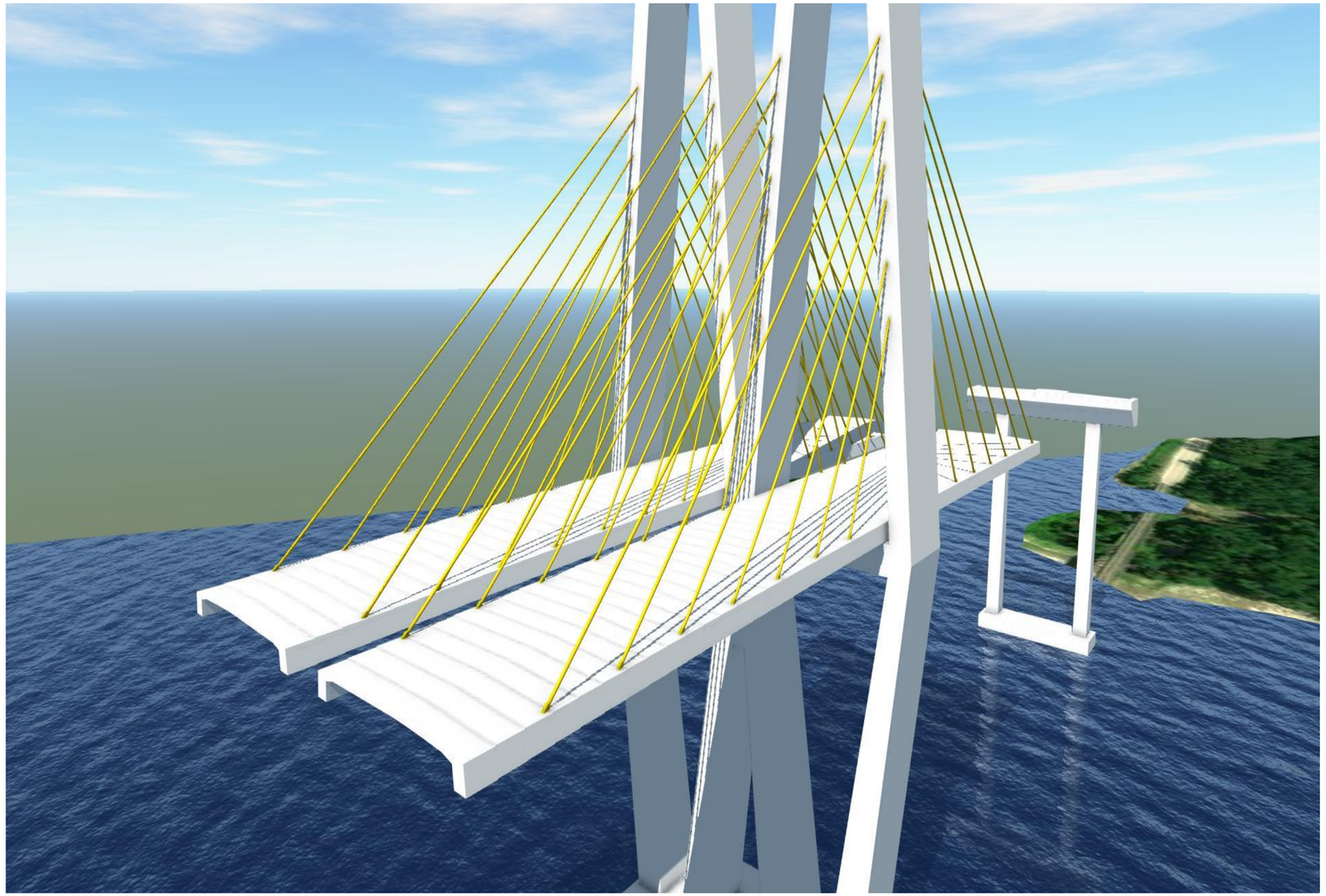


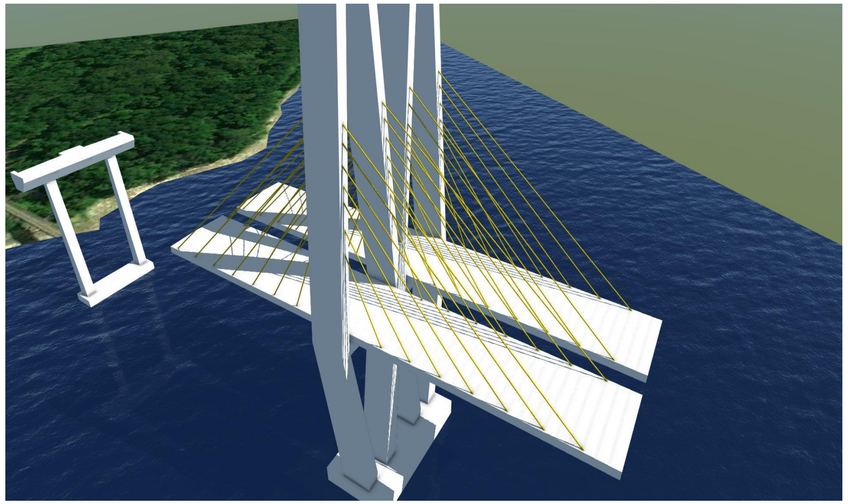


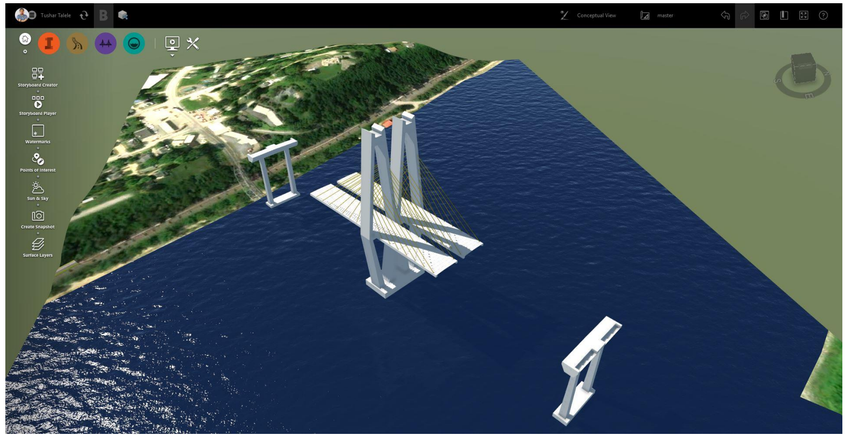




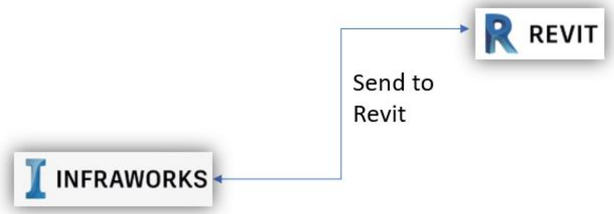
Modeling Custom Bridge Components

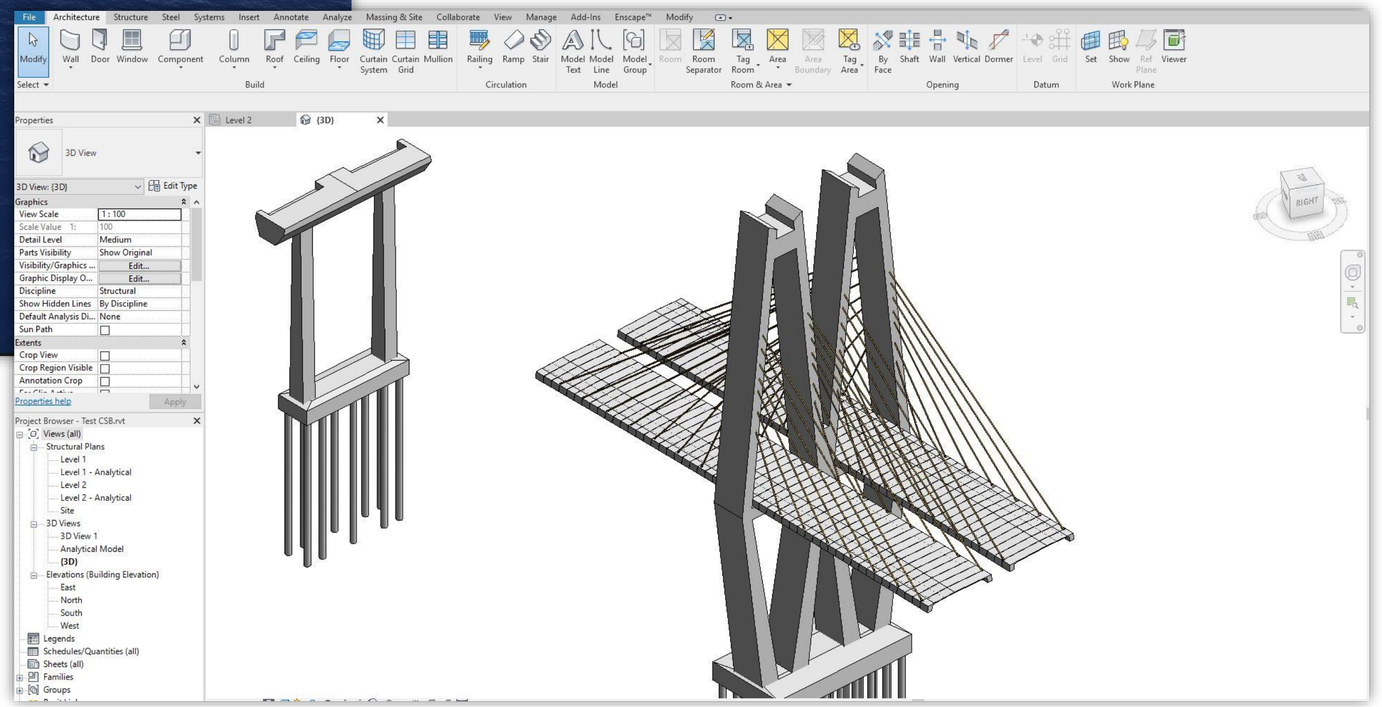




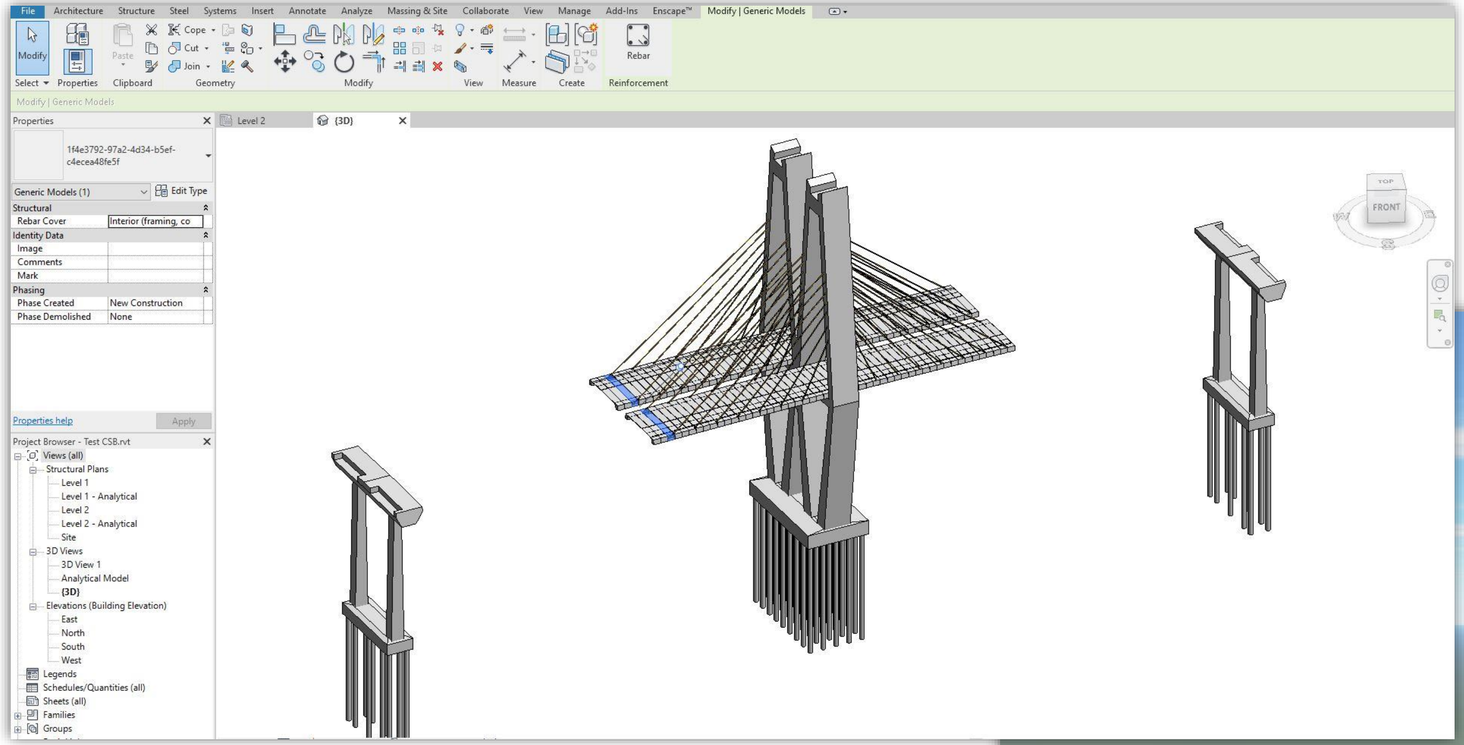


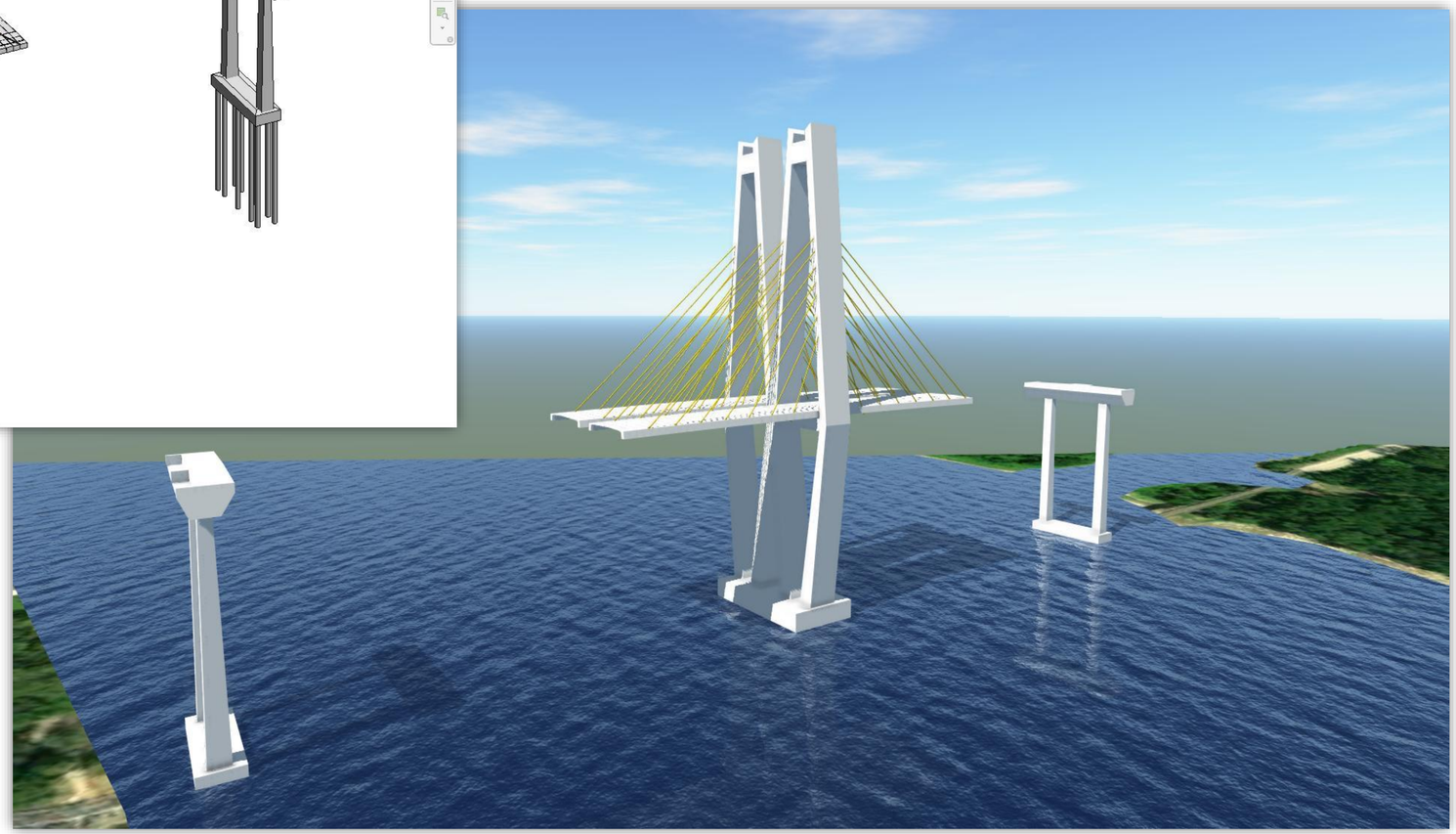
Modeling Custom Bridge Components



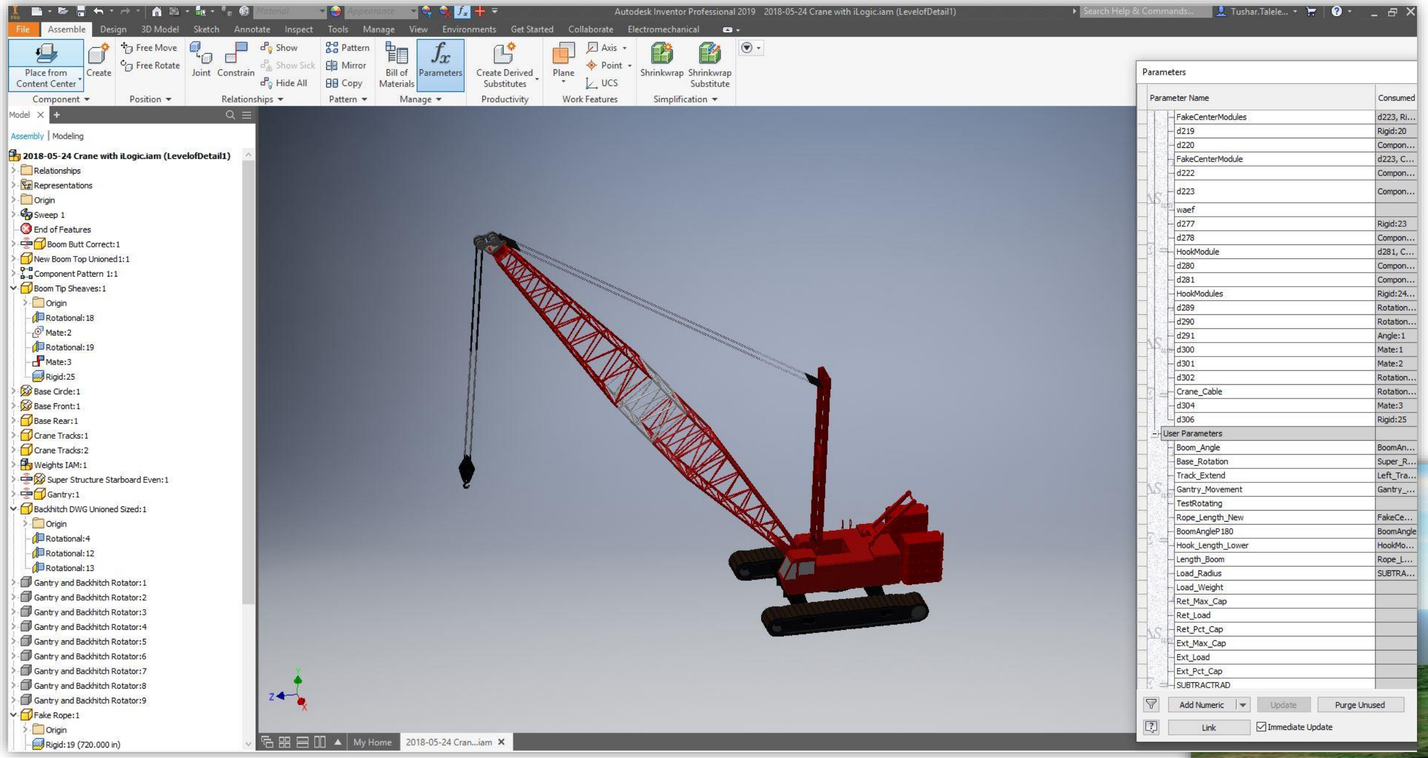


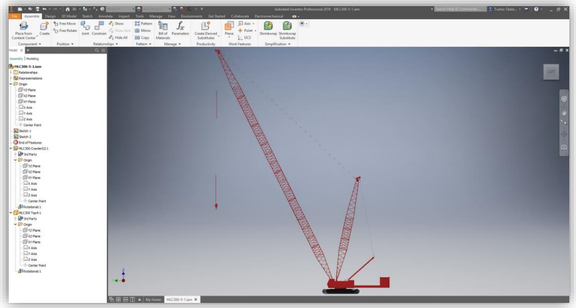
Modeling Custom Bridge Components

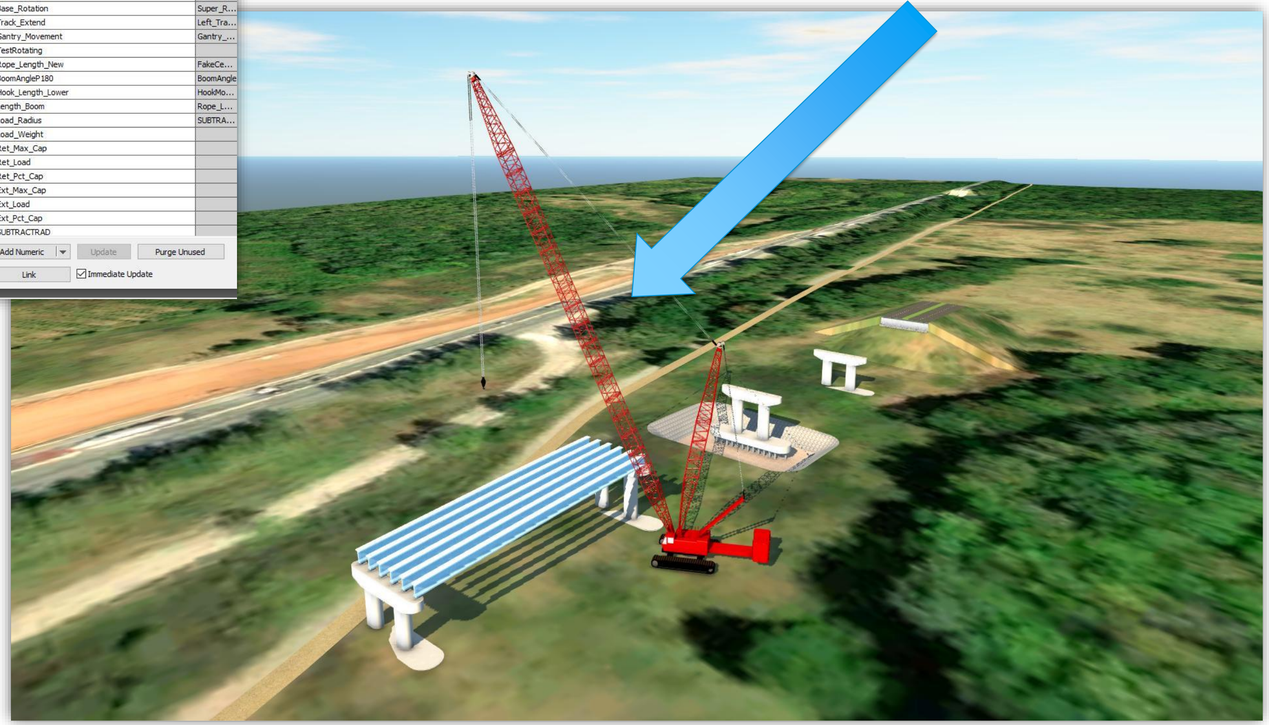




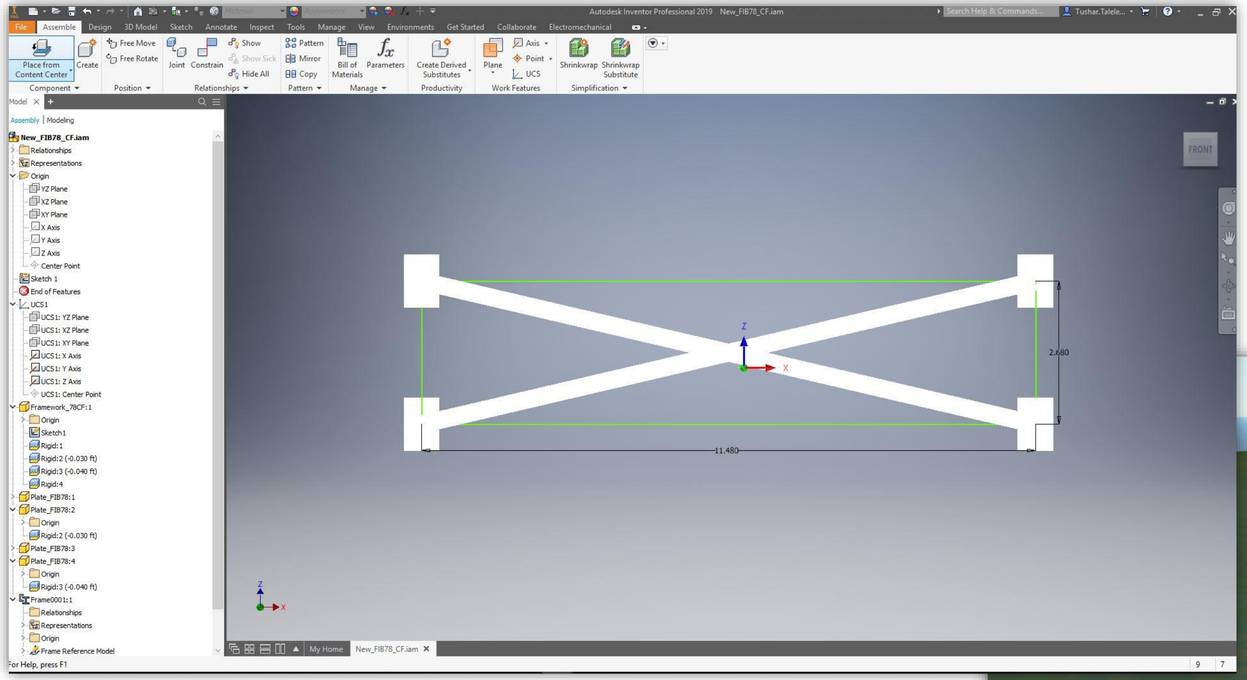
Leveraging Equipment as Parametric Generic Objects

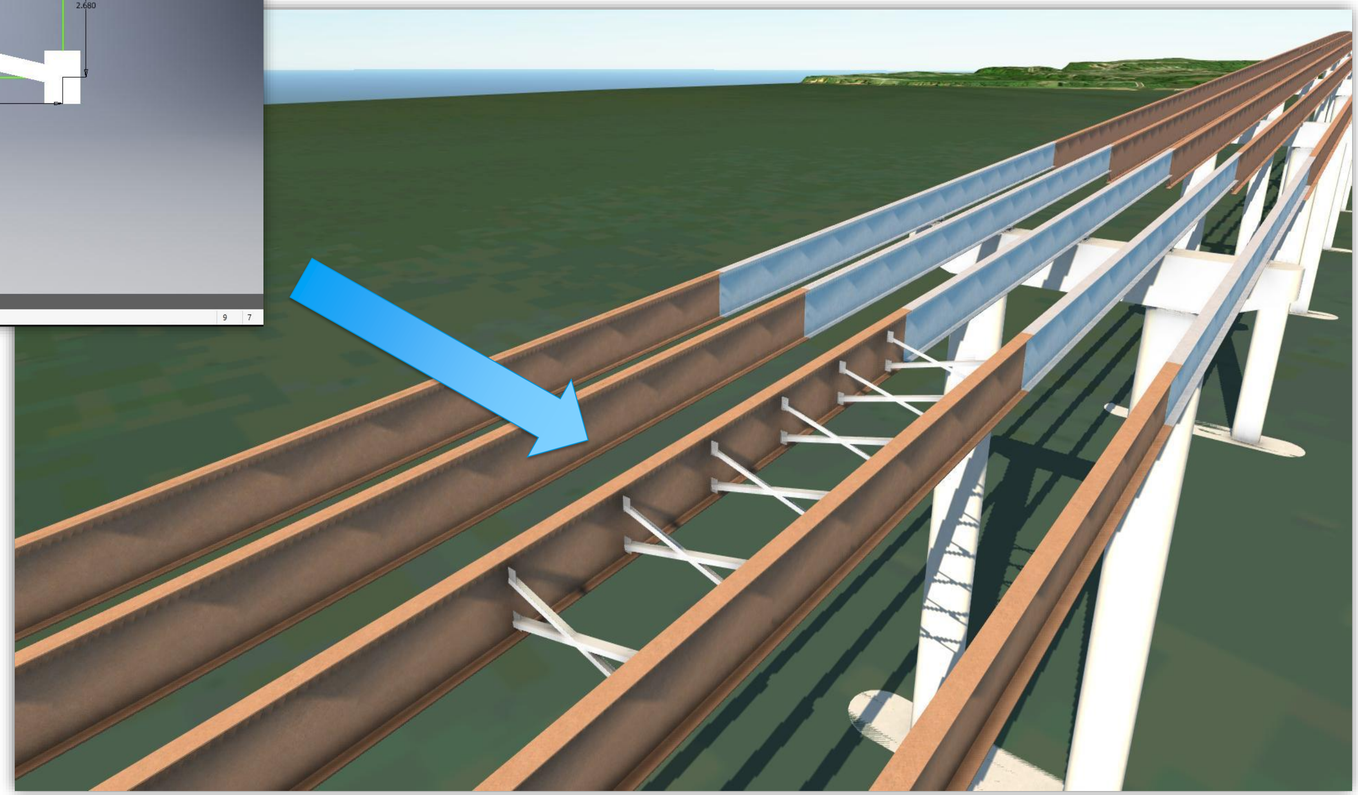






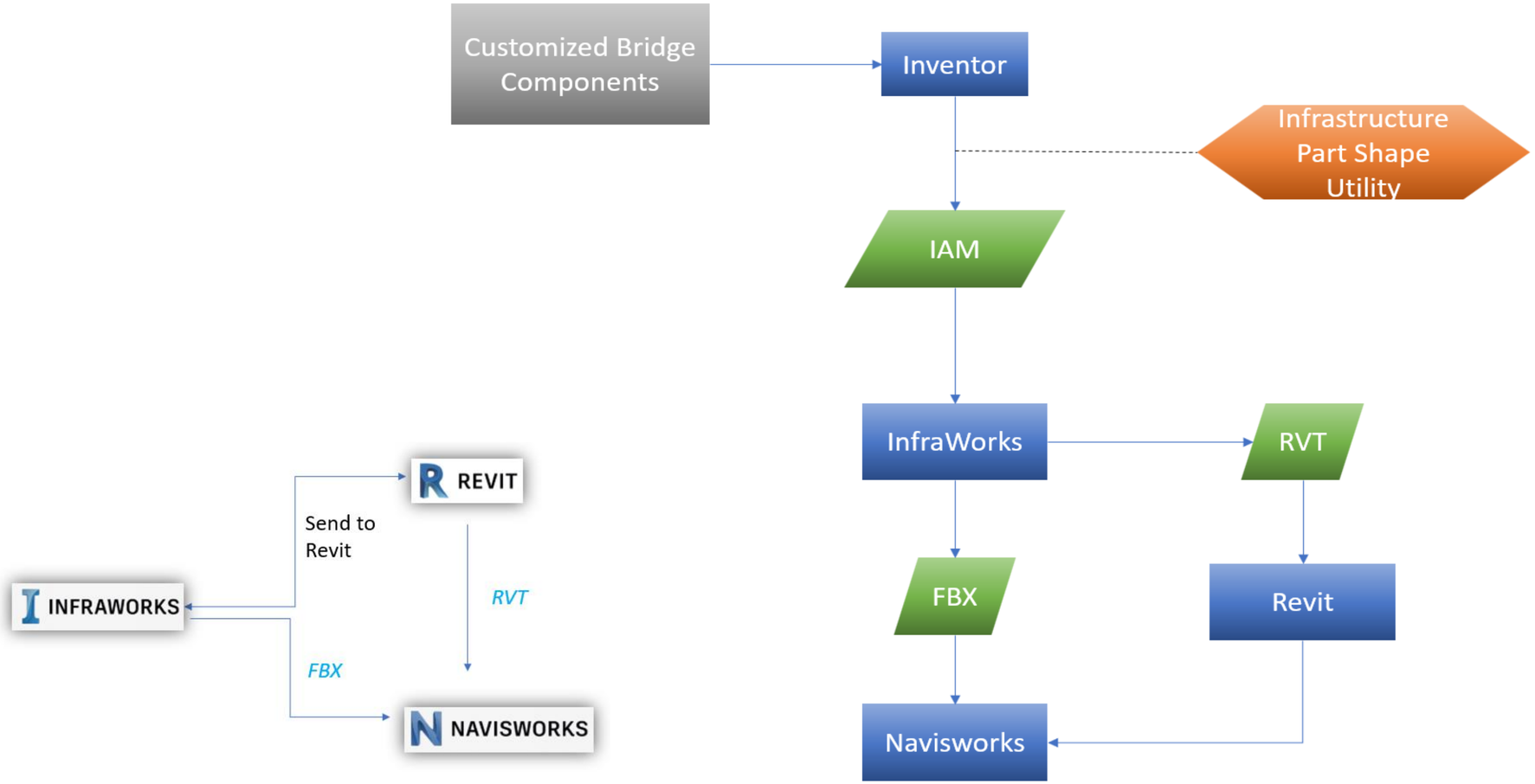
Leveraging Bridge Components as Parametric Generic Objects





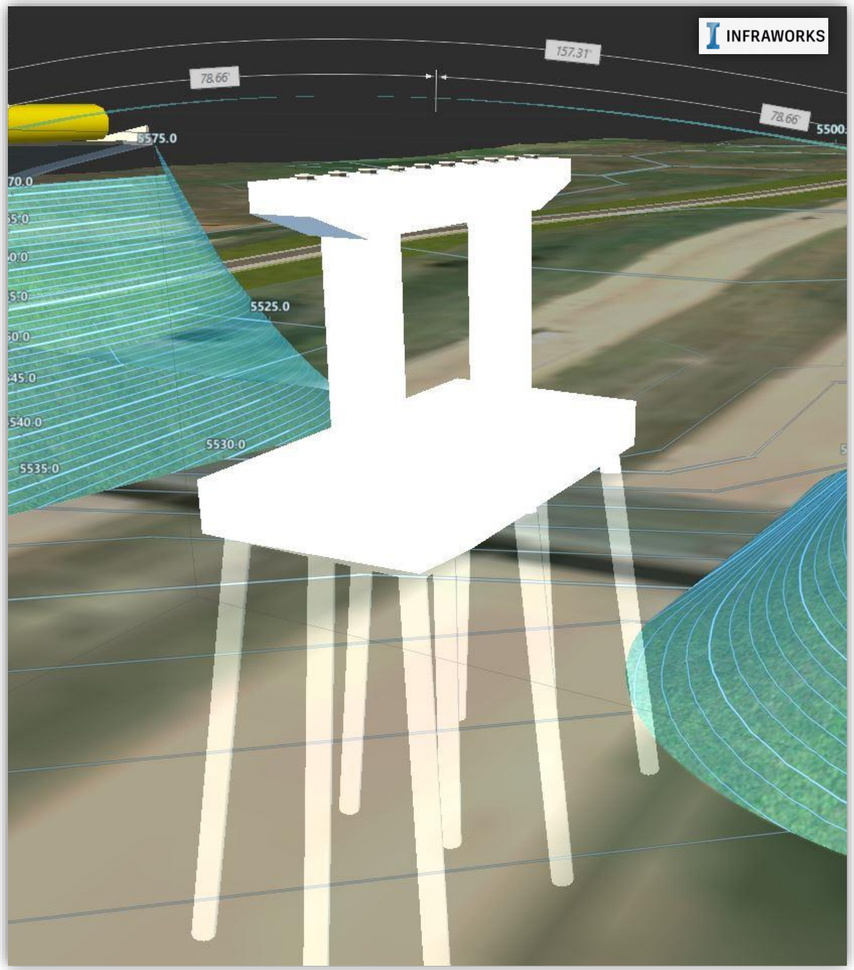
Detailed Construction Planning InfraWorks Led Workflow Leveraging Navisworks

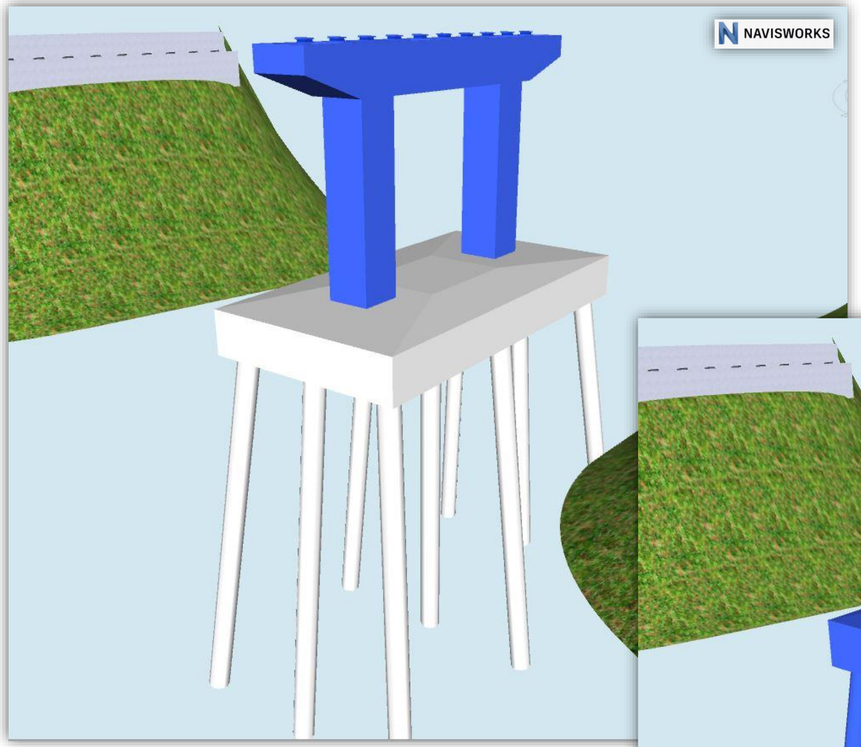
Construction Planning Leveraging Navisworks

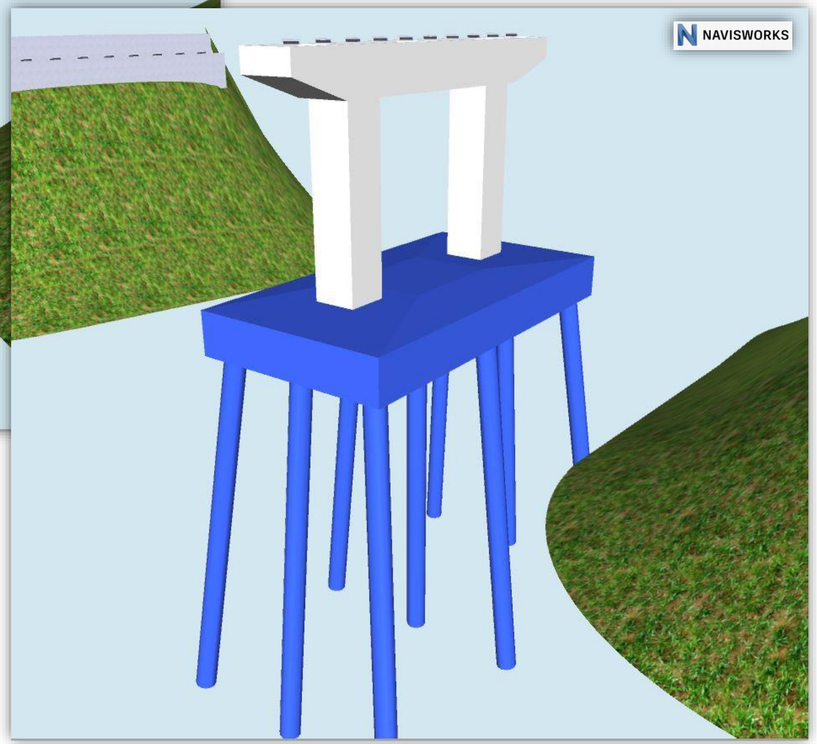


Technical Challenges

Selecting individual entities to link with phasing activities



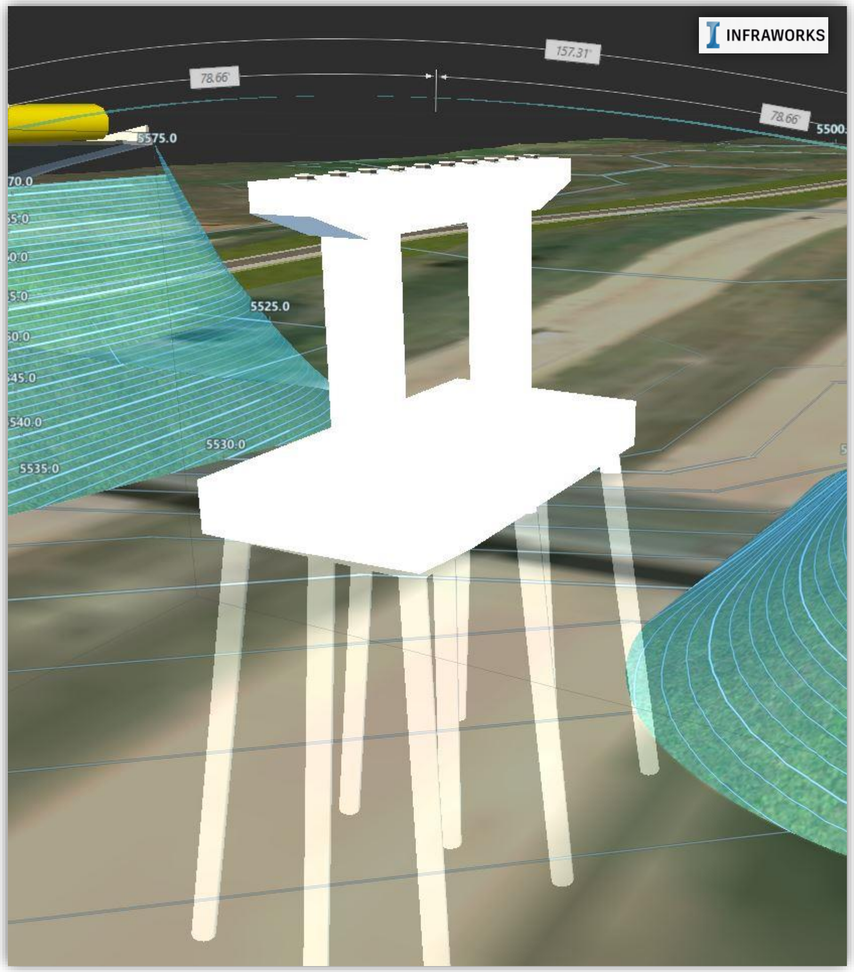


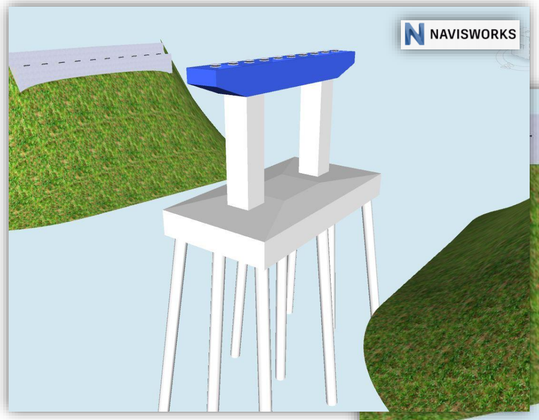


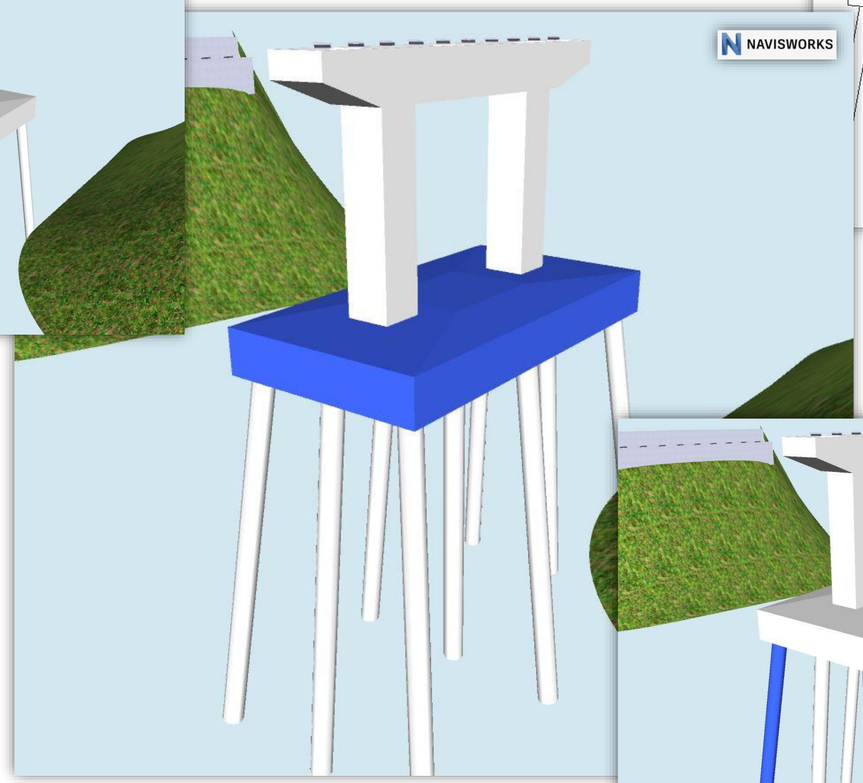
Inventor Parts (IPT)

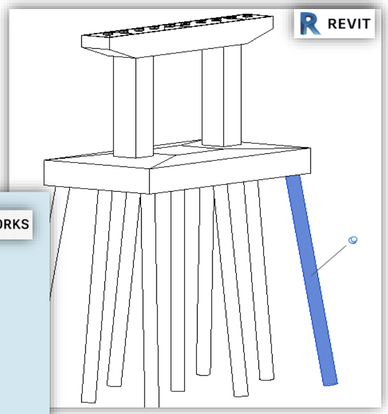
Technical Challenges

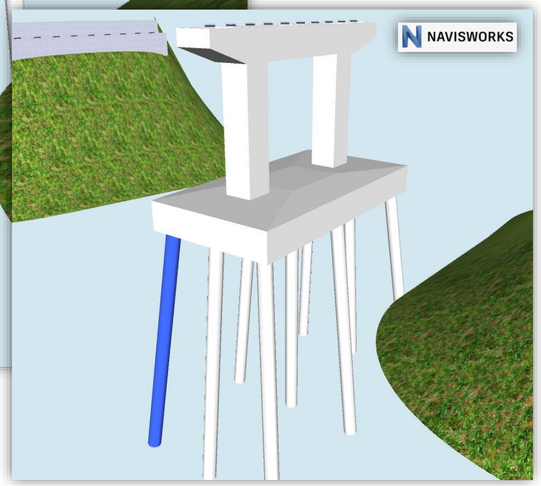
Solution – Use of Inventor Assemblies (IAM) in InfraWorks allows users to select individual phasing component











Inventor Assembly (IAM)

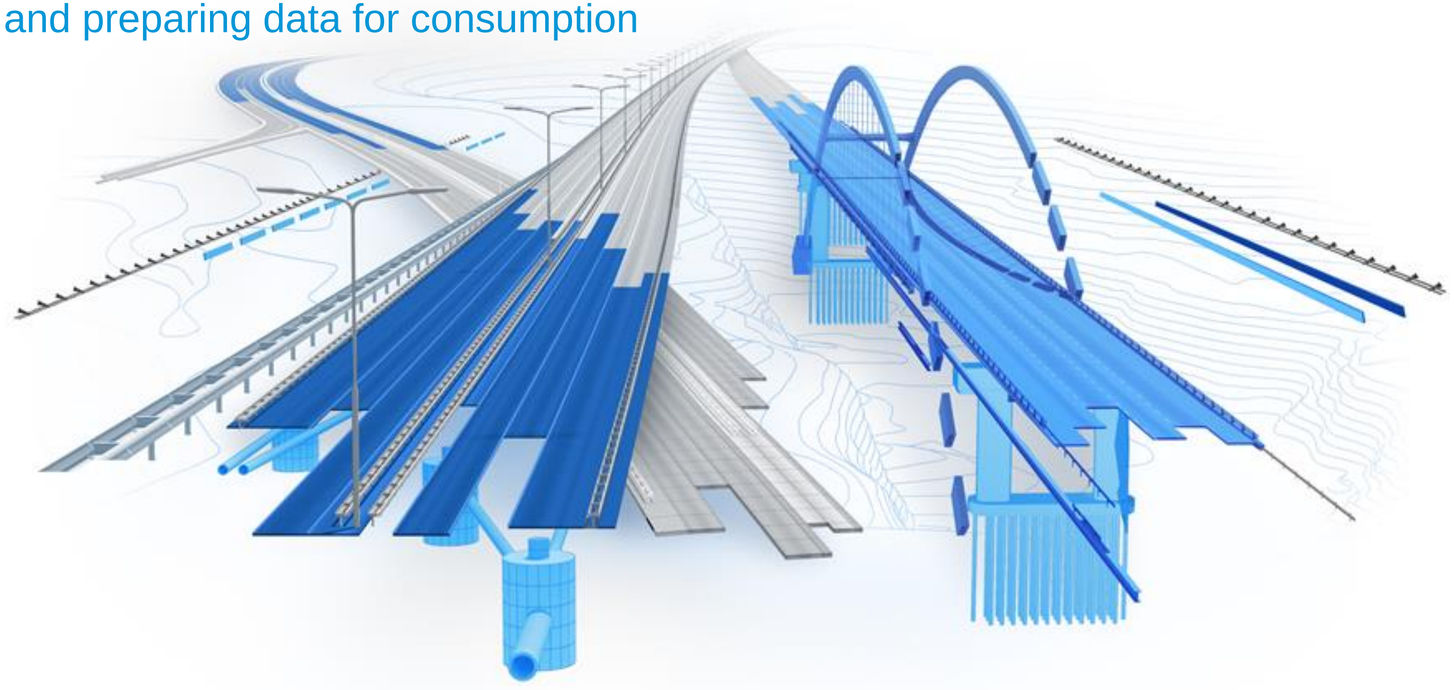
Future Advancement Wishlist

- ✓ Flexibility and more control over Intersections in InfraWorks
  - Wishlist - Ability to select alignments manually to form intersection with each other and more control over traffic direction
  - Present Scenario - Automatically creates Intersection for alignments crossing each other
- ✓ Merging of Proposals in InfraWorks
  - Wishlist – It will give ability to merge alternative concept proposals and existing – proposed proposal for MOT study
  - Present Scenario – Not available in current release. Merging of proposals used to be part of InfraWorks but not efficient
- ✓ Point Cloud Visibility on BIM 360 through published IWM model files
- ✓ Improvement in Point Cloud Feature extraction tools for photogrammetry generated Point Clouds in InfraWorks
- ✓ Reality Visualization AR/MR direct integration with InfraWorks Model

Conclusions

Connected BIM Interoperability – Solving Real World Problems Modelling Infrastructure Projects

- ✓ Discover the workflow for using InfraWorks, Autodesk Civil 3D, Inventor, Revit and Navisworks
- ✓ Discover the process of using Transportation Modeling
- ✓ Learn about interoperability challenges and preparing data for consumption
- ✓ Lessons learned: solutions



Questions ?

THANK YOU

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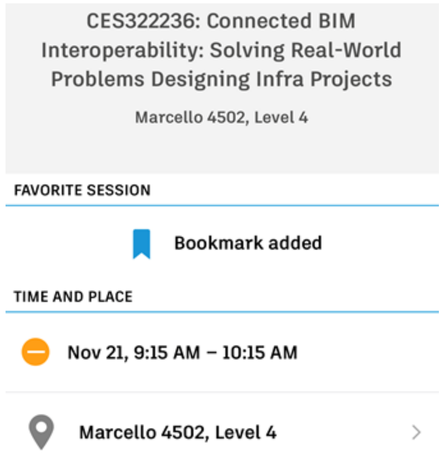

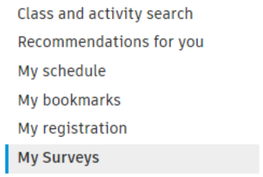

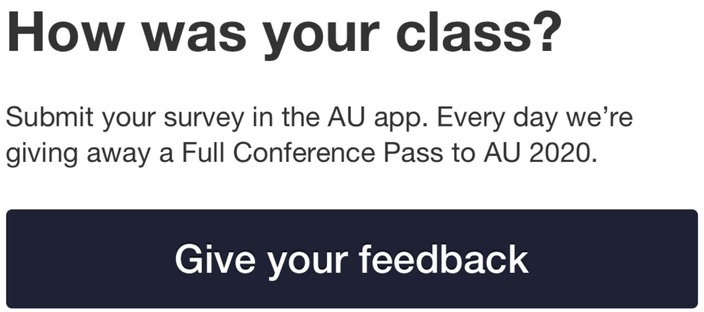

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