



Geometry Update

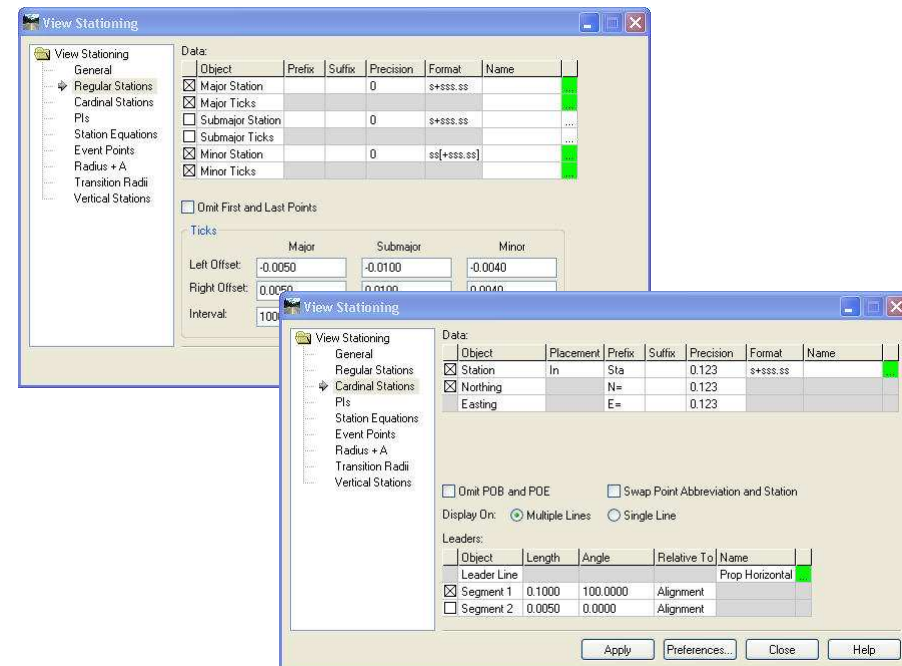
Robert Nice
Bentley UK

Geometry Update

Let's hear about new capabilities within InRoads geometry. In addition, let's look at some capabilities within InRoads geometry that may be new or puzzling to you.

Updated Interface

- Implement *tree view* and *grids* for various geometry view commands
 - *View Closed Areas*
 - *View Stationing*
 - *View Station & Offset*
 - *View Curve Set*
 - *View Vertical in Plan*
 - *View Switch Height Plan*
 - *View Turnouts*
 - ...
- Consistency
- Enables the next step!



A few more

Curve Set Annotation

Data:

Object	Column	Row	Prefix	Suffix	Precision	Format	Name
<input checked="" type="checkbox"/> Line							
<input checked="" type="checkbox"/> Point							
<input type="checkbox"/> Text							
<input type="checkbox"/> Curve Number	1	1					
<input checked="" type="checkbox"/> Station	1	2	Sta		0.123	s+sss.ss	
<input checked="" type="checkbox"/> Northing	1	3	N =		0.123		
<input checked="" type="checkbox"/> Easting	1	4	E =		0.123		
<input checked="" type="checkbox"/> Radius	1	5	R =	m	0.123		
<input type="checkbox"/> Degree of Curve	1	4	Dc =		0.1	ddd"mm'ss.ss"	
<input checked="" type="checkbox"/> Delta Left	1	6	D =	Lt	0.1	ddd"mm'ss.ss"	
<input type="checkbox"/> Delta Right			D =	Rt			
<input checked="" type="checkbox"/> Arc Length	1	7	Lc =	m	0.123		
<input checked="" type="checkbox"/> Spiral Length	1	8	Ls =	m	0.123		
<input checked="" type="checkbox"/> Constant	1	9	A =		0.123		
<input checked="" type="checkbox"/> Superelevation	1	10	D =	mm	0	0.50	

Station Offset Annotation

Data:

Object	Column	Row	Prefix	Suffix	Precision	Format	Name
<input checked="" type="checkbox"/> Name	1	1					
<input type="checkbox"/> Description	1	2					
<input type="checkbox"/> Style	1	3					
<input checked="" type="checkbox"/> Station	1	4	Sta		0.123	s+sss.ss	
<input checked="" type="checkbox"/> Offset Left	2	4	Lt	m	0.123		
<input type="checkbox"/> Offset Right			Rt				
<input checked="" type="checkbox"/> Northing	1	6	N =		0.123		
<input checked="" type="checkbox"/> Easting	1	7	E =		0.123		
<input type="checkbox"/> Elevation	1	8	EI =		0.123		

Leaders:

Object	Length	Angle	Relative To	Name
<input checked="" type="checkbox"/> Leader Line				
<input checked="" type="checkbox"/> Segment 1	0.0400	83.3333	From Alignment	
<input checked="" type="checkbox"/> Segment 2	0.0050			

Vertical Change In Plan

Data:

Object	Prefix	Suffix	Precision	Format	Name
<input checked="" type="checkbox"/> Station	Sta		0.123	s+sss.ss	
<input checked="" type="checkbox"/> Elevation	Elev =		0.123		
<input checked="" type="checkbox"/> Sag	Sag				
<input checked="" type="checkbox"/> Crest	Crest				

Drop Station Equation Name

Apply Preferences... Close Help

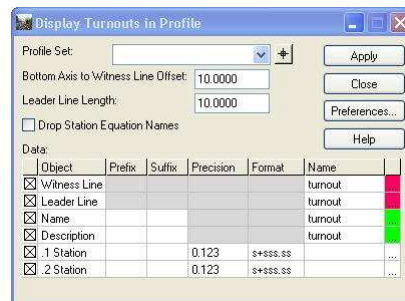
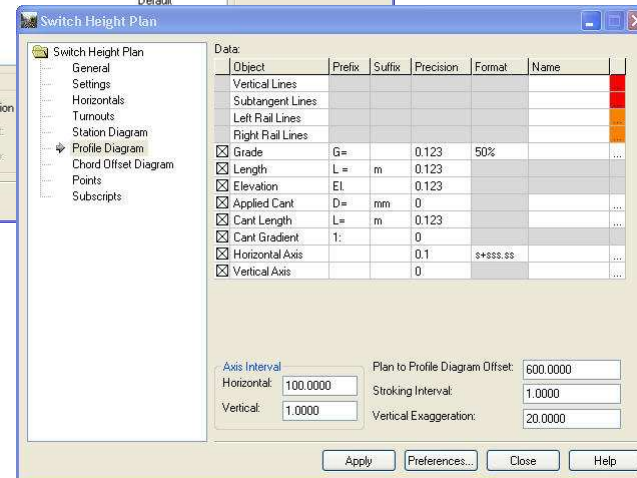
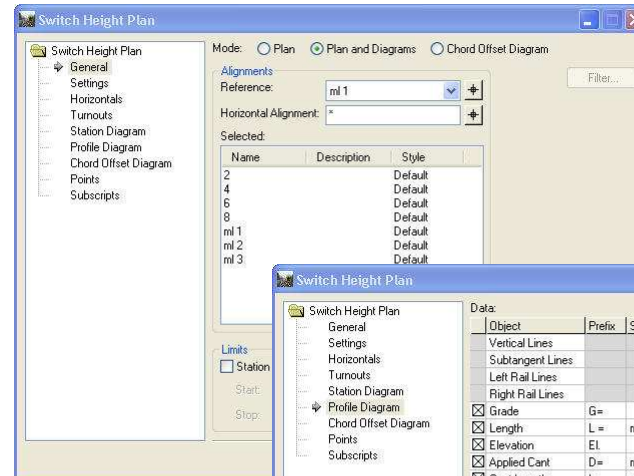
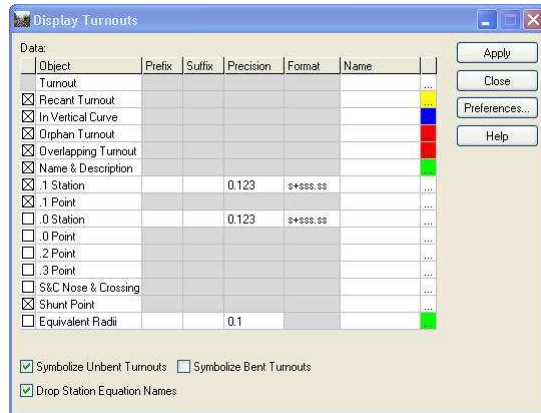
View Closed Areas

Data:

Object	Prefix	Suffix	Precision	Name
<input checked="" type="checkbox"/> Name				
<input checked="" type="checkbox"/> Description				
<input checked="" type="checkbox"/> Area in Square Meters	Area =	s.m.	0	
<input checked="" type="checkbox"/> Area in Hectares	Area =	hectar	0.1234	
<input checked="" type="checkbox"/> Perimeter in Meters	Perimet	m	0.123	
<input type="checkbox"/> Area in Square Feet			0	
<input type="checkbox"/> Area in Acres			0	
<input type="checkbox"/> Perimeter in Feet			0	

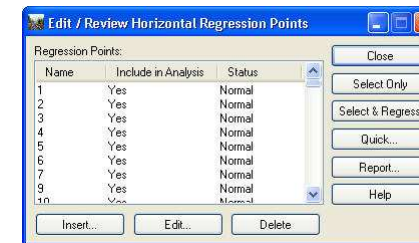
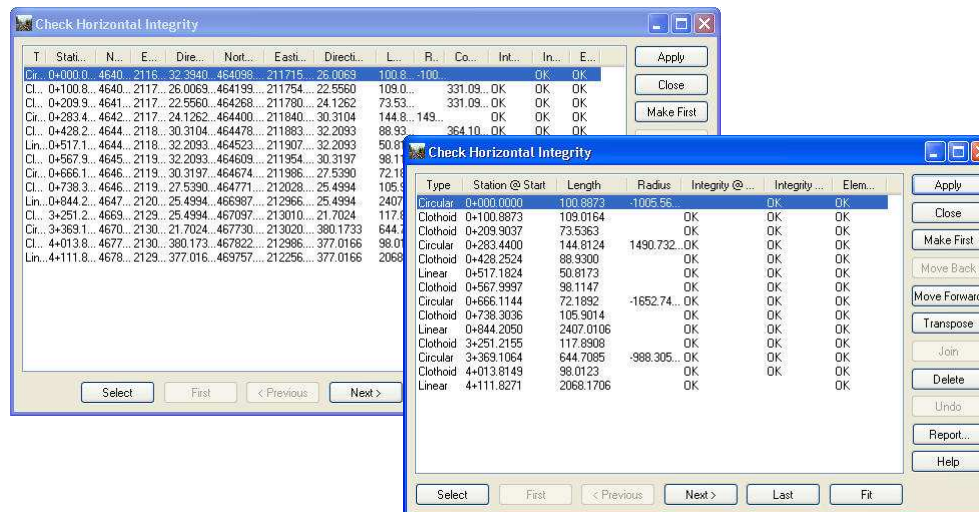
Apply Preferences... Close Help

And even some for rail users!



Updated Interface

- Implemented configurable list view
 - *Check Integrity*
 - *Edit / Review Regression Points*
 - ...
- Enabled by right clicking the title

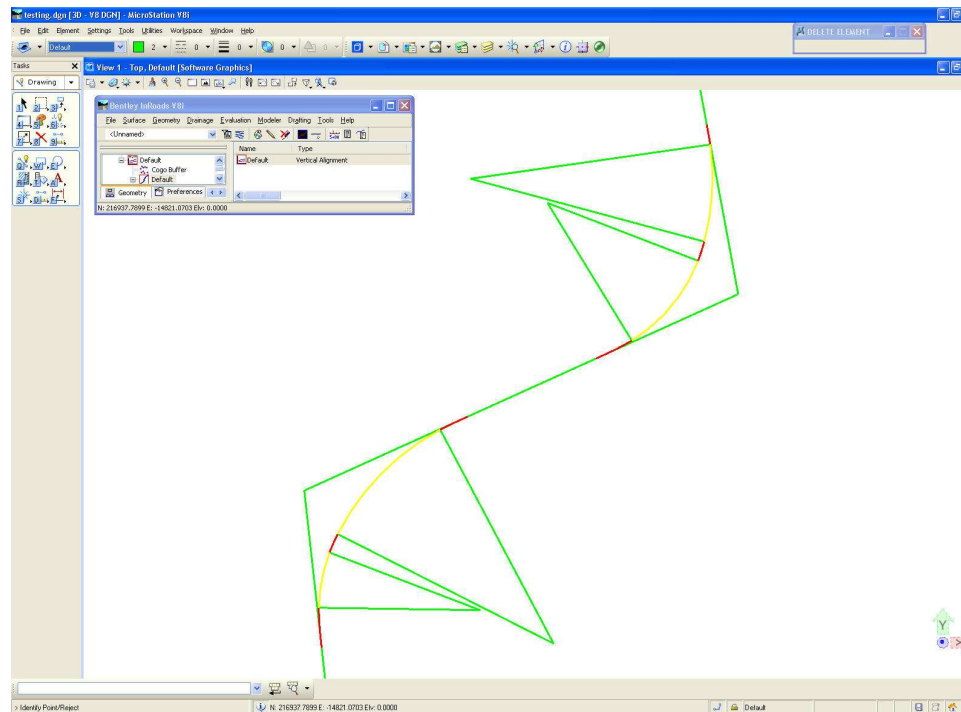


Explorer

- View All
 - Horizontal alignments
 - Turnouts (rail only)
 - Rails, Joints & Keepers (rail only)
- Hilite
- Fit & Hilite
- <Ctrl> Active
 - Set an alignment active by selecting the graphics
- <Ctrl> Delete
 - Delete an alignment by selecting the graphics

Horizontal Curve Set Commands

- If you can create it with the curve set commands then you can edit it with the same
 - Primarily aimed at *Move PI & Insert PI* and SCSCS curve-sets



AREMA Transition Spiral

- Chord definition
- Simple & compound
 - Available in ***Bentley Rail Track!***

```

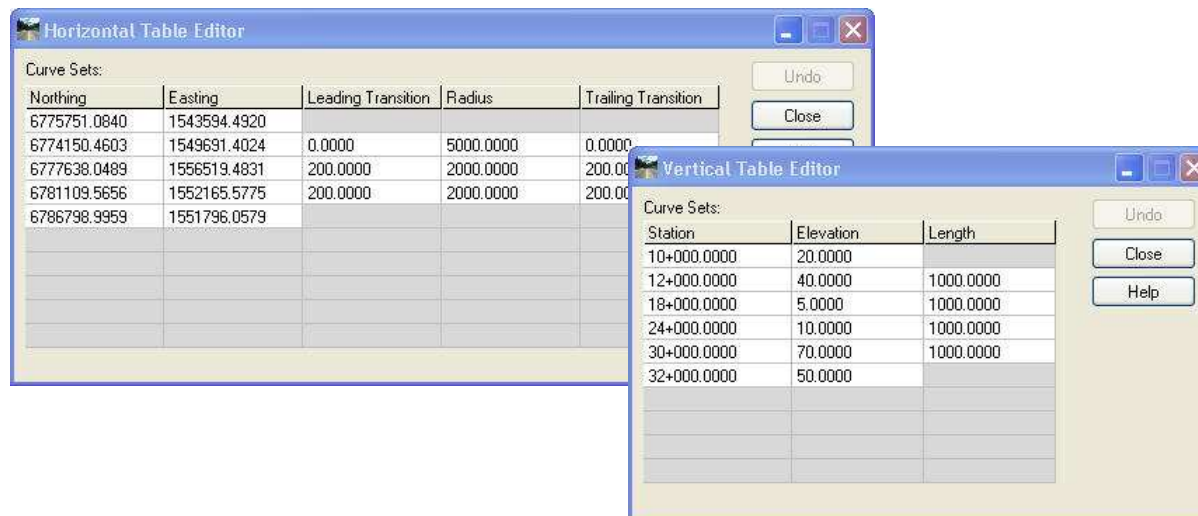
Element: AREMA
      TS (      )      3+37.1050      10191.4712      10277.4501
      SPI (     )      5+37.0953      10305.0631      10442.0496
      SC (     )      6+37.1050      10357.5103      10527.2682
      Entrance Radius:      0.0000
      Exit Radius:      2864.9344
      Length:      300.0000
      Angle:      3°00'00.0" Right
      Constant:      927.0816
      Long Tangent:      197.9902
      Short Tangent:      100.0646
      Long Chord:      299.9634
      Ks:      299.9177
      Ys:      5.2370
      P:      1.3107
      K:      149.9786
      Tangent Direction:      N 55°23'24.1" E
      Radial Direction:      S 34°36'35.9" E
      Chord Direction:      N 56°23'25.4" E
      Radial Direction:      S 31°36'35.9" E
      Tangent Direction:      N 58°23'24.1" E

Element: Circular
      SC (      )      6+37.1050      10357.5103      10527.2682
      PI (      )      10+99.8233      10600.0368      10921.3357
      CC (      )      7917.6297      12028.8778
      CS (      )      15+54.5718      10706.1755      11371.7164
      Radius:      2864.9344
      Design Speed(aph):      70.0000
      Cant(inches):      5
      Delta:      18°20'57.6" Right
      Degree of Curvature(Chord):      2°00'00.0"
      Length:      917.5133
      Length(Chorded):      917.4667
      Tangent:      462.7183
      Chord:      913.5973
      Middle Ordinate:      36.6515
      External:      37.1265
      Tangent Direction:      N 58°23'24.1" E
      Radial Direction:      S 31°36'35.9" E
      Chord Direction:      N 67°33'52.9" E
      Radial Direction:      S 13°15'38.3" E
      Tangent Direction:      N 76°44'21.7" E
    
```



Table Editors

- Simpler editing
 - No discontinuities, no compound curve sets
- We now honor the Tools > Options > Geometry
 - Define Transitions By *Length* or *Constant*
 - Spiral Definition *Clothoid*, *AREMA*, *Bloss*, etc.
 - Undocumented Tip - <Ctrl> right click

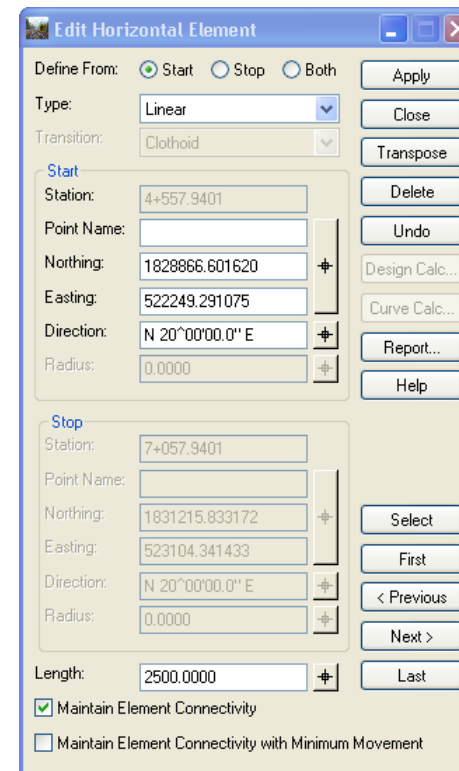


Vertical Alignment Healing

- An attempt to synchronize / update the vertical alignment when the horizontal alignment has changed.
 - The coordinate position of vertical PI's will be held!
 - *New in 'Athens'*

Edit Horizontal Element

- Component Editor type of functionality
- *Maintain Element Connectivity with Minimum Movement*
 - Previous element is freed
 - Current element is fixed
 - Next element is freed



Edit Horizontal Element

Define From: Start Stop Both

Type: Linear

Transition: Clothoid

Start

Station: 4+557.9401

Point Name:

Northing: 1828866.601620

Easting: 522249.291075

Direction: N 20°00'00.0" E

Radius: 0.0000

Stop

Station: 7+057.9401

Point Name:

Northing: 1831215.833172

Easting: 523104.341433

Direction: N 20°00'00.0" E

Radius: 0.0000

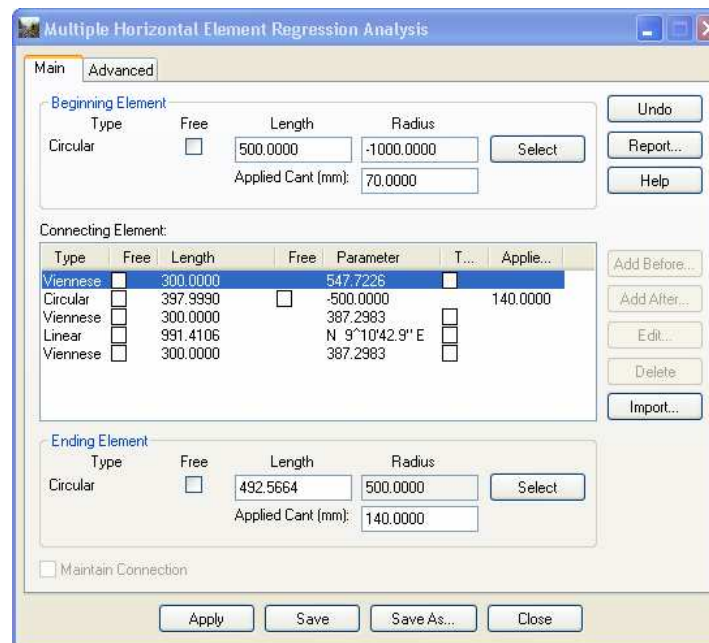
Length: 2500.0000

Maintain Element Connectivity

Maintain Element Connectivity with Minimum Movement

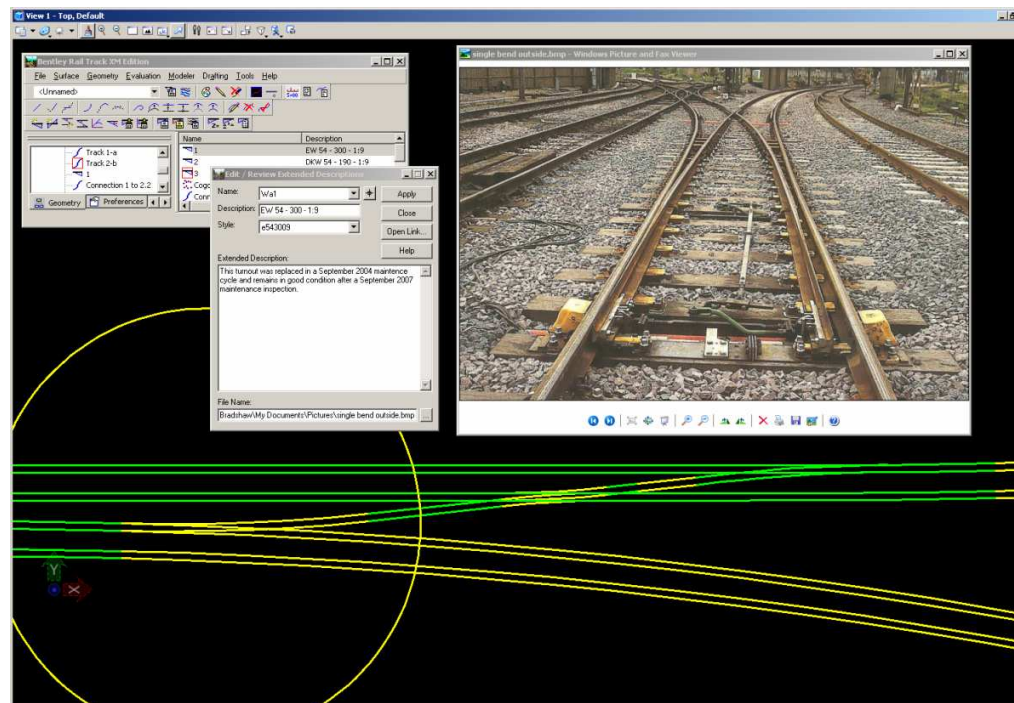
Multiple Element Connection Editors

- Edit beginning and ending elements
 - Change radii / direction
- Inclusion of cant (rail only)



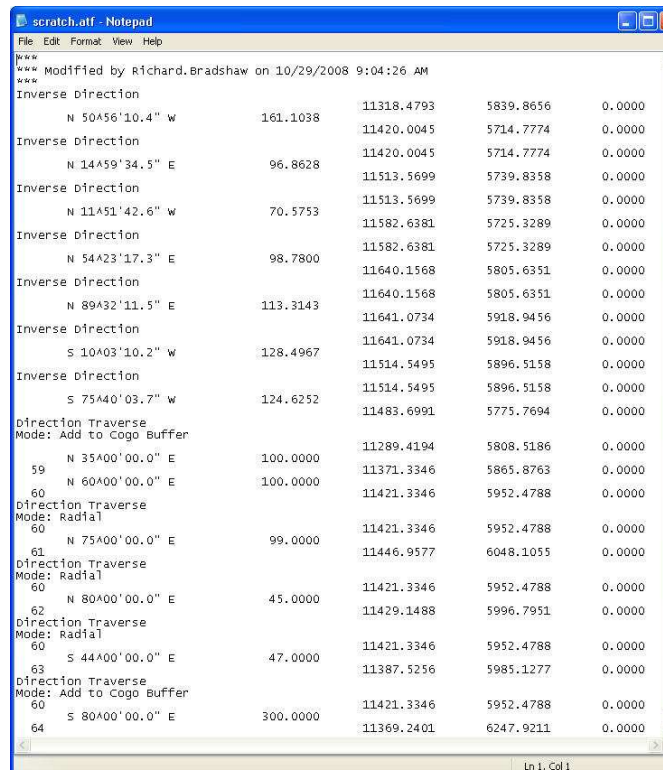
Edit / Review Extended Descriptions

- Adding non-graphical data to the design data
 - Extending the data with long textual descriptions
 - Persisted with the .alg
 - Extending the data with an external file / digital images



Cogo Audit Trail Lock

- Similar to the *Report Lock* for cogo commands, but independent!
 - Writes a .atf file to the same folder as the active geometry file.



```
scratch.atf - Notepad
File Edit Format View Help
www
www Modified by Richard.Bradshaw on 10/29/2008 9:04:26 AM
www
Inverse Direction
  N 50°56'10.4" W      161.1038      11318.4793      5839.8656      0.0000
Inverse Direction
  N 14°59'34.5" E      96.8628      11420.0045      5714.7774      0.0000
Inverse Direction
  N 11°51'42.6" W      70.5753      11513.5699      5739.8358      0.0000
Inverse Direction
  N 54°23'17.3" E      98.7800      11582.6381      5725.3289      0.0000
Inverse Direction
  N 89°32'11.5" E      113.3143      11640.1568      5805.6351      0.0000
Inverse Direction
  S 10°03'10.2" W      128.4967      11641.0734      5918.9456      0.0000
Inverse Direction
  S 75°40'03.7" W      124.6252      11641.0734      5918.9456      0.0000
Direction Traverse
Mode: Add to Cogo Buffer
  59  N 35°00'00.0" E      100.0000      11289.4194      5808.5186      0.0000
  60  N 60°00'00.0" E      100.0000      11371.3346      5865.8763      0.0000
Direction Traverse
Mode: Radial
  60  N 75°00'00.0" E      99.0000      11421.3346      5952.4788      0.0000
  61  N 80°00'00.0" E      45.0000      11446.9577      6048.1055      0.0000
Direction Traverse
Mode: Radial
  60  N 80°00'00.0" E      45.0000      11421.3346      5952.4788      0.0000
  62  S 44°00'00.0" E      47.0000      11429.1488      5996.7951      0.0000
Direction Traverse
Mode: Radial
  60  S 44°00'00.0" E      47.0000      11421.3346      5952.4788      0.0000
  63  S 80°00'00.0" E      300.0000      11387.5256      5985.1277      0.0000
Direction Traverse
Mode: Add to Cogo Buffer
  60  S 80°00'00.0" E      300.0000      11421.3346      5952.4788      0.0000
  64  S 80°00'00.0" E      300.0000      11369.2401      6247.9211      0.0000
Ln 1, Col 1
```



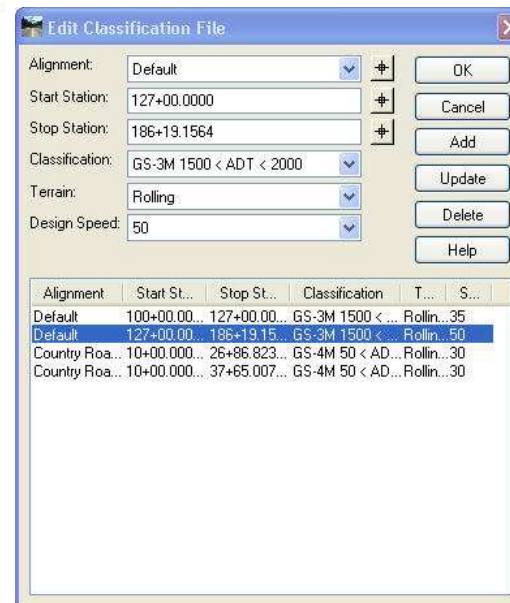
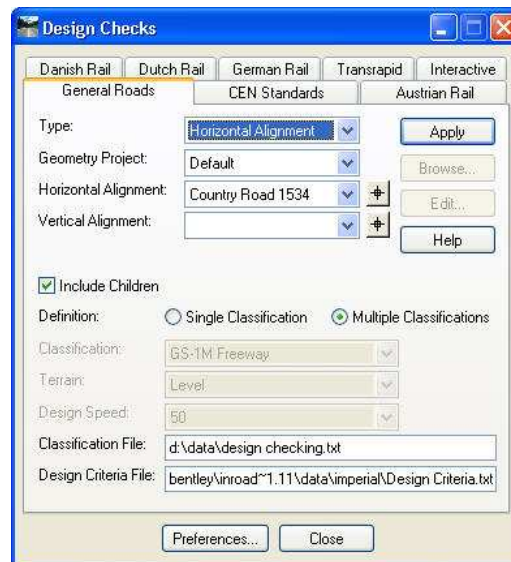
Design Checks

- Not just warnings!
 - Now it indicates that the geometry is *acceptable!*

Checking stopping sight distances for alignment 'default'

10+550.0000
 Classification: GS-1M Freeway Terrain: Rolling Speed: 60
 Warning: Desirable minimum stopping sight distance exceeded!
 Desirable minimum stopping sight distance: 205.0000
 Desirable minimum length should be: 499.1020
 Actual length: 300.0000

11+050.0000
 Classification: GS-1M Freeway Terrain: Rolling Speed: 60
 Acceptable: Actual length is greater than desirable minimum stopping sight distance.
 Desirable minimum stopping sight distance: 205.0000
 Actual length: 300.0000



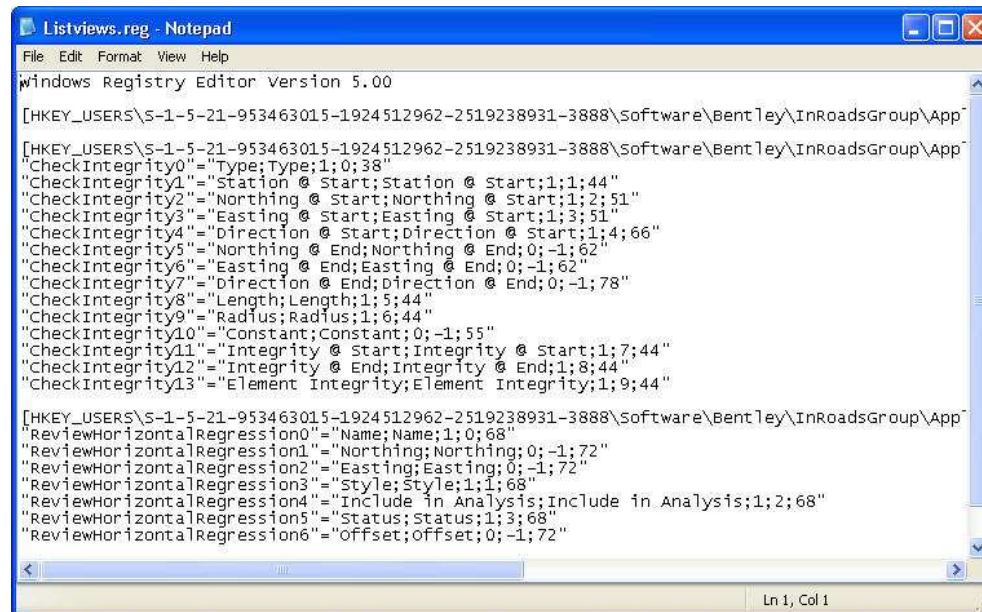
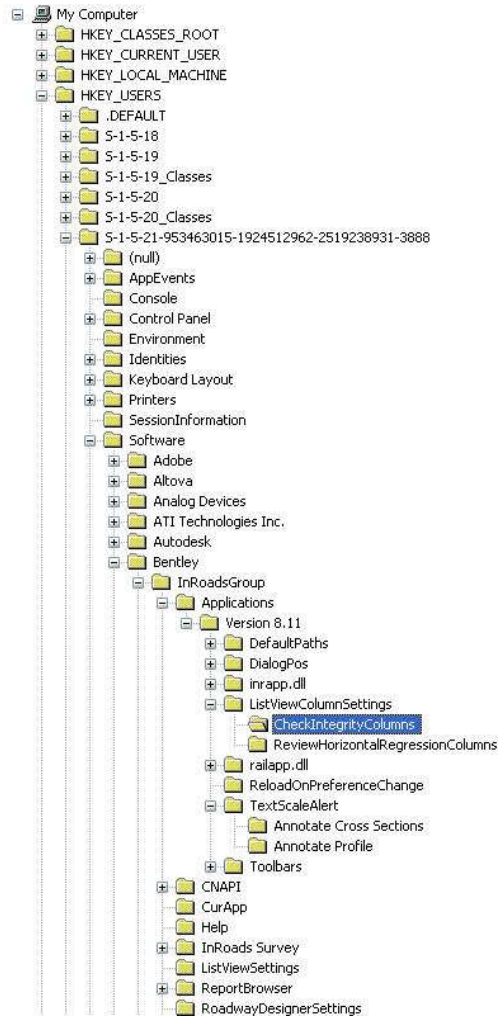
Rail Related Geometry Enhancements

- Quick Regression
- Integrated Horizontal & Cant / Superelevation
- Turnouts
 - Inclusion of railway standards
 - Creation / editing enhancements
- Field to Design / Design to Field
 - Machine to design / Design to machine
- See *Bentley Rail Design Update* for complete details!

Tips

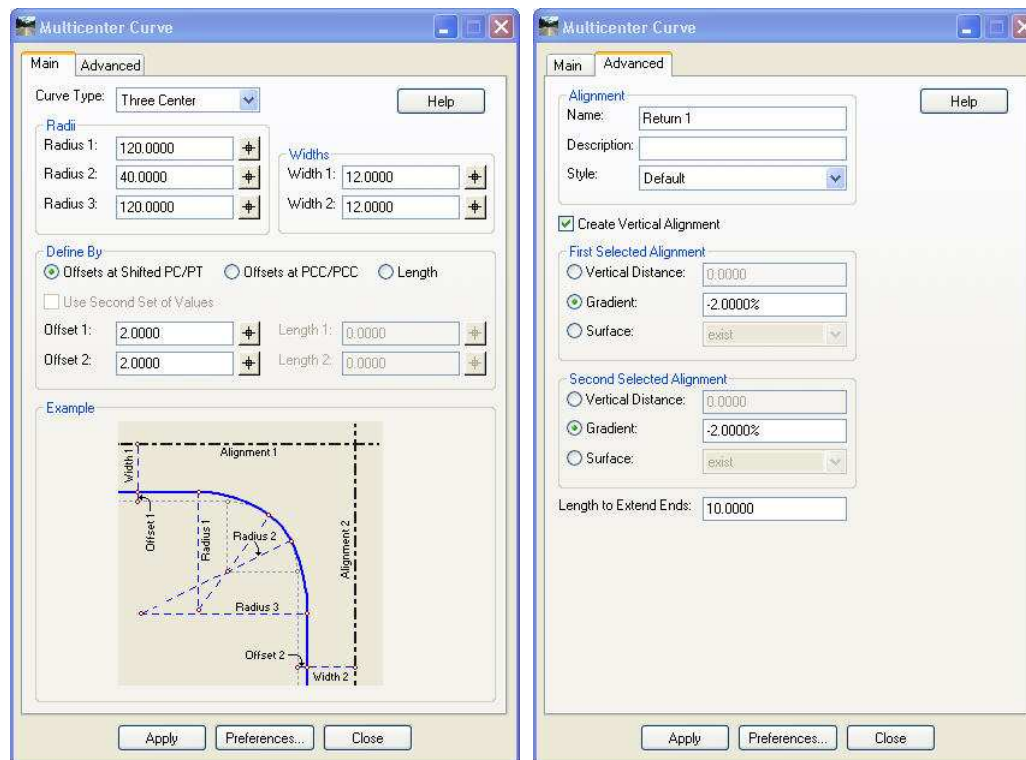
Useful things that you may not be aware of!

Tip #1: How to clone list view settings?



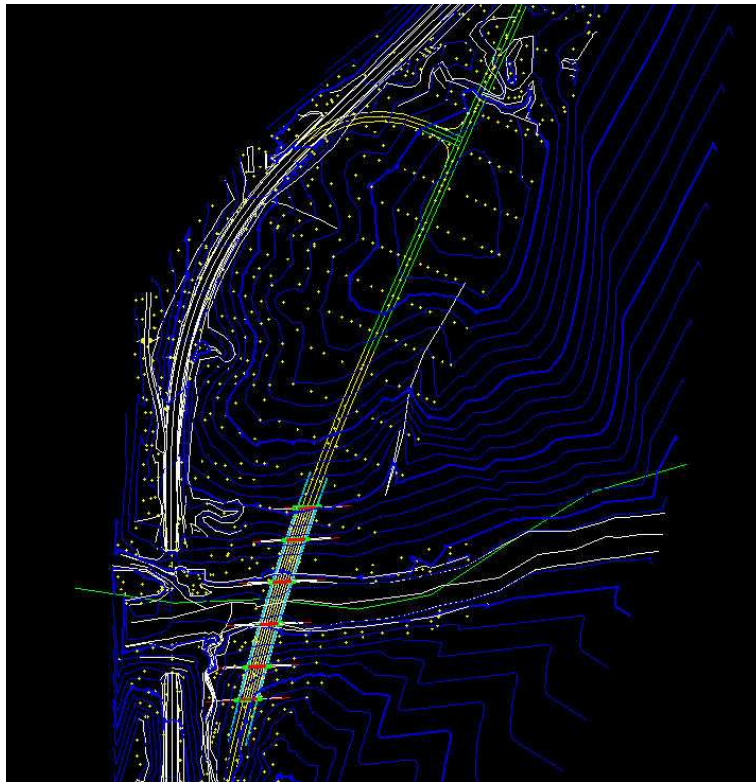
Tip #2: Multi-Center Curve

- Creates horizontal & optionally vertical geometry for 1, 2 & 3 center curves



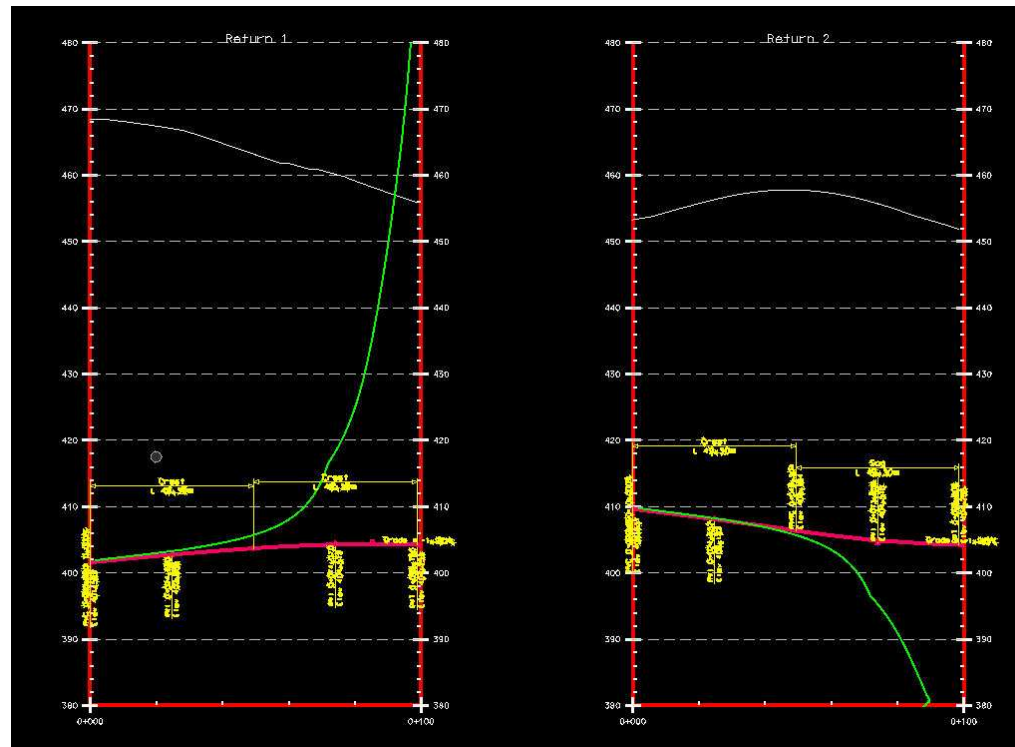
Multi-Center Curve: Horizontal Geometry

- Horizontal



Multi-Center Curve: Vertical Geometry

- 2% cross-slope from mainline for 12'
- Tangential slope at PVC

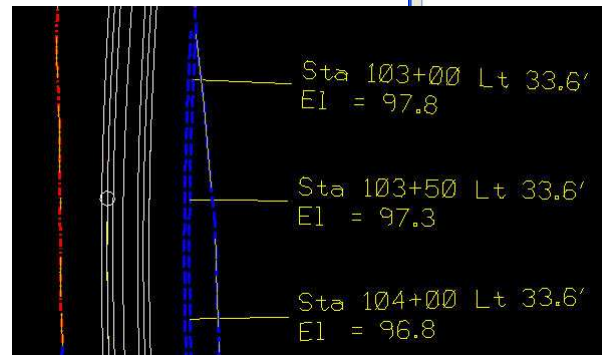
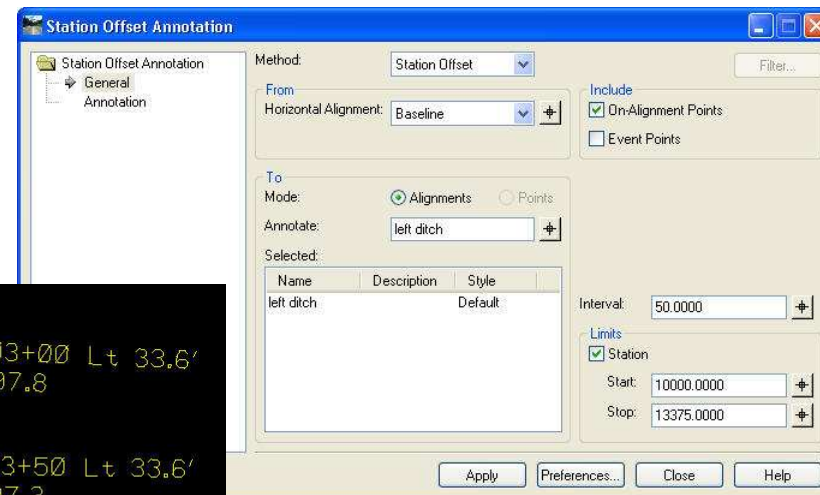


But what if in a transition?

- Create a surface with *Roadway Designer* and use it in *Multi-Center Curve* for the vertical geometry.
 - Almost the same computations, except
 - Elevation at PC and PT are from the surface
 - Tangential slopes at PC and PT are from the surface
 - Compute an elevation slightly before the PC and slightly after the PC
 - Likewise for the PT

Tip #3: How to annotate features?

- File > Import > Geometry from Graphics
 - Import features as a horizontal & vertical alignment
- Geometry > View > Station Offset Annotation
 - Set method to *Station Offset*
 - Set from as *baseline*
 - Set to imported feature
 - Set stationing
 - Set interval



Tip #4: How to import textual data?

- Text Import Wizard
 - Horizontal as curve-sets
 - Vertical as curve-sets
 - Horizontal & vertical events
 - More in a moment!
 - Cogo
 - Regression points
 - Data must be in order
 - Bypasses data checking available in *Regression > Add Regression Points*
- Wizards are persisted to the XIN

S+E & N+E Events from a Single .txt

Text Import Wizard - Step 2 of 4

Apply Filter to:
 All Lines
 Lines that Start With: S+0
 Lines that Include:
 Segments of Text

Original Data Type:
 Fixed Width - Fields are aligned in columns
 Delimited - Characters separate each field

Defined Filters:
 Name Description
 Include S... Include lines that start with 'S+0'
 Include N... Include lines that start with 'N+E'

Start: Include Start in Import
 End: Include End in Import

Exclude Filtered Lines From Import

S+0	Station	Offset	Skip	Skip	Skip	Skip
S+0	10000.0000	0.0000	10316.9388	4571.1443	0.0000	Default
S+0	10200.0000	0.0000	10188.2812	4724.2532	0.0000	Default
S+0	10400.0000	0.0000	10064.6059	4881.2596	0.0000	Default
S+0	10600.0000	0.0000	9961.6829	5032.6329	0.0000	Default
S+0	10800.0000	0.0000	9882.6001	5236.6052	0.0000	Default
S+0	11000.0000	0.0000	9831.8784	5429.6236	0.0000	Default
S+0	11200.0000	0.0000	9807.5122	5627.9809	0.0000	Default
S+0	11400.0000	0.0000	9802.5073	5827.9075	0.0000	Default

Buttons: Open..., Save, Save As..., < Back, Next >, Finish, Cancel

Text Import Wizard - Step 2 of 4

Apply Filter to:
 All Lines
 Lines that Start With: N+E
 Lines that Include:
 Segments of Text

Original Data Type:
 Fixed Width - Fields are aligned in columns
 Delimited - Characters separate each field

Defined Filters:
 Name Description
 Include S... Include lines that start with 'S+0'
 Include N... Include lines that start with 'N+E'

Start: Include Start in Import
 End: Include End in Import

Exclude Filtered Lines From Import

N+E	Station	Offset	Skip	Skip	Skip	Skip
N+E	10000.0000	0.0000	10316.9388	4571.1443	0.0000	Default
N+E	10150.0000	0.0000	10220.5206	4686.0510	0.0000	Default
N+E	10500.0000	0.0000	10010.1540	4965.2097	0.0000	Default
N+E	10850.0000	0.0000	9868.1501	5284.1557	0.0000	Default
N+E	11200.0000	0.0000	9807.5122	5627.9809	0.0000	Default
N+E	11550.0000	0.0000	9799.8895	5977.8847	0.0000	Default
N+E	11900.0000	0.0000	9793.7811	6327.8214	0.0000	Default
N+E	12250.0000	0.0000	9779.1777	6677.9489	0.0000	Default

Buttons: Open..., Save, Save As..., < Back, Next >, Finish, Cancel

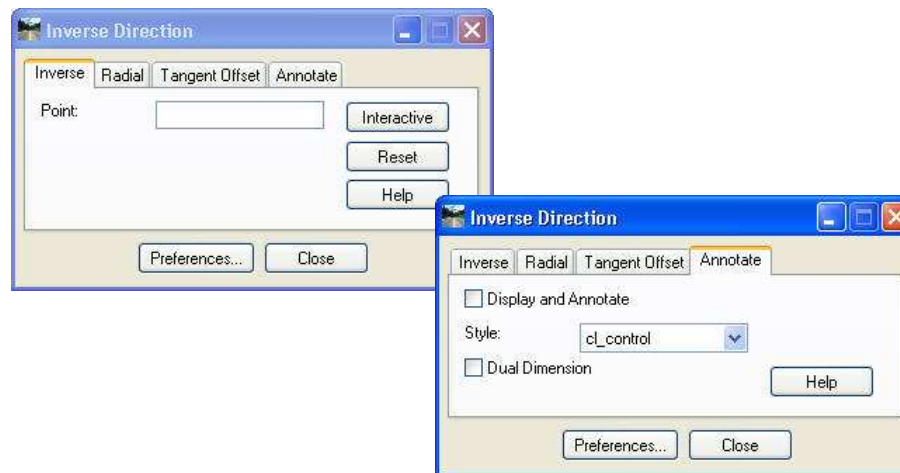
Skip	Station	Offset	Northing	Easting	Skip	Skip
Skip	S+0	10000.0000	0.0000	10316.9388	4571.1443	0.0000
Skip	S+0	10200.0000	0.0000	10188.2812	4724.2532	0.0000
Skip	S+0	10400.0000	0.0000	10064.6059	4881.2596	0.0000
Skip	S+0	10600.0000	0.0000	9961.6829	5032.6329	0.0000
Skip	S+0	10800.0000	0.0000	9882.6001	5236.6052	0.0000
Skip	S+0	11000.0000	0.0000	9831.8784	5429.6236	0.0000
Skip	S+0	11200.0000	0.0000	9807.5122	5627.9809	0.0000
Skip	S+0	11400.0000	0.0000	9802.5073	5827.9075	0.0000
N...	11900.0000	0.0000	9793.7811	6327.8214	0.0000	0.0000
N...	11550.0000	-0.0000	9799.8895	5977.8847	0.0000	0.0000
N...	11200.0000	0.0000	9807.5122	5627.9809	0.0000	0.0000
N...	10850.0000	-0.0000	9868.1501	5284.1557	0.0000	0.0000
N...	10500.0000	0.0000	10010.1540	4965.2097	0.0000	0.0000
N...	10150.0000	-0.0000	10220.5206	4686.0510	0.0000	0.0000
N...	10000.0000	-0.0000	10316.9388	4571.1443	0.0000	0.0000
S...	13375.0000	0.0000	9315.4313	7690.8656	0.0000	0.0000
S...	13200.0000	0.0000	9405.5630	7540.8613	0.0000	0.0000
S...	13000.0000	0.0000	9508.5706	7369.4279	0.0000	0.0000
S...	12800.0000	0.0000	9610.2712	7197.2283	0.0000	0.0000
S...	12600.0000	0.0000	9694.7156	7016.1082	0.0000	0.0000
S...	12400.0000	0.0000	9753.1424	6825.0025	0.0000	0.0000
S...	12200.0000	0.0000	9784.4039	6627.6253	0.0000	0.0000

Buttons: Open..., Save, Save As..., < Back



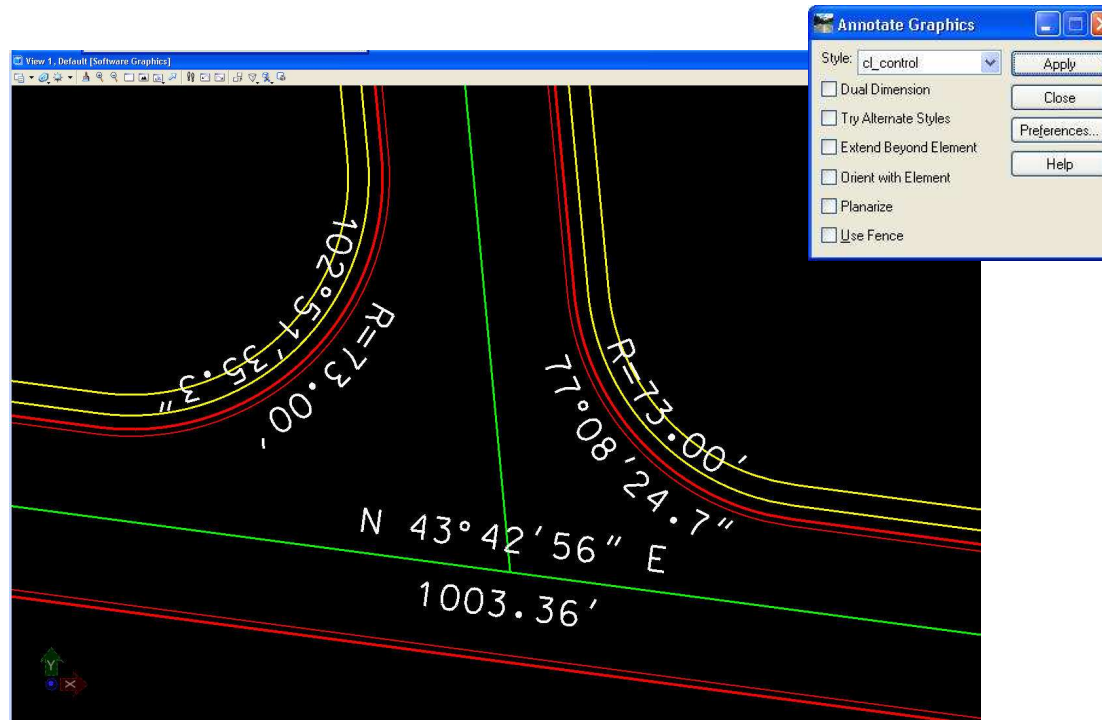
Tip#5: Inversing

- *Display and Annotate* check box
 - Set on and you get lines and annotation based upon geometry style
 - Set off and you don't get the line and annotation



Tip #6: Annotating MicroStation Graphics

- Utilizes geometry "styles" to annotate MicroStation lines, linestrings & circular arcs



Tip#7: Chord definition settings

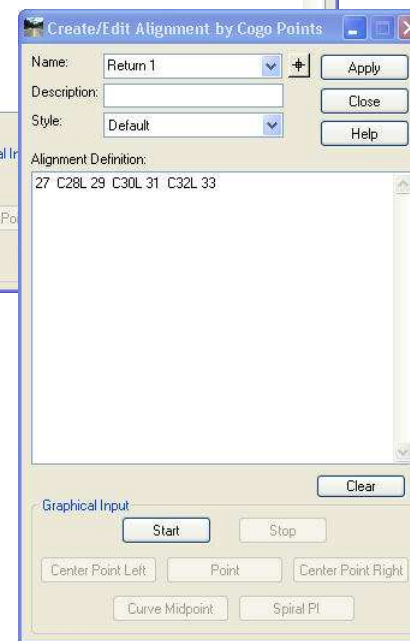
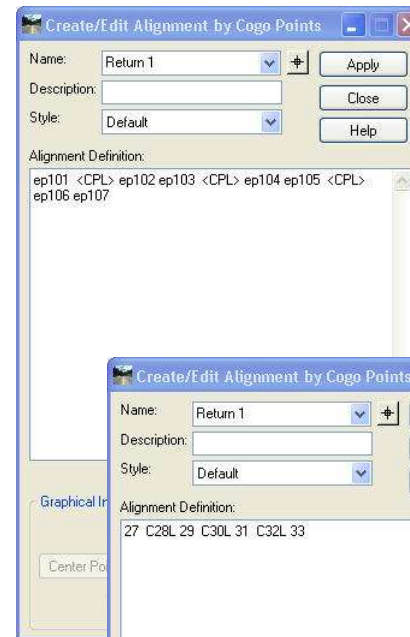
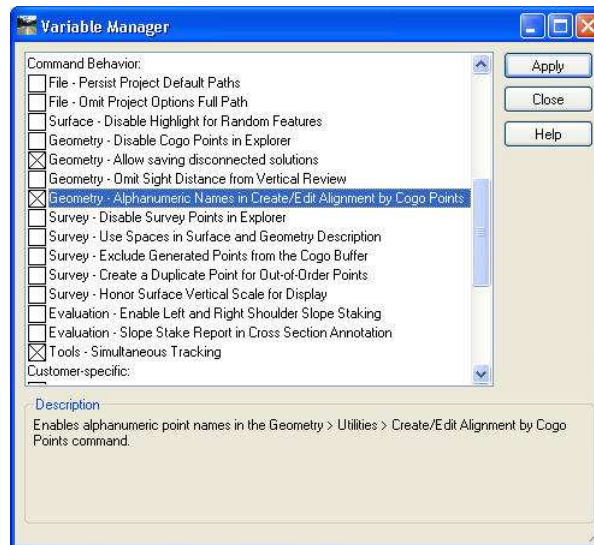
- Arc / chord definition is persisted with the alignment
 - No you can not mix arc and chord in the same alignment!
 - We persist the radius not the degree of curve
- Other system settings are in the preference file, accessible from ***Tools > Options > Geometry***

Tip #8: Alpha-numeric cogo points

- Graphical commands have always supported alpha-numeric points names.
 - Cogo Classic / Import ICS have never supported alpha-numeric point or alignment naming!
- What about *Geometry > Utilities > Create / Edit Alignment by Cogo Points*?
 - Emulates ICS, so the answer should be no, but it is yes!

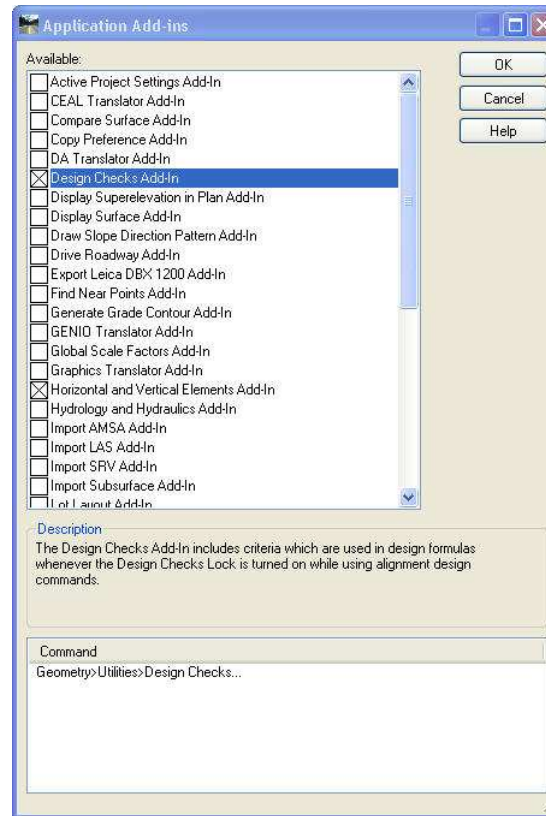
Alpha-numeric cogo points

- Variable Manager
 - Lots of other options!



And while we are on Tools!

- *Application Add-ins* now only show the available add-ins for the running product



Questions?

