OpenRoads Designer
Managing Civil Geometry from Simple to Complex

Bentley
Advancing Infrastructure

Learning Objectives

This session intends to define concepts of OpenRoads Geometry and cover some commonly asked questions on it's use. This session intends to provide something for the novice user through to expert user.

- Reference Lectures Material
  - Previous Learn Conferences
    - Best Practice Geometry
  - CivilAccuDraw, MicroStation AccuDraw or Both (Lecture)
  - QuickStart: OpenRoads Technology Geometry (Workshops)
  - Creating and Editing Alignment Geometry (Workshops)

Harnessing the Power of Civil Geometry

OpenRoads geometry is very powerful but can get complex. However, once you understand all of the tools and relationships you will be on your way to being a geometry master. In this session we explore tools and techniques that make editing and managing even complex geometry easy. We will explore tools such as Copy, Append, Table Editing, Simplify, Complex Redefine, and more.

Agenda

- *Geometry - where have we come from*
  - *The drivers for change*
- *OpenRoads Geometry*
  - *Getting Started*
  - *Tools*
  - *Workflows*

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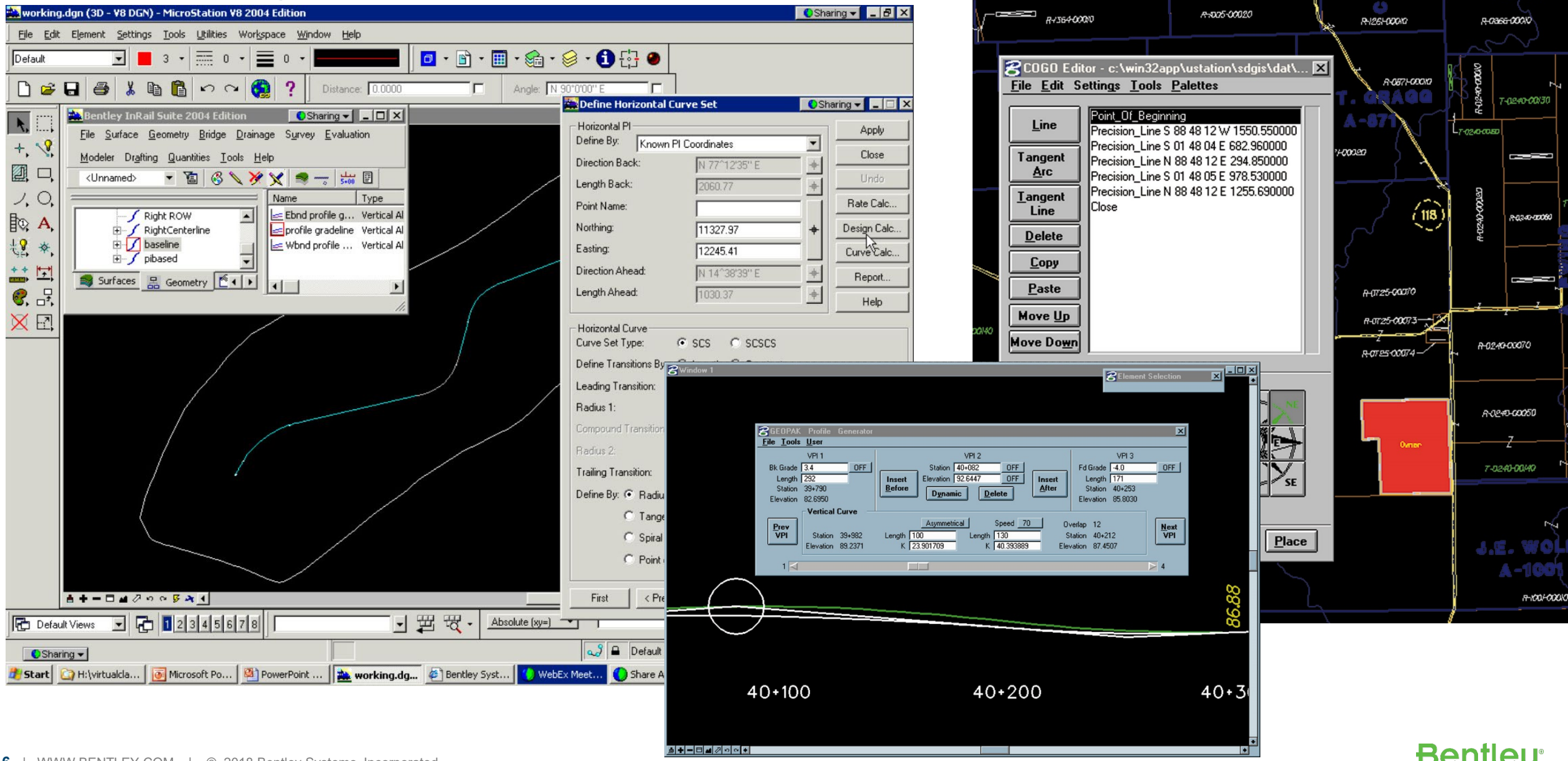
Geometry - where we've come from

Geometry - where we've come from



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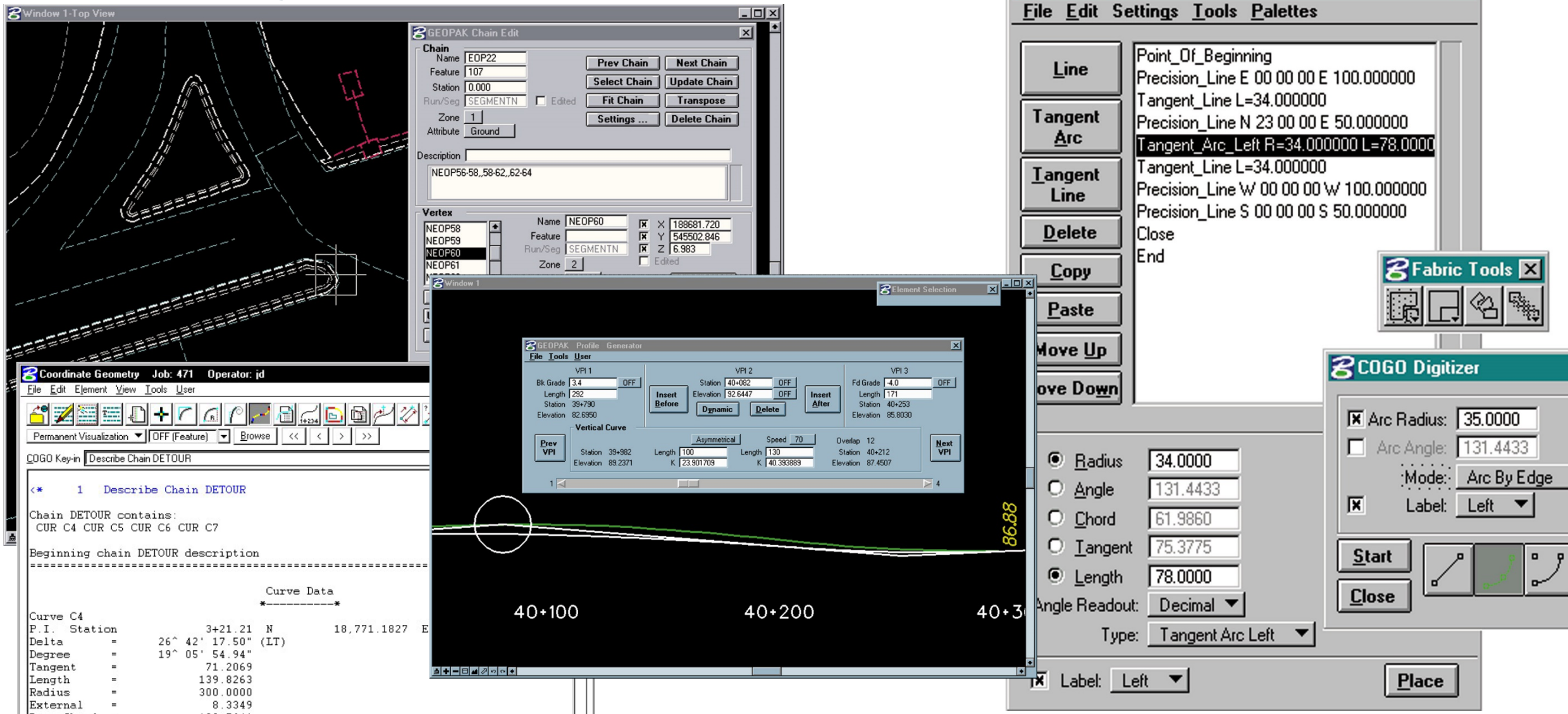
Geometry - where we've come from



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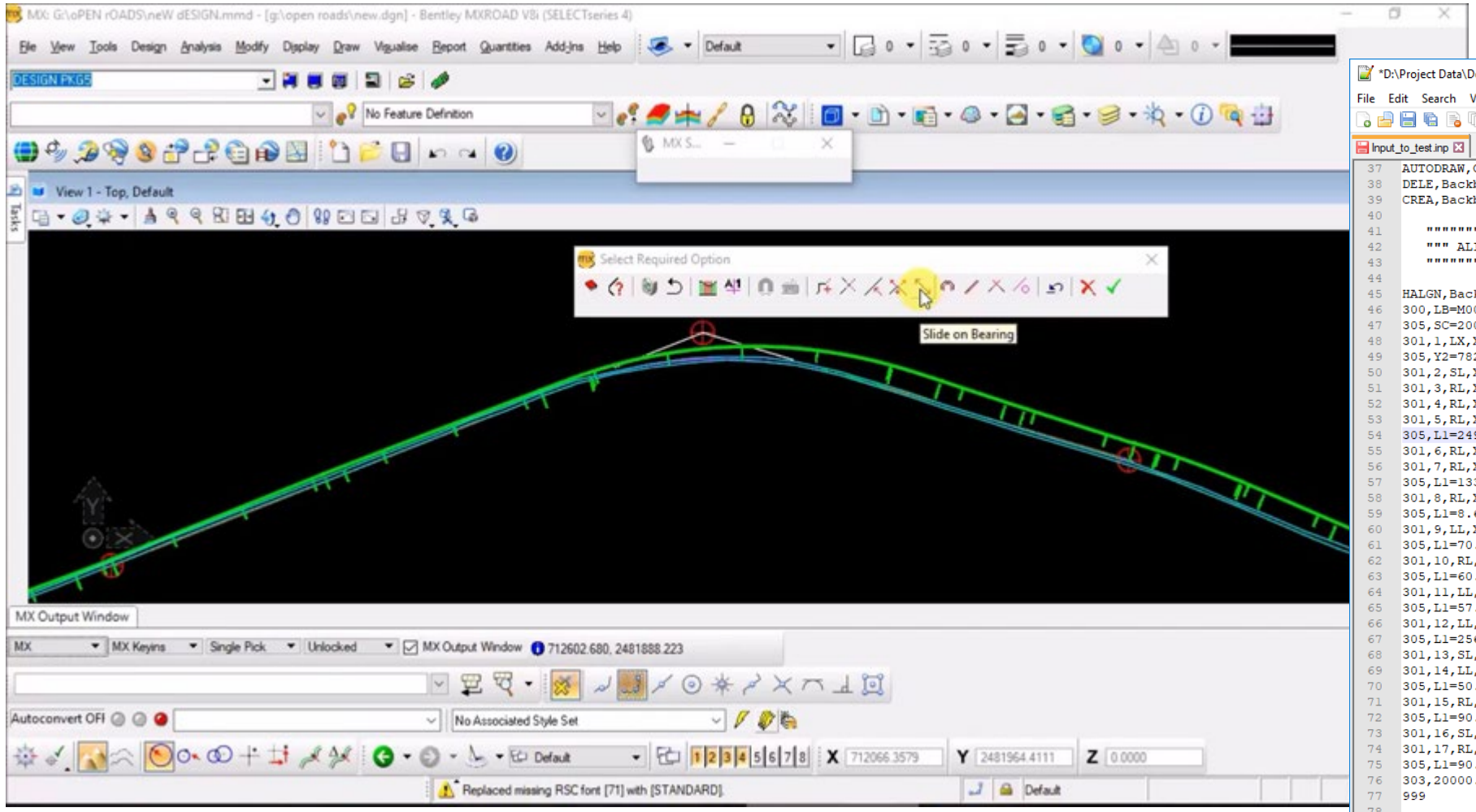
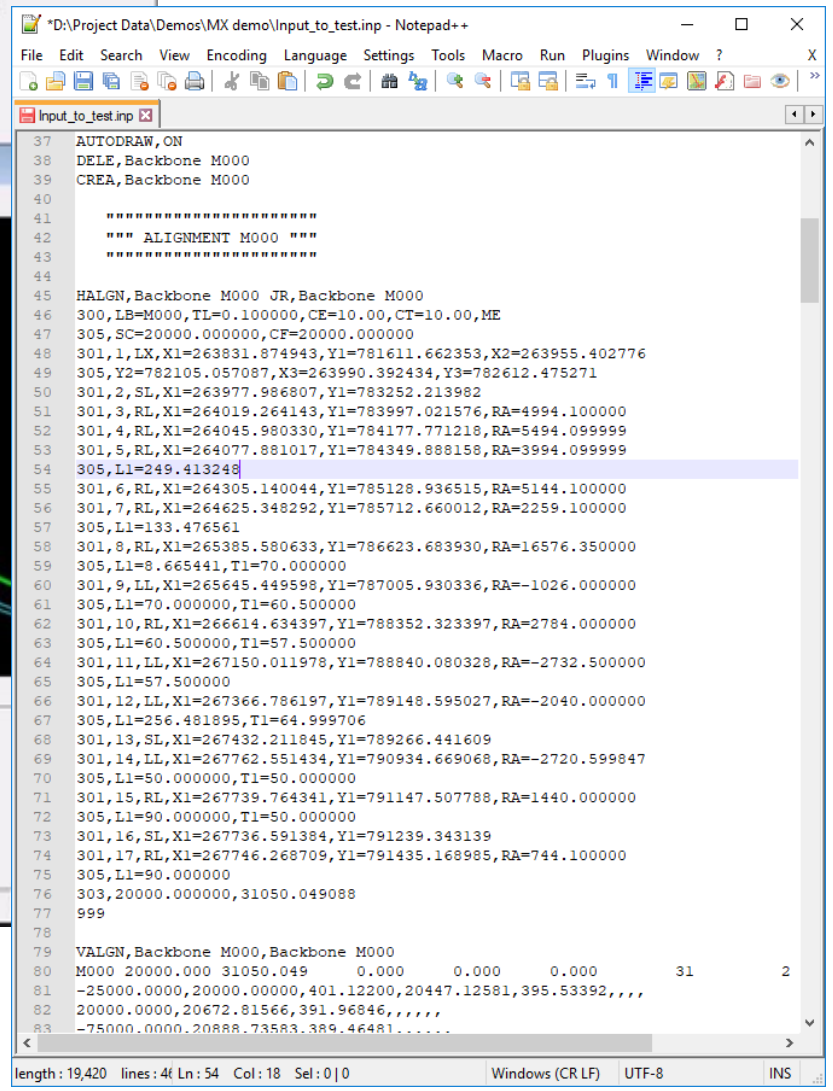
Geometry - where we've come from





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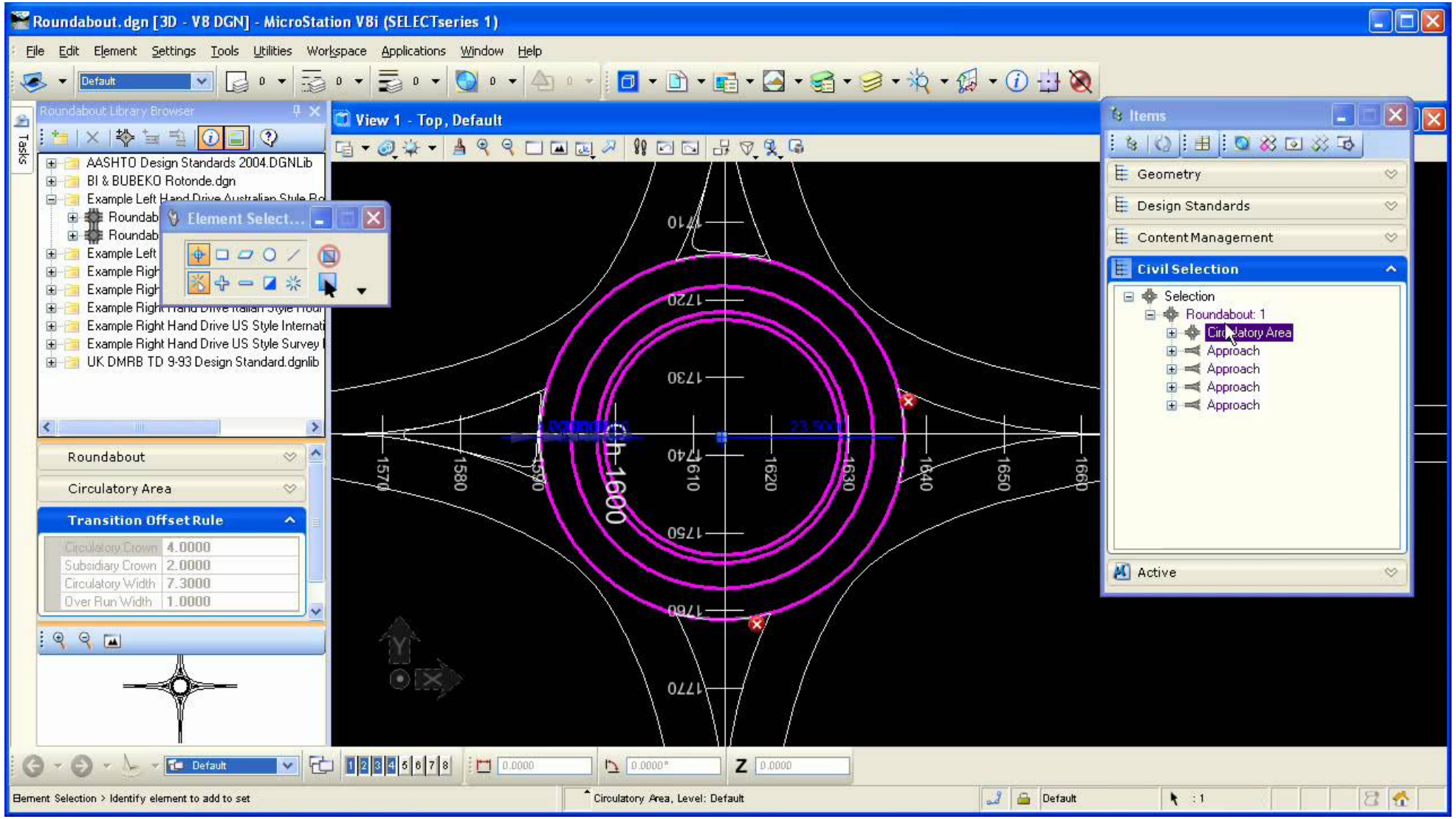
Geometry - where we've come from



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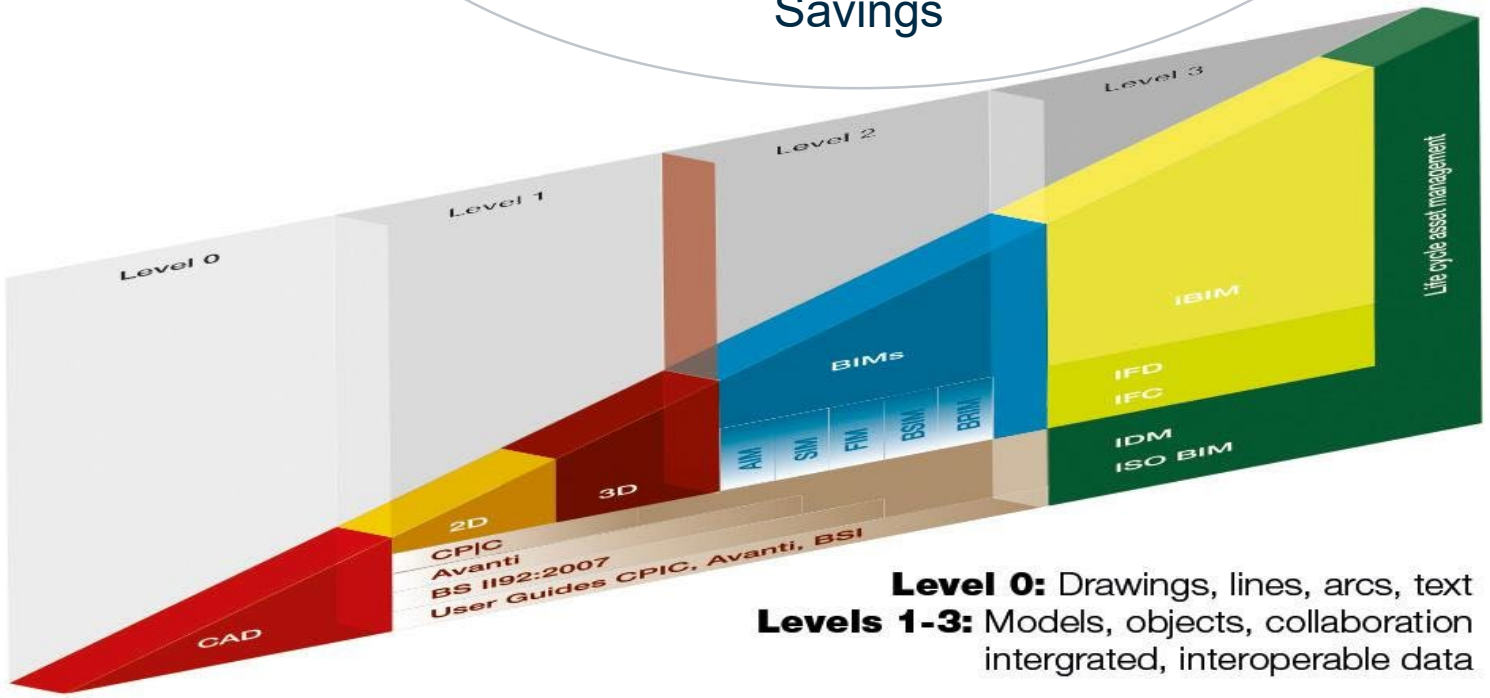
The drivers for change

- Legacy processes

Disconnected Workflows
Multiple tools doing the same / similar thing
Difficult to Learn for new users
No Undo
No relationships
Manual updates
Sharing / CopyingGreater efficiency
Confidence
Object modelling
Savings



Level 0: Drawings, lines, arcs, text
Levels 1-3: Models, objects, collaboration intergrated, interoperable data

Bew-Richards BIM maturity model

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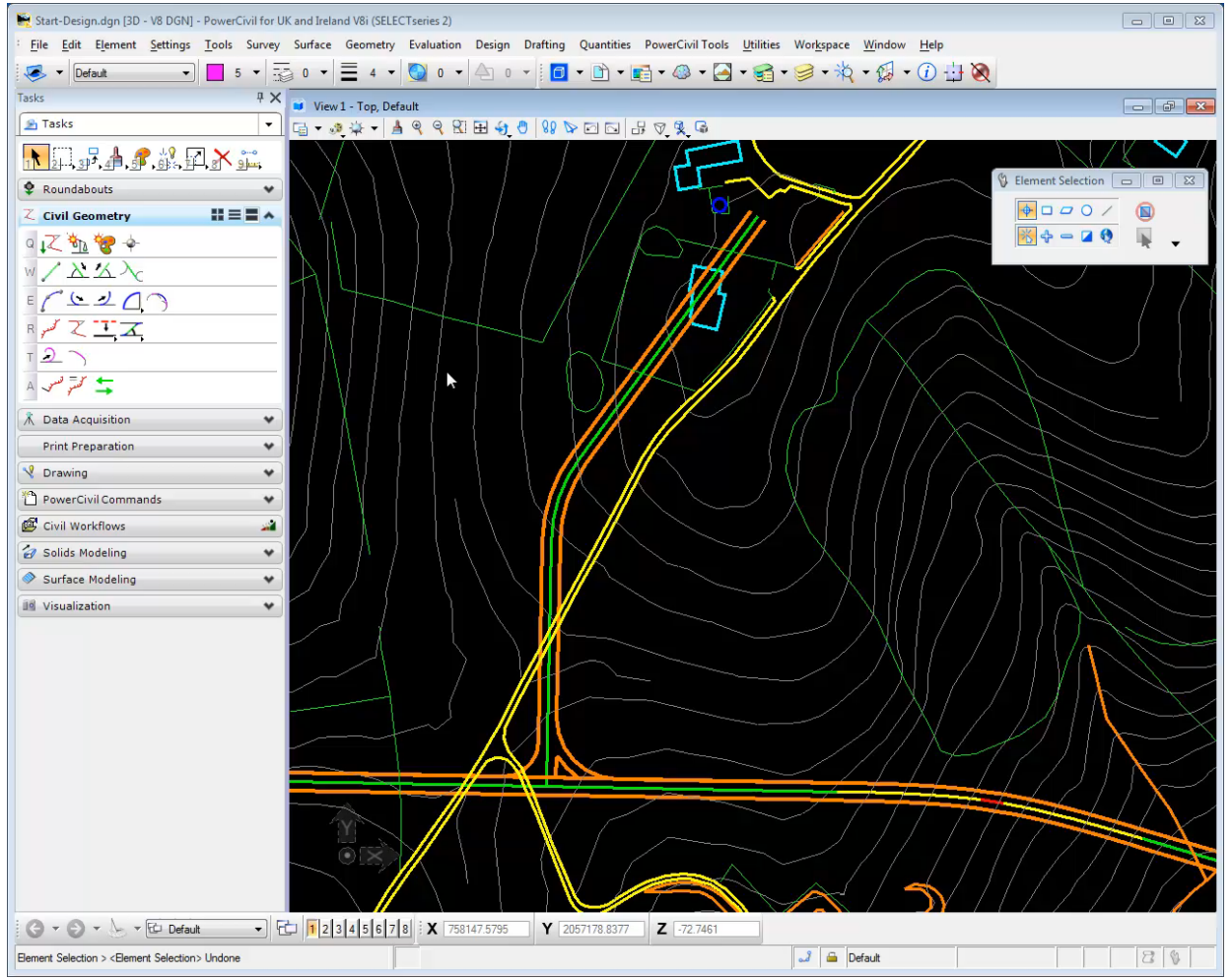
Introduction to 2D Civil Geometry – SELECTseries2 (cira 2010)

Lets focus on the phrase

*'Civil tools create geometry with **rules** and **associations** that provide **intelligent updating** – Design Intent'*

Originally seen way back in SELECTseries 2 as new Horizontal Geometry capability

3D Civil Geometry – SELECTseries 3 (cira 2013) and beyond



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OpenRoads Geometry

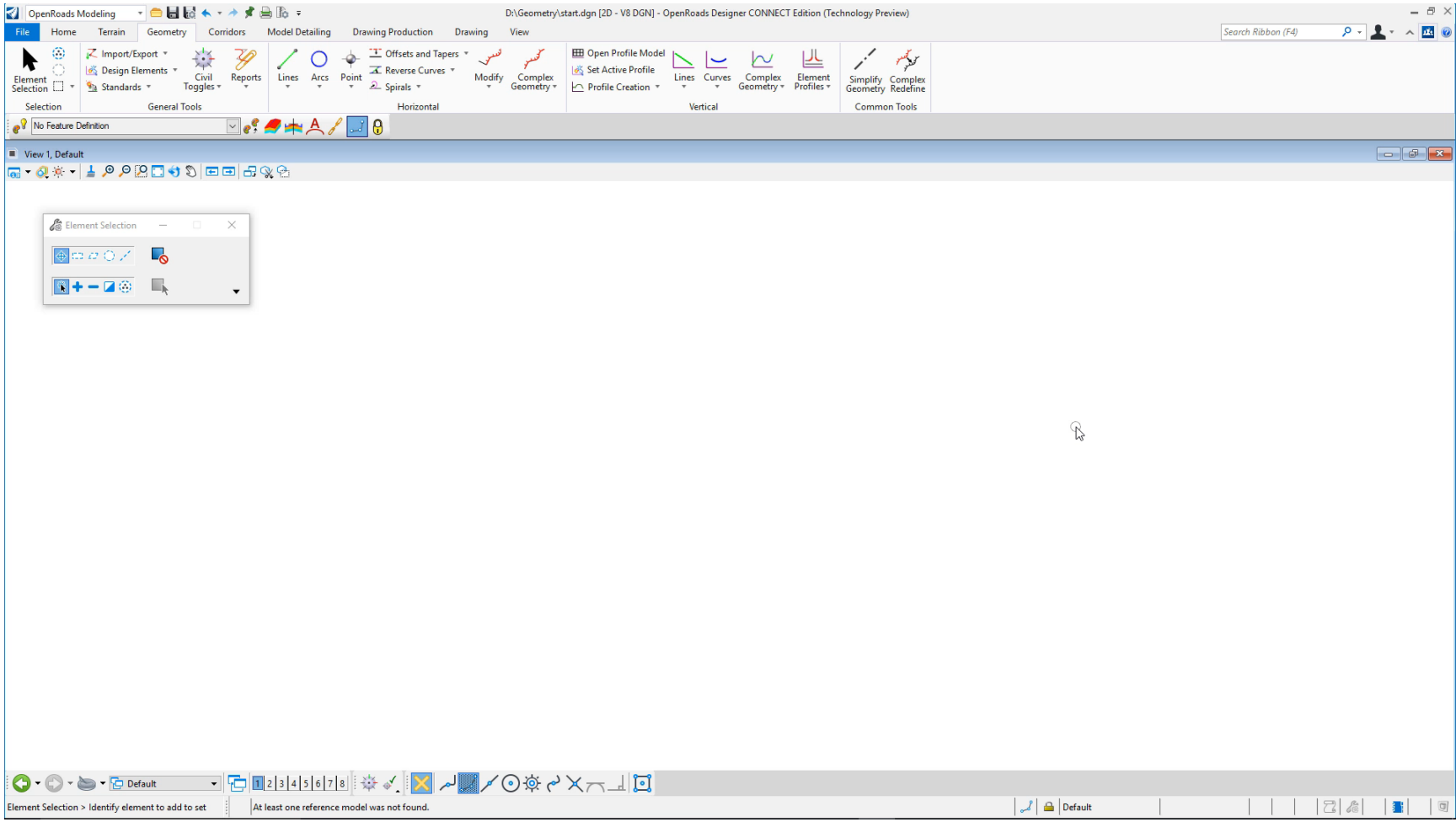
Characteristics of Openroads Geometry

- *MicroStation graphical elements with added **intelligence**. Created with **rules** and **relationships** that provide **intelligent updating** – Design Intent*
- *Interactive / Dynamic user experience*
  - *Easier to Learn*
  - *Edit handlers, manipulators*
  - *Context sensitive toolbars*
  - *In-Place Editing*
  - *Heads up prompting keeps your focus on your work.*
- *Supports multiple data sources ALG, GPK and FIL, LandXML*

OpenRoads Geometry – Getting Started

Getting Started

- Connected User
- Personal Portal
- Connect Advisor
  - Communities
  - Learn Server
  - You Tube



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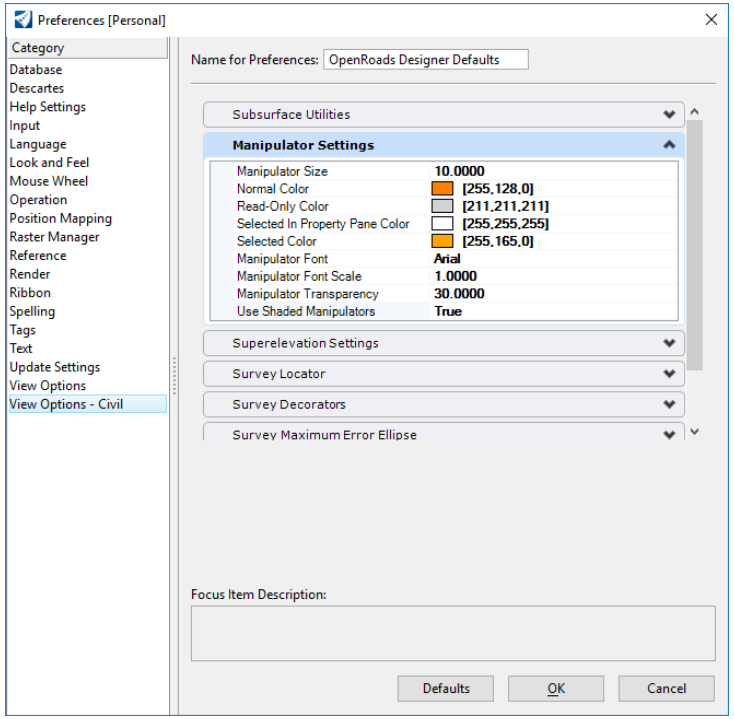
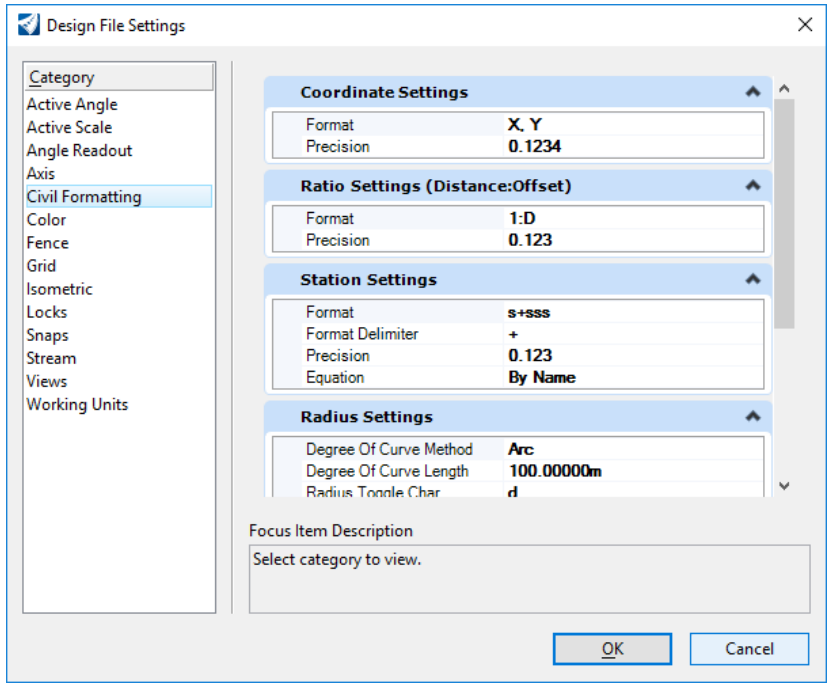
Getting Started – Look and Feel

- ORD Back Stage
- Settings > User > Preferences
  - Look and feel

- Settings > File > Design file settings
  - Units
  - Civil formatting
    - Stationing
    - Radius
    - Profile





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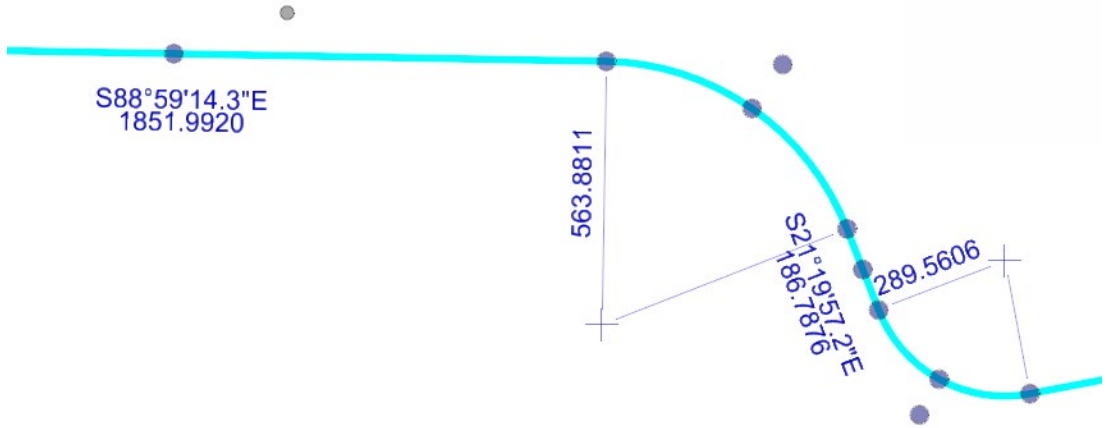
Getting Started – Look and Feel

- Manipulators have to work for you so make them your own personal preferences
  - Change the colour to suit your background
  - Change the size to suit your eyesight and screen

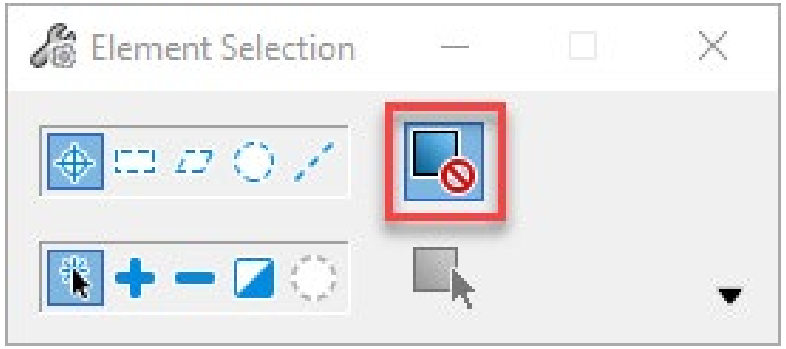
Manipulator Settings

Manipulator Size	10.0000
Normal Color	[255,128,0]
Read-Only Color	[211,211,211]
Selected In Property Pane Color	[255,255,255]
Selected Color	[255,165,0]
Manipulator Font	Arial
Manipulator Font Scale	1.0000
Manipulator Transparency	30.0000
Use Shaded Manipulators	True



Getting Started – Look and Feel

- Manipulators not available ?
  - Handles turned off
  - Zoomed out or partially off screen
  - Stored in a Reference file
    - Activate / exchange
  - Imported without rules (think read only)



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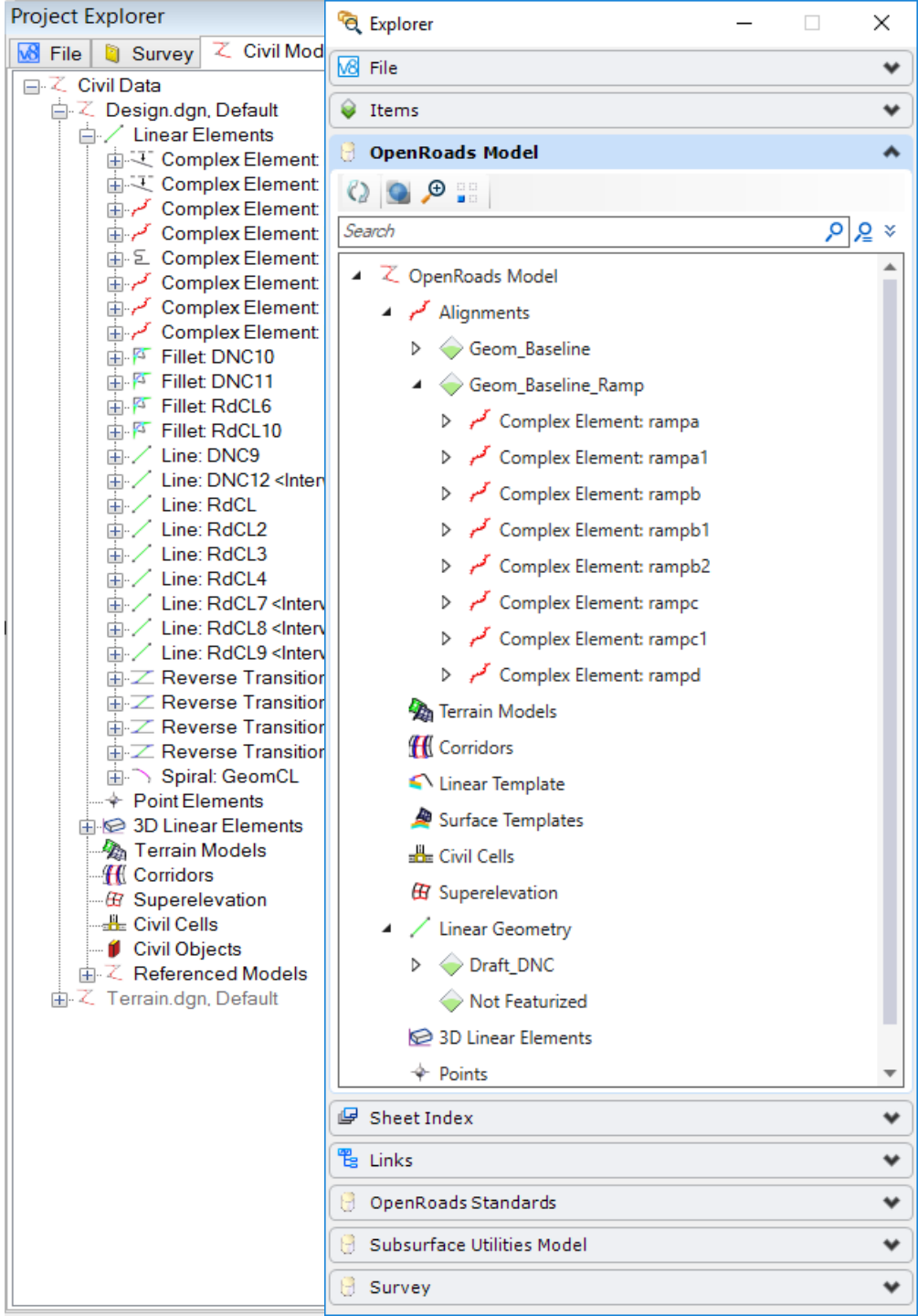
Getting Started – Look and Feel

- Civil Model and Element info
  - Geometry is stored in the following containers
    - OpenRoads Designer
      - Alignments (New in CONNECT)
      - Linear
  - It's all Geometry
  - Features provide default Geometry naming
  - Sorting by Feature Definition > Element Name
  - Right Click options to navigate / highlight and dig into elements within a complex

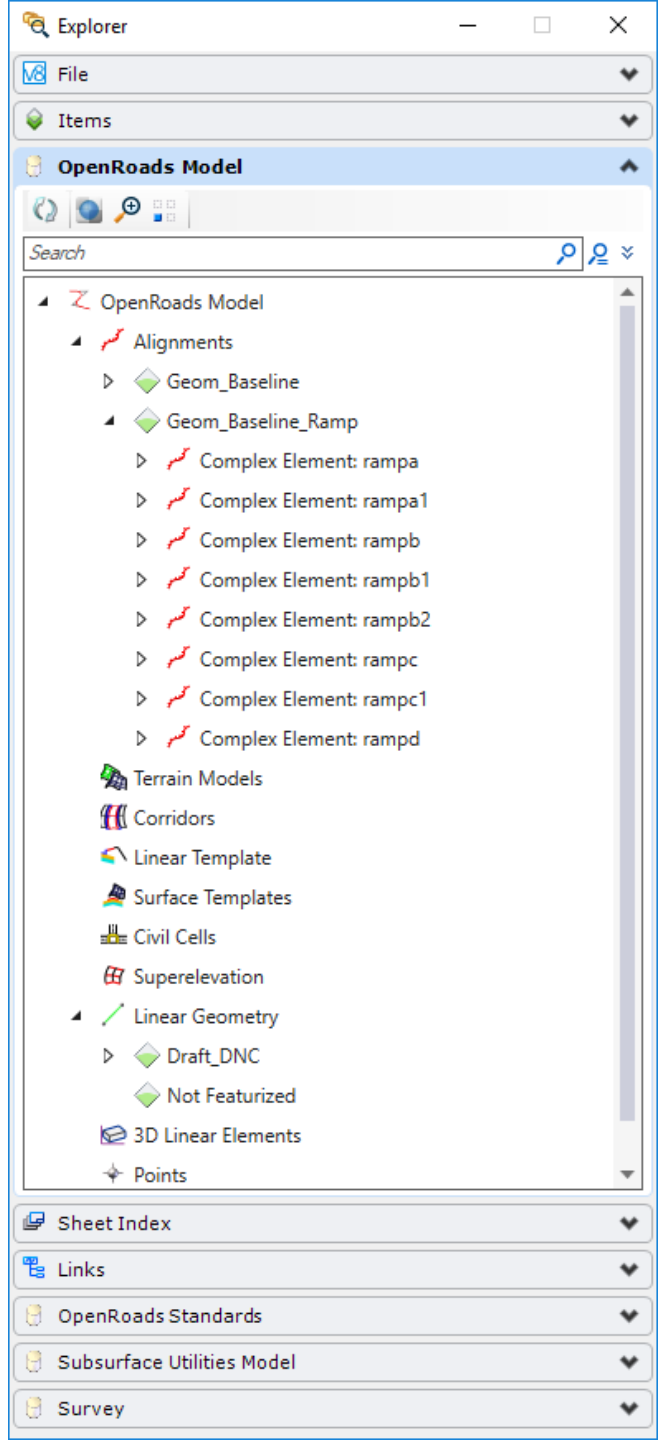


Getting Started – Look and Feel

Project Explorer > Civil Model

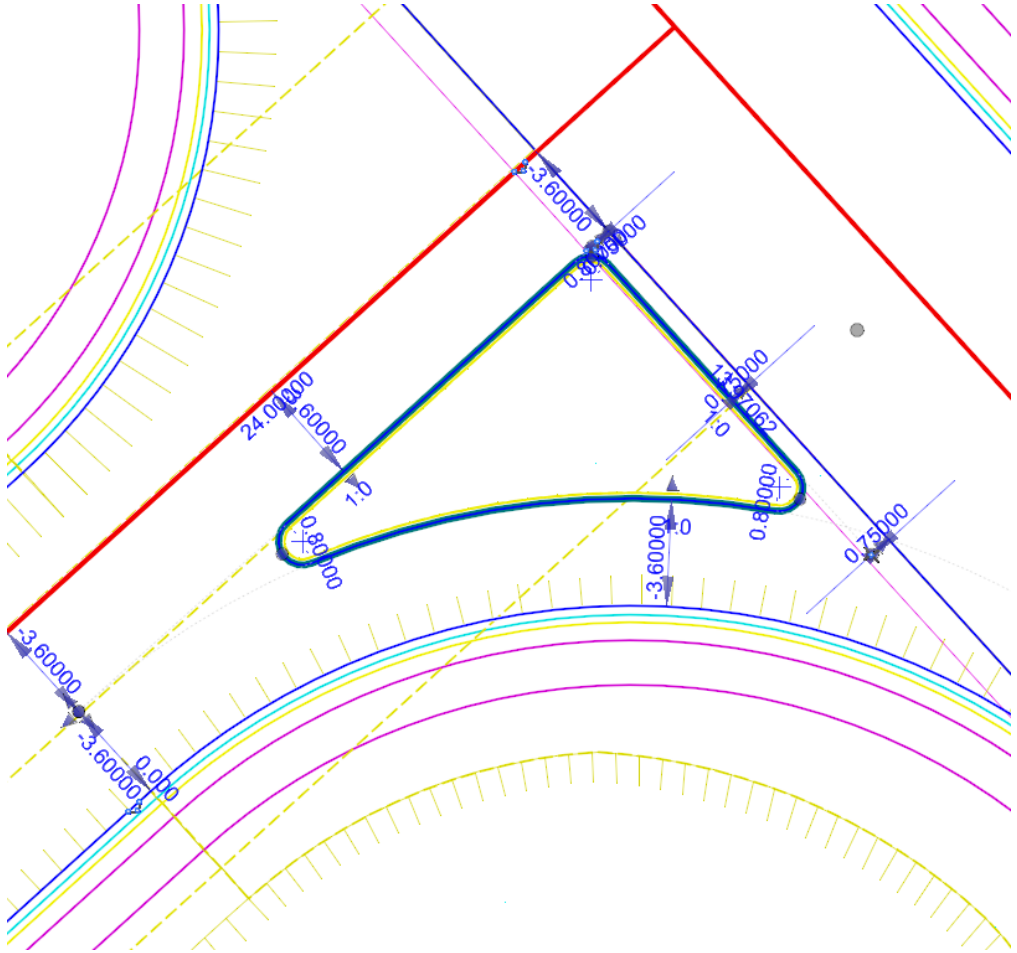
Provides the container for the Civil Model

- Alignments
- Linear Elements
- Point Elements
- 3D Linear
- Terrain Models
- Corridors
- Superelevation
- Civil Objects
- Civil Cells
- Reference Models



Understanding The Geometry Model - Rules

- Rules
  - Relationship – cause / effect
    - Line / Arc / Spiral from / to
    - Line / Arc between
    - Offset from
    - Slope from
    - Etc
  - Includes
    - Snaps
    - Civil Accudraw
  - Multiple Rule Buckets
    - Geometry
    - Corridor



Without Rules there would be no Design Intent
They underpin EVERYTHING in OpenRoads

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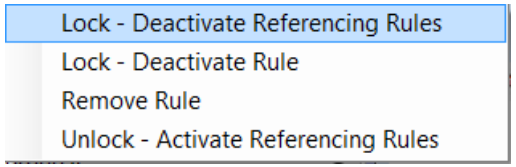
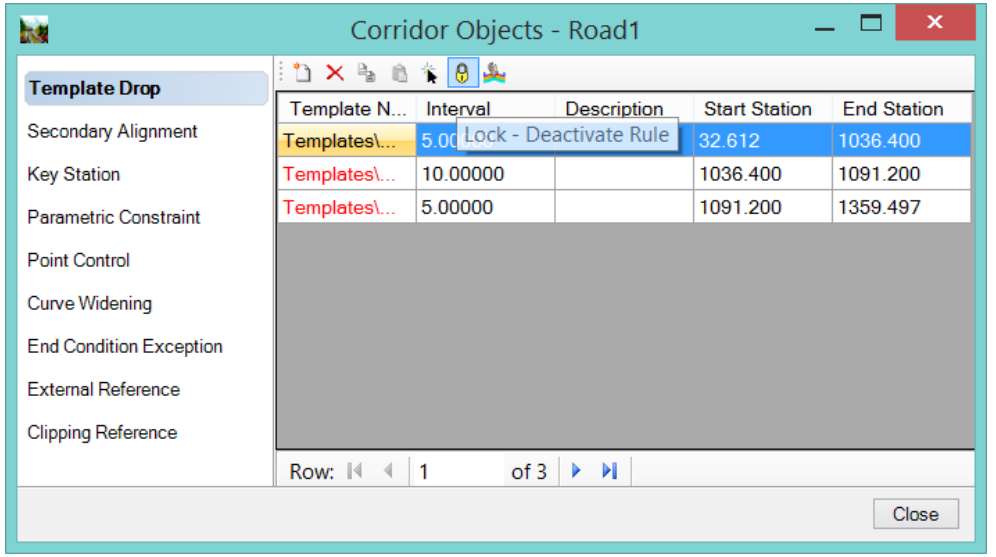
Understanding The Geometry Model - Rules

- Rules
  - Rule Management
    - Lock / Unlock Rule #
      - Can't edit / delete / no manipulators
    - Lock / Unlock Referencing Rules #
      - Children are locked and don't update
    - Remove Rule

  # sometimes a toggle or explicit command





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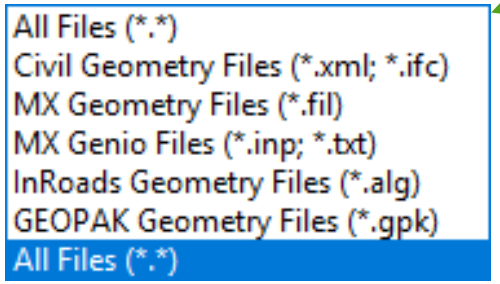
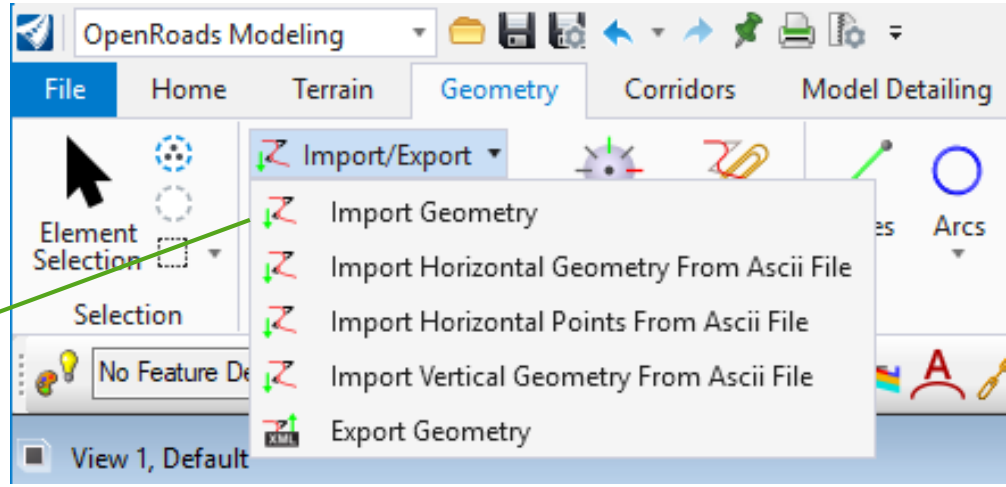
OpenRoads Geometry – Importing

Getting Started – Import / Export Geometry

- Import Geometry – looks to native product formats and third party file types
  - GPK - GEOPAK
  - ALG - InRoads
  - .FIL - MX
  - LandXML
  - ASCii H&V
  - IFC Alignment
  - Genio
  - Import Horizontal Points from Ascii File





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New
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Save
Save As
Save Settings
Send Mail
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Tools
Settings
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Import
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Publish i-model
Help
Exit

Open

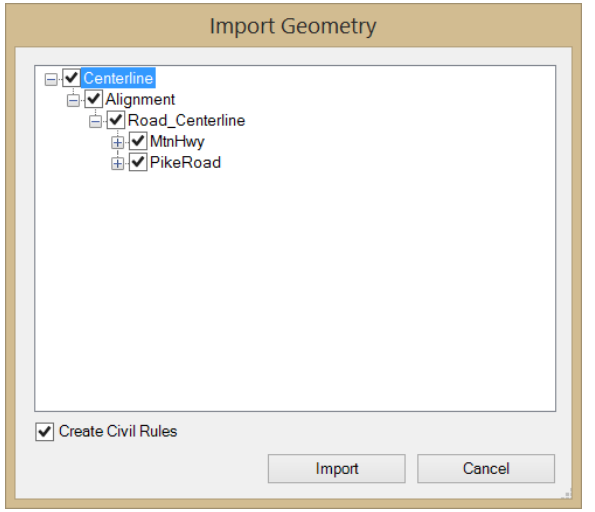
Recent Files for Training-Metric

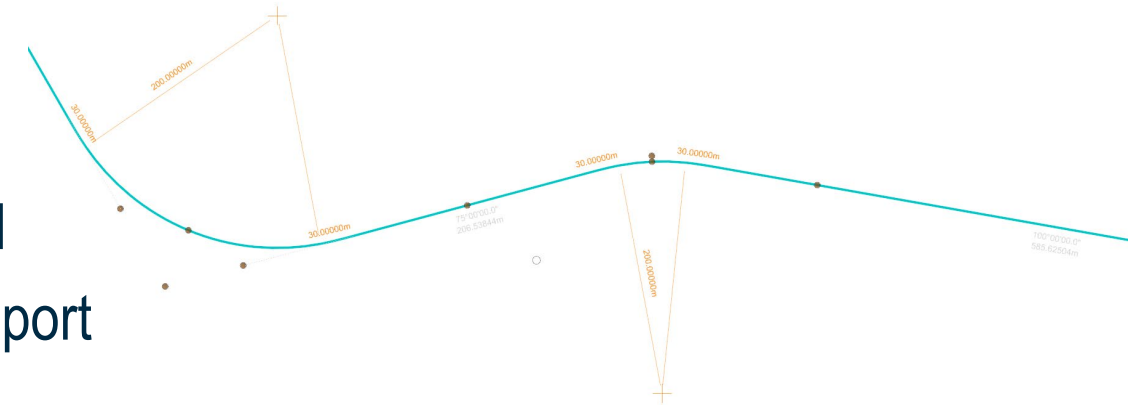
Geometry_import_3D.dgn
D:\Geometry\
Model: Default
Modified: 12/10/2017 09:55:21
Size: 824 KB

Browse

What we just saw– Import Geometry

- Create Civil Rules - What does this mean ?
- Ruled Geometry
  - Promotes the Geometry to the DGN
  - Creates dynamically editable civil geometry H&V
- Un-Ruled Geometry
  - Read only Geometry to the DGN
  - Only provides Station controls
  - Vertical can have new profile defined and applied
  - Maintains control to the Native application / re-import





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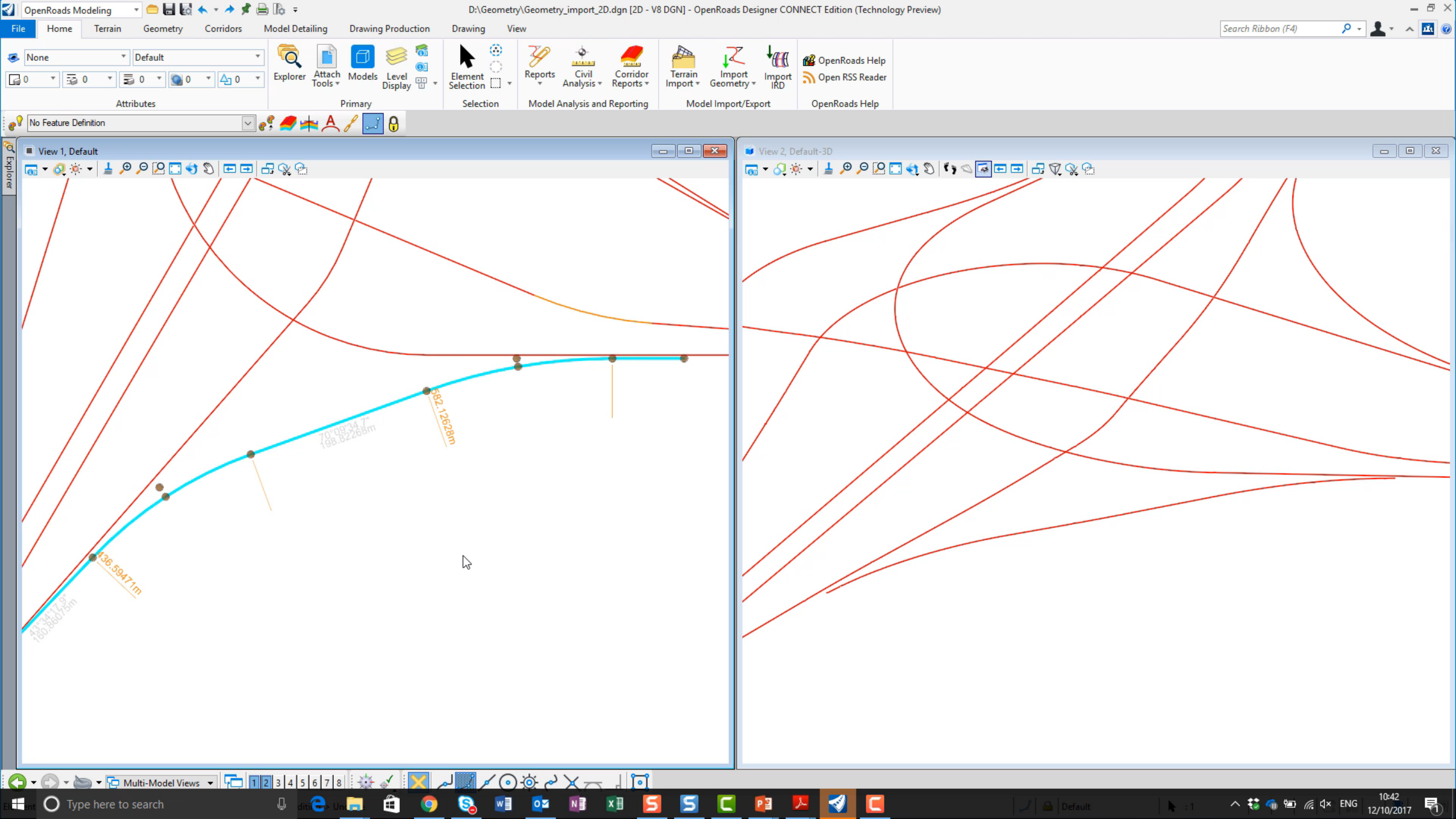
OpenRoads Modeling
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File
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Terrain
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Corridors
Model Detailing
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Search Ribbon (F4)
None
Default
Attributes
Explorer
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Level Display
Primary
Element Selection
Selection
Reports
Civil Analysis
Corridor Reports
Model Analysis and Reporting
Terrain Import
Import Geometry
Import IRD
Model Import/Export
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436.59471m
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Multi-Model Views
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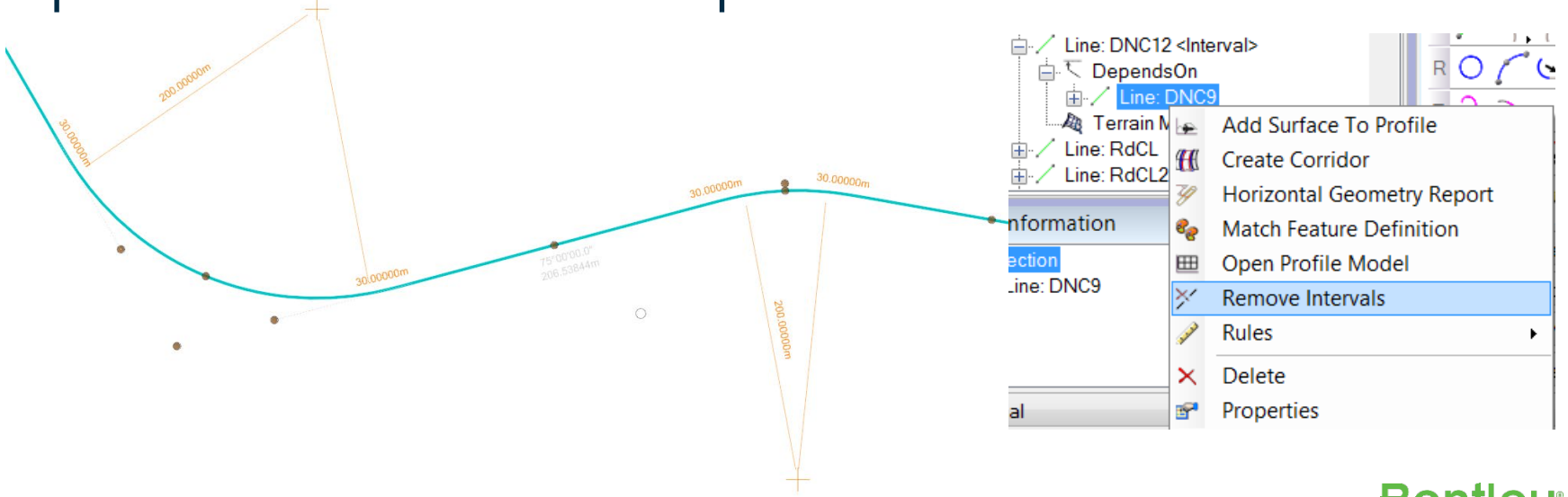
12/10/2017

Geometry Intervals - what are they ? What are the benefits

- Intervals are the **visible presentation** of underlying **base geometry**
- Intervals have external rules applied to them and so dynamically react to changes
  - Trim / Extend
  - Gaps
- Creates New named Element with rule to the parent with the base (hidden) geometry provides the ‘provenance’ that facilitates part of what we refer to as ‘design intent’



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Geometry Intervals - How can they be edited / removed ?

- Interval presentation
  - Intervals are displayed ‘dimmed’ to help identify intervals
  - Prior to update 2 the controlling base element properties were displayed
- Interval editing
  - How to access the interval

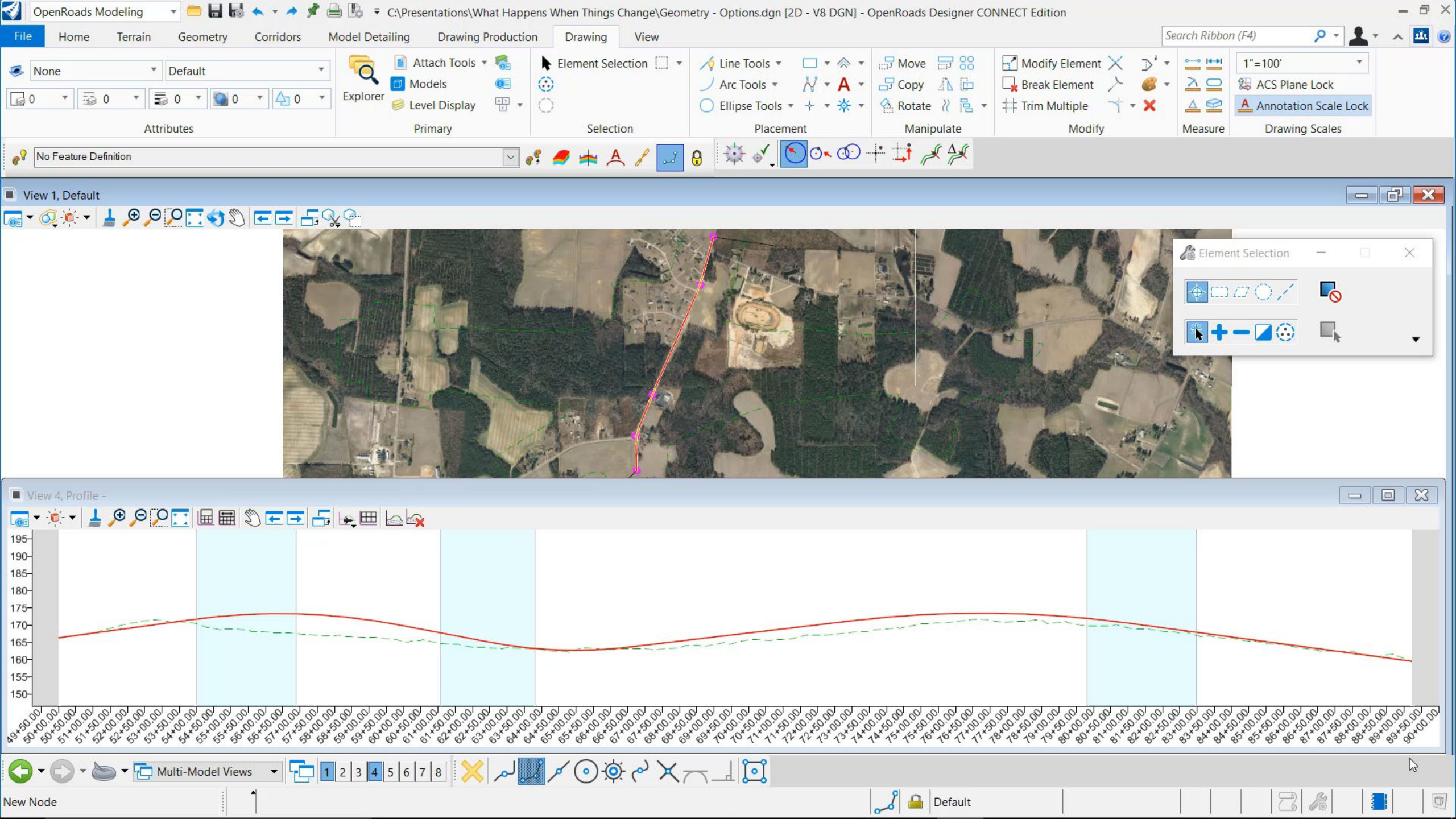
Impact of Simplifying Geometry and removing Intervals

- Simplify Geometry
  - Comparable to Legacy edits
    - Export to the tools we know, edit, round trip
    - ‘Dumbs’ the geometry down and removes rules
    - May not be desirable
  - Where there is no dependent rule allows the base elements in a complex to be simplified down to the interval
  - Works for both horizontal and vertical
  - Option to keep base element

Simple Geometry editing

How To…

- Insert PI
  - Use Insert Vertex to insert PI to horizontal alignment
- Delete PI and Remove Curves
  - Use Delete Vertex to remove PI's which can also remove horizontal curves
- Insert Curves
  - Use Insert Fillet tool if you need to insert a curve or curve combinations between tangents on previously create alignment
- Append Elements
  - If you need to add additional elements to the beginning or end of alignment


OpenRoads Modeling
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File
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Corridors
Model Detailing
Drawing Production
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Attach Tools
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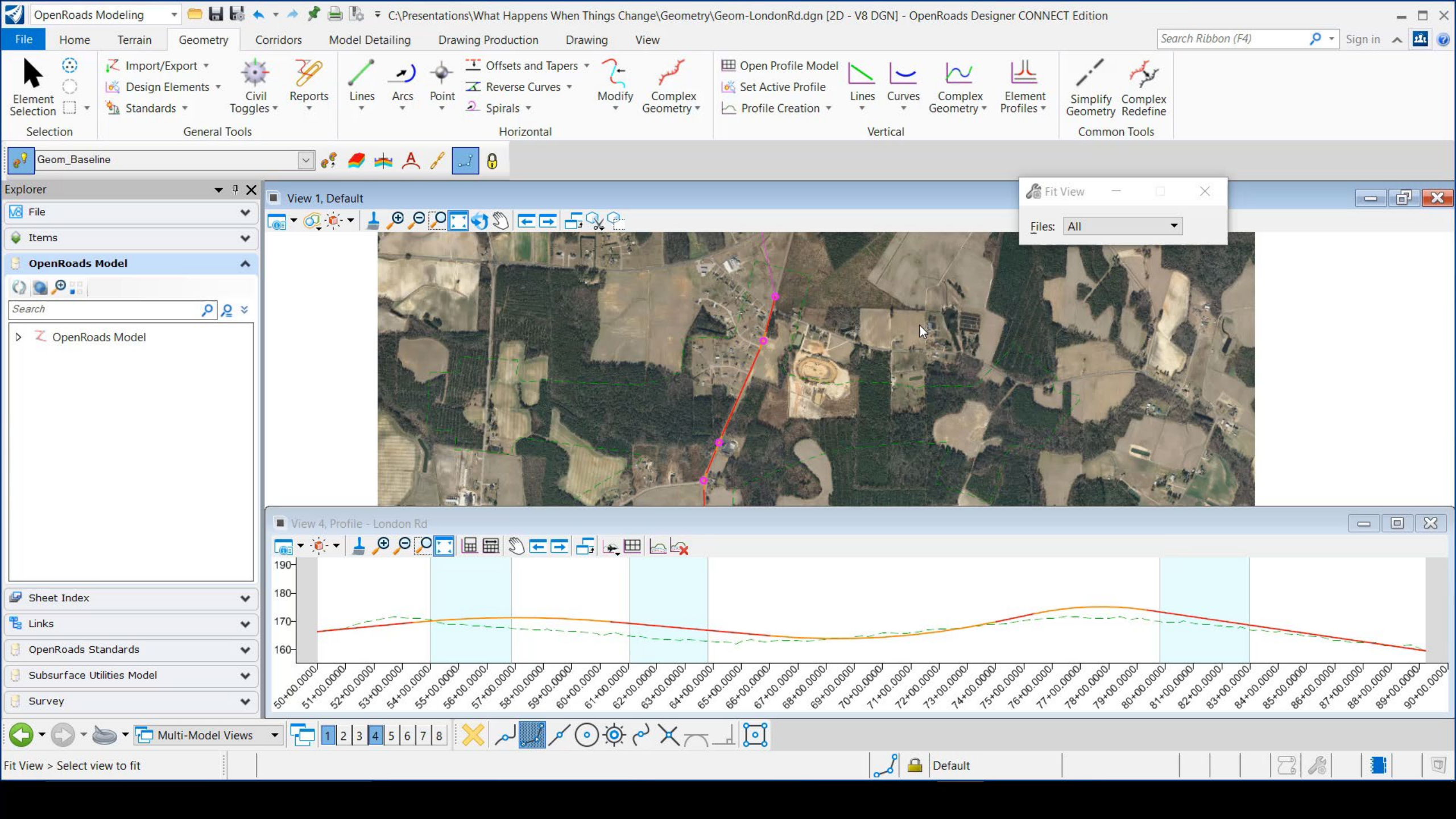
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Complex Redefine
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Multi-Model Views
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Fit View > Select view to fit
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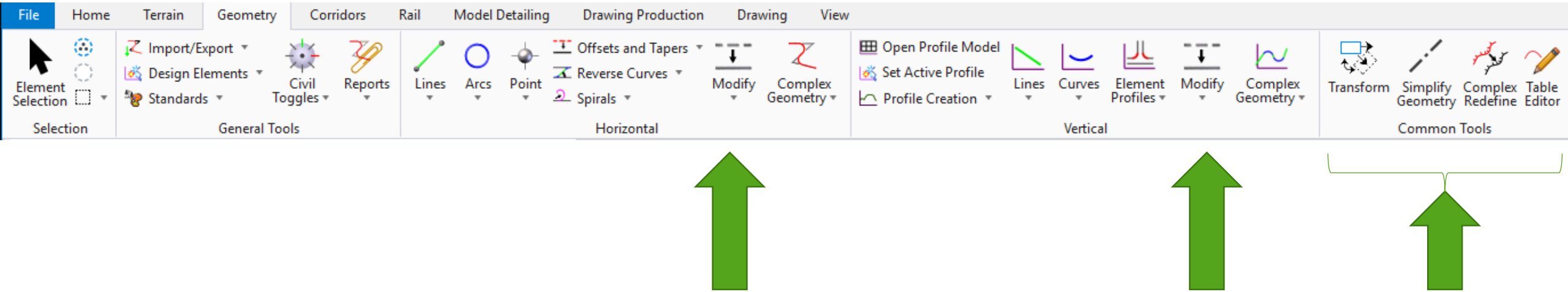
Complex Geometry editing

- New Geometry Paradigm
  - impact of
    - Rules & relationships
    - Reference files
  - MSTN edits vrs Civil Edits



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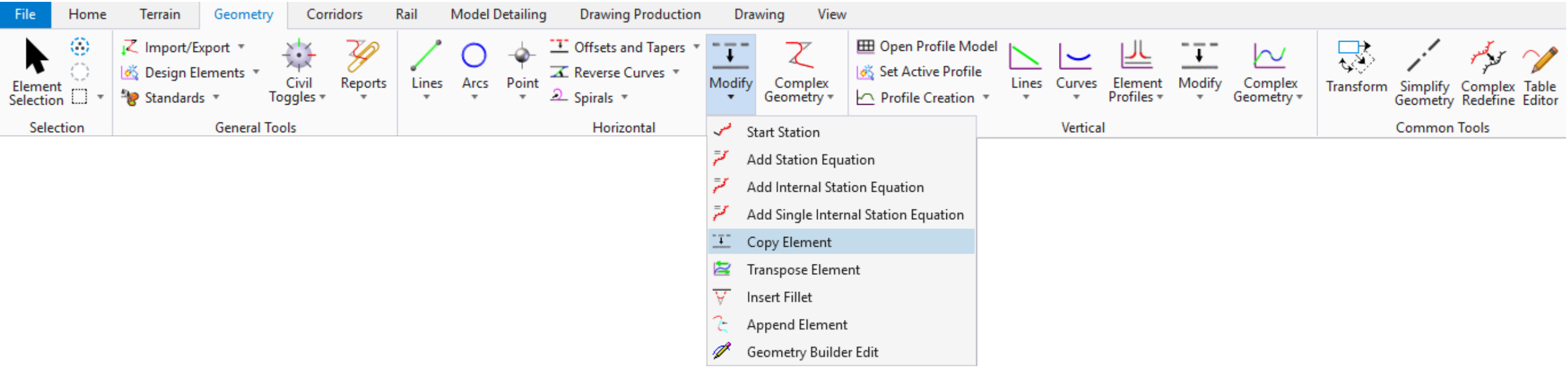
Complex Geometry editing



- Copy
  - MSTN Copy vrs Civil Copy
    - MSTN – just copies plan graphics
    - Civil Copy preserves civil integrity including vertical if present and gives option of maintaining rules

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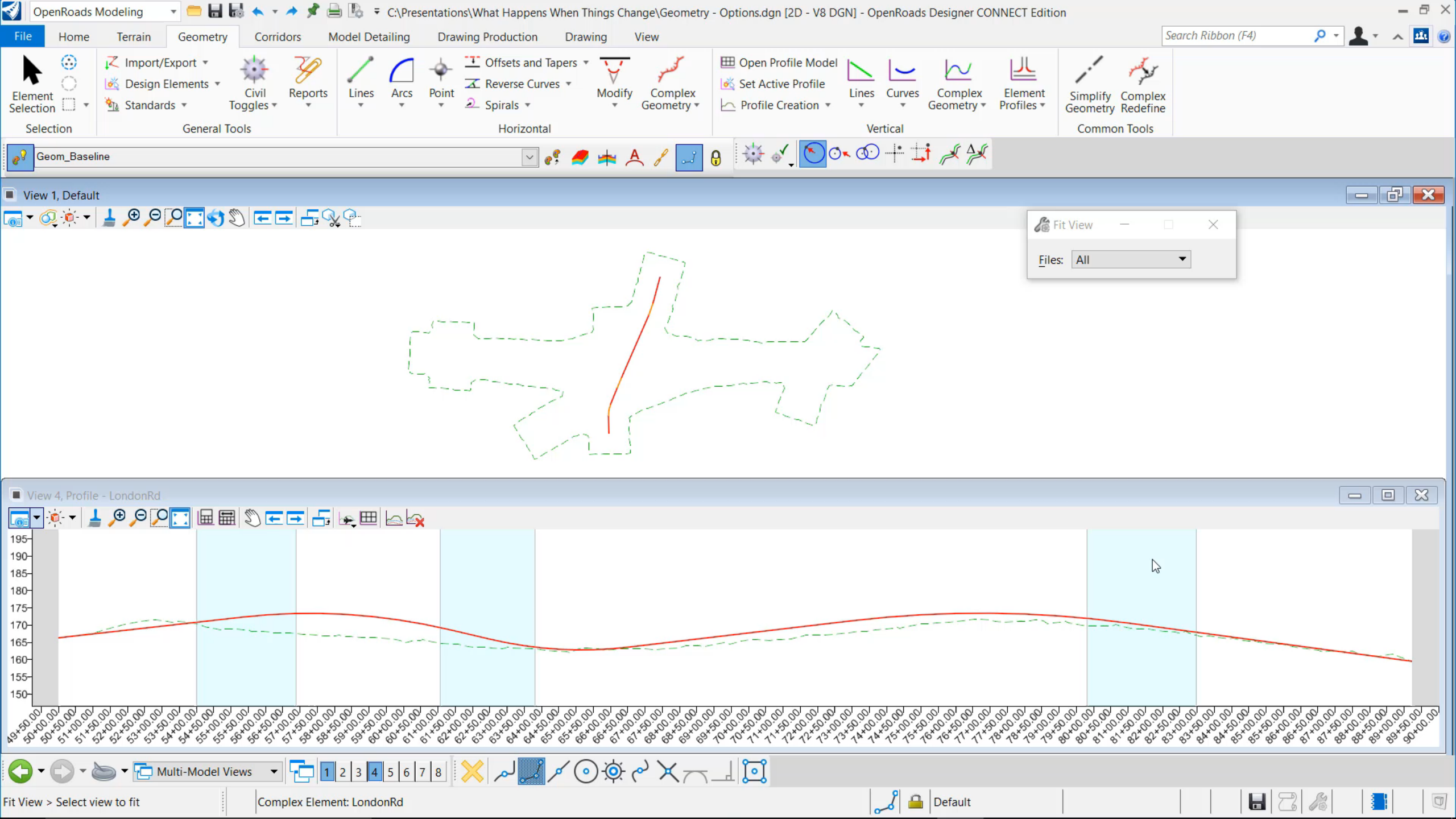
Complex Geometry Editing Options

- Drop – edit rebuild
  - REMEMBER – Civil Geometry is more than just CAD graphics
  - In the early stages this can be ok but the project develops, especially by adding vertical this can give rise to rule issue and ‘static’ models due to lost refences
- Substitute Geom
  - Allows the corridor to be reassigned to new geom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Reverse Curves
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Element Profiles
Vertical
Simplify Geometry
Complex Redefine
Common Tools
Geom_Baseline
View 1, Default
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Multi-Model Views
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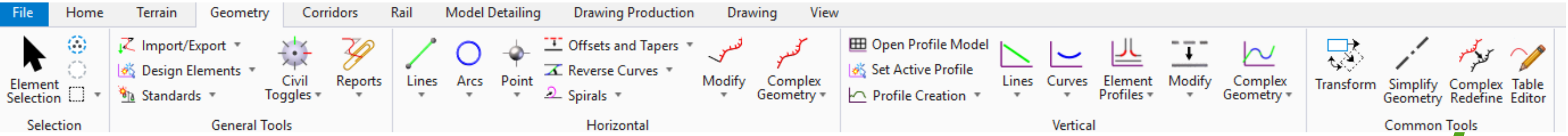
Complex Element: LondonRd
Default

Complex Geometry editing Options - Complex Redefine



- Provides the best and recommended workflow for complex editing of ‘ruled geometry’
- Non destructive
- Preserves rules

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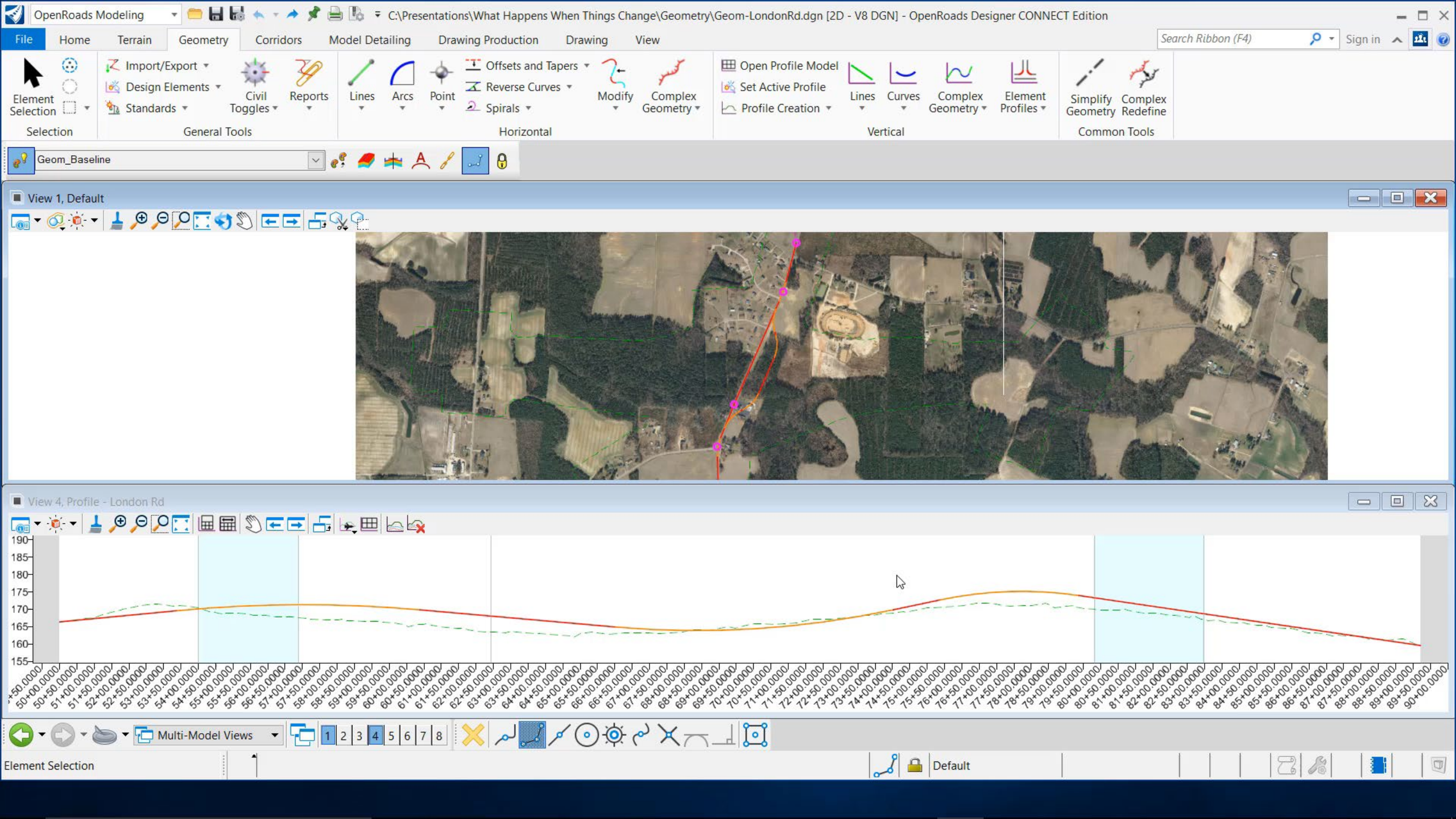
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View 1, Default
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190
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Multi-Model Views
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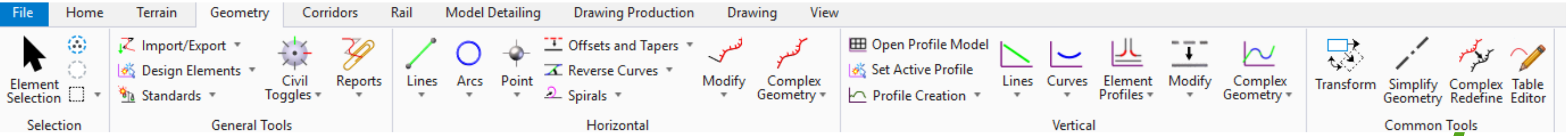
Element Selection
Default

Complex Geometry editing Options - Complex Redefine



- The recommended workflow for complex editing of ‘ruled geometry’
- Non destructive
  - Preserves rules
  - Links maintained for common elements
- Projects vertical (the new horizontal will be different so this is a best first attempt)

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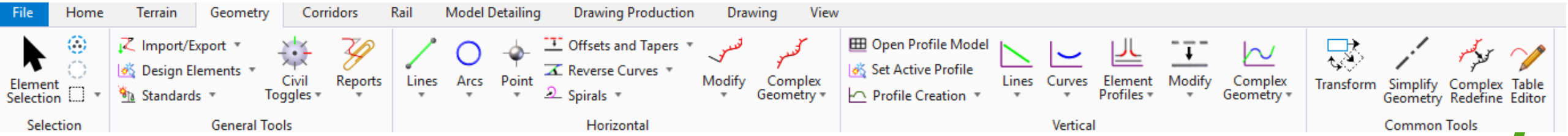
Complex Geometry editing Options – Table Editor (H&V)



Alignment Table Editor: rampc

Station	Back Tangent Length		Back Bearing	Back Spiral Length		Northing		Easting	Radius	Arc Length	Ahead Spiral Length		Ahead Bearing	Ahead Tangent Length
0+000.000		☐			☐	3971111.77621	☐	231661.48965				☐	203°00'19.1"	455.99629
0+537.850	455.99629	☐	23°00'19.1"	0.00000	☐	3970615.80704	☐	231450.90893	436.59471	163.70694	0.00000	☐	224°29'20.8"	309.01981
1+270.314	309.01981	☐	44°29'20.8"	0.00000	☐	3969841.29502	☐	230690.08708	291.06314	683.18218	0.00000	☐	90°00'17.0"	512.29795
2+187.844	512.29795	☐	270°00'17.0"	0.00000	☐	3969841.19066	☐	231959.89627	1746.37885	127.28181	0.00000	☐	94°10'50.2"	312.32434
2+563.809	312.32434	☐	274°10'50.2"		☐	3969813.78046	☐	232334.88926				☐		

Report

Apply

NOTE :- Table Editor 'Simplifies the geometry'

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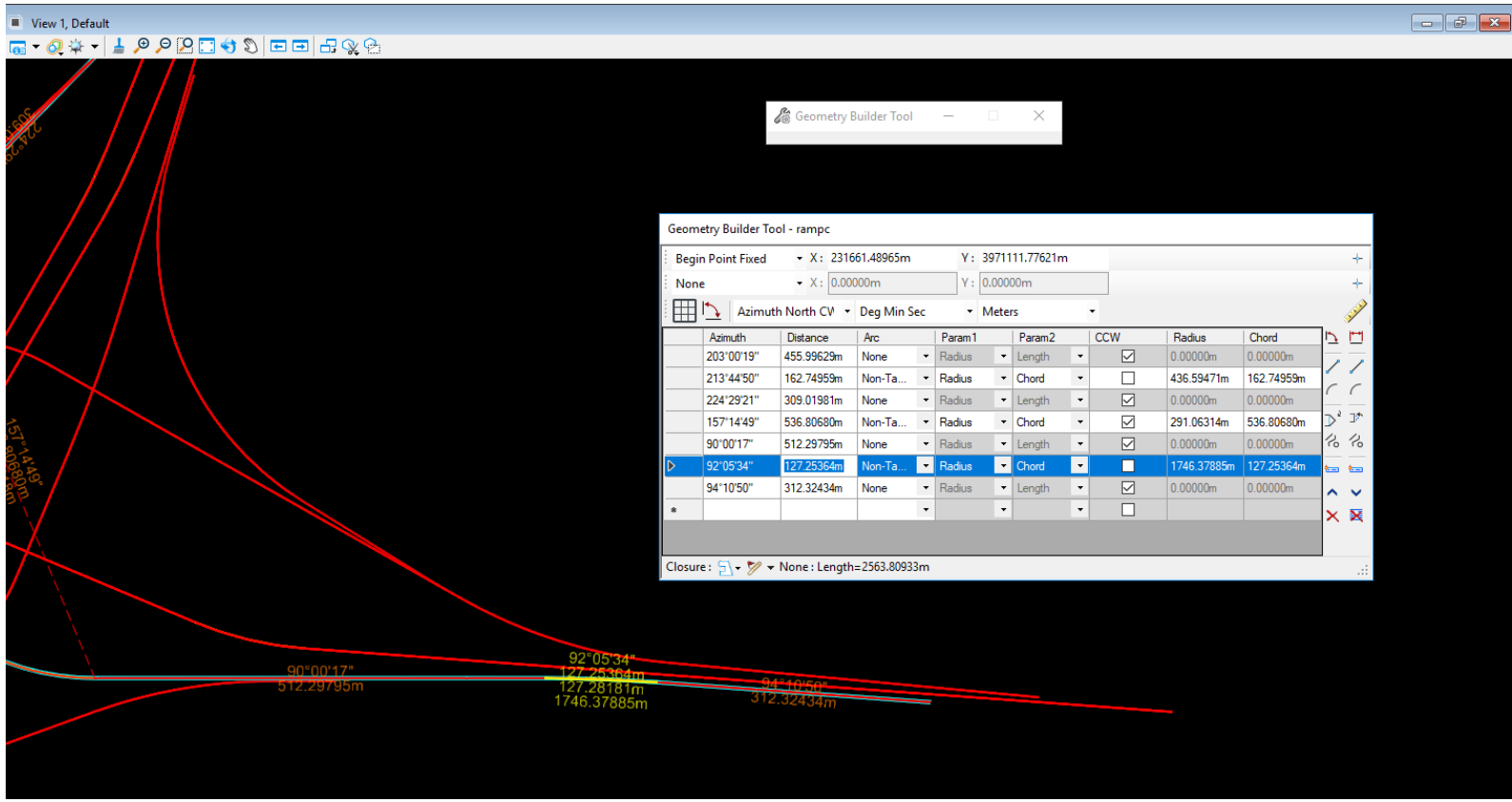
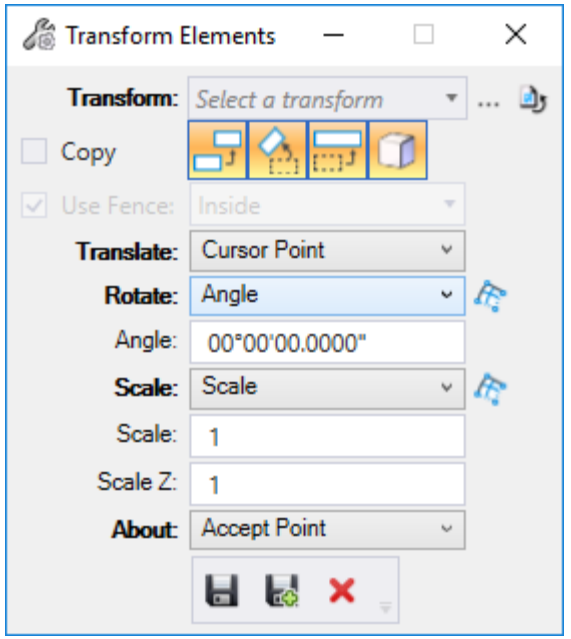
Complex Geometry editing Options – Geometry Builder

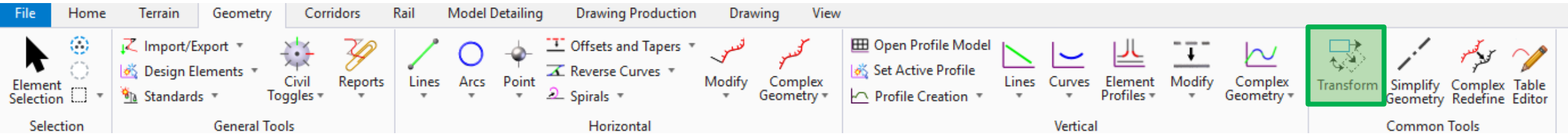
- Provides ‘COGO’ workflows
- Really powerful geometry creation / editing tools
  - Element Highlight
  - Move element up/down
  - Insert element before/after



Complex Geometry editing Options – Transform

- Allows custom ‘Transformation’ to be defined and saved for reuse for one or more
  - Move / rotate / scale
  - Z transform
  - Defined by
    - Cursor Point
    - Points
    - Deltas





- Caution – ‘Transform’ ‘Simplifies’ the geometry – AKA removes rules

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Geometry Modeling Improvements in 2019 R3

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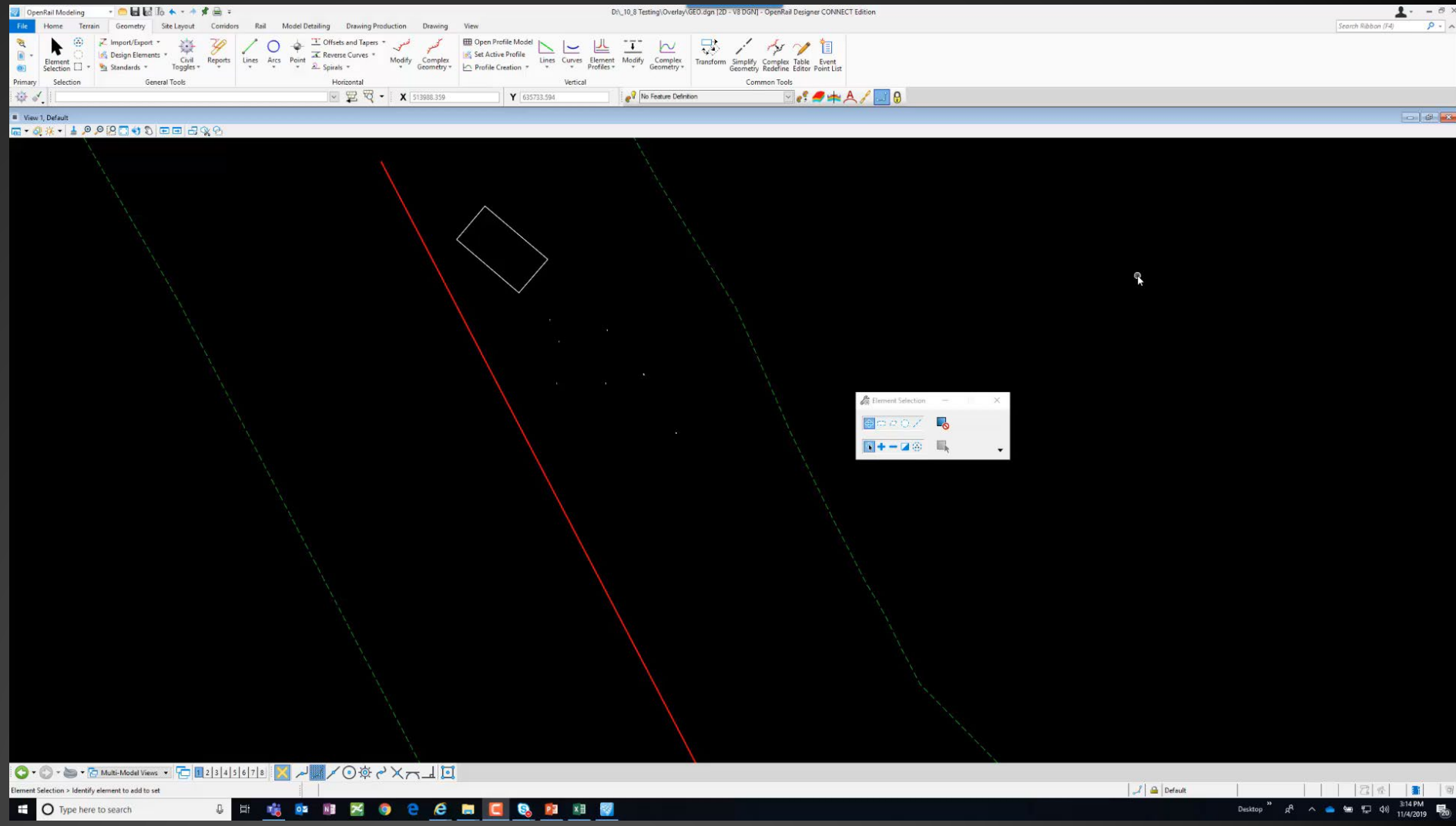
Open ‘X’ Common Deliverables

Drawing Production Enhancements

Event Points



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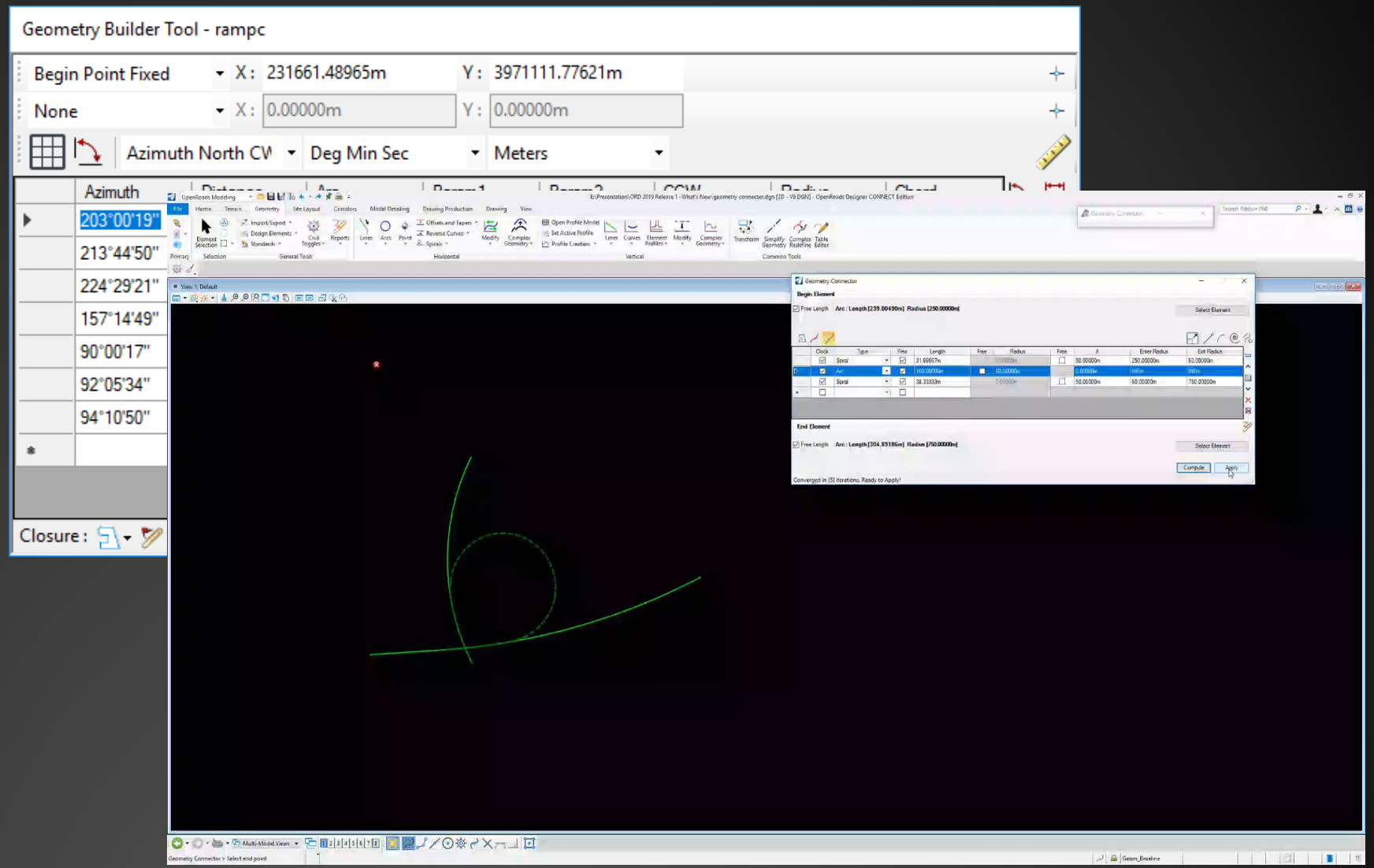
Geometry Modeling Improvements

Geometry workflows

Geometry Builder and Connection Editor



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Thank You

Have a great conference!

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Advancing Infrastructure