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FEBRUARY 13, 2023

GEDO NovaTrack. Introduction

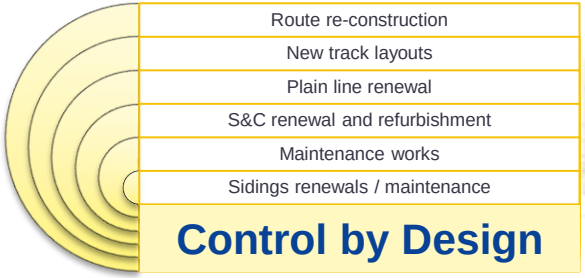
Trimble Geospatial Track Survey & Scanning

V.2.2.2

AGENDA

- Short intro into GEDO NovaTrack software
- Key features
- Standard workflows & special case
- Live demo
- Reference & Support information
- Questions

Goals within track maintenance and renewal



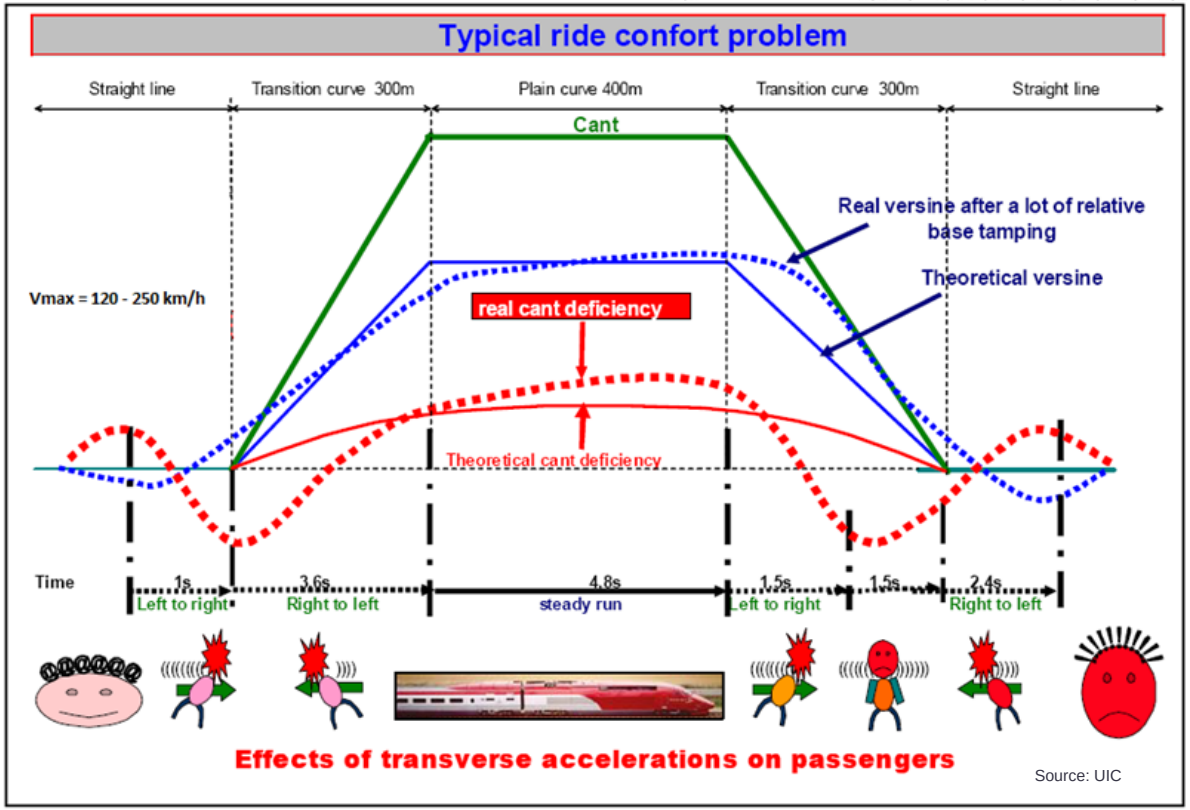
- Reduction of maintenance/renewal cycles
- Avoid issues with the clearances to the structures
- Increase in life of track infrastructure
- Track improvements by detecting geometry irregularities
- Always known the initial track position
- Increase construction asset utilization

Typical issues with alignment data

Challenges with track design alignments:

- Design alignment data is not available or partial
- Transition tangents are moved due to the relative tamping process
- Both vertical and horizontal radii are drifted from the original design
- Cant alignment is off from design
- No control of clearances before and after re-alignment

Consequences of bad* track maintenance



* - relative

What is Trimble GEDO NovaTrack ?

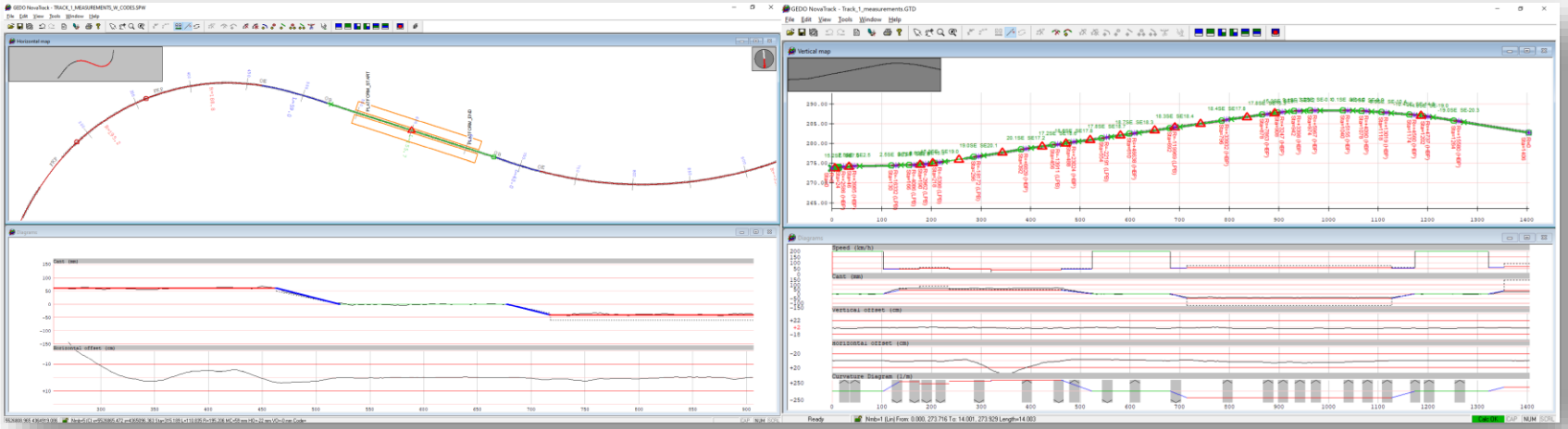
- Trimble GEDO NovaTrack – software for analysis of existing track geometry and approximation with best fit design alignment geometry elements

- Primary applications
  - Create design alignment data for track maintenance (design tamping)
  - Evaluation of existing track geometry parameters
  - Checking historical alignment data against existing track position
  - Adjustment of old design alignment to match with existing track

GEDO NovaTrack - finding best-fit alignment solution

Key functionality and features:

- Automatic alignment fitting based on existing track measurement data
- Curvature prediction using 1/R curvature and Direction Analysis
- Clearance info during alignment adjustment process
- Calculation of design speed and cant
- Check alignment conformity against design regulations



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GEDO NovaTrack workflows - from measurement to a specific application

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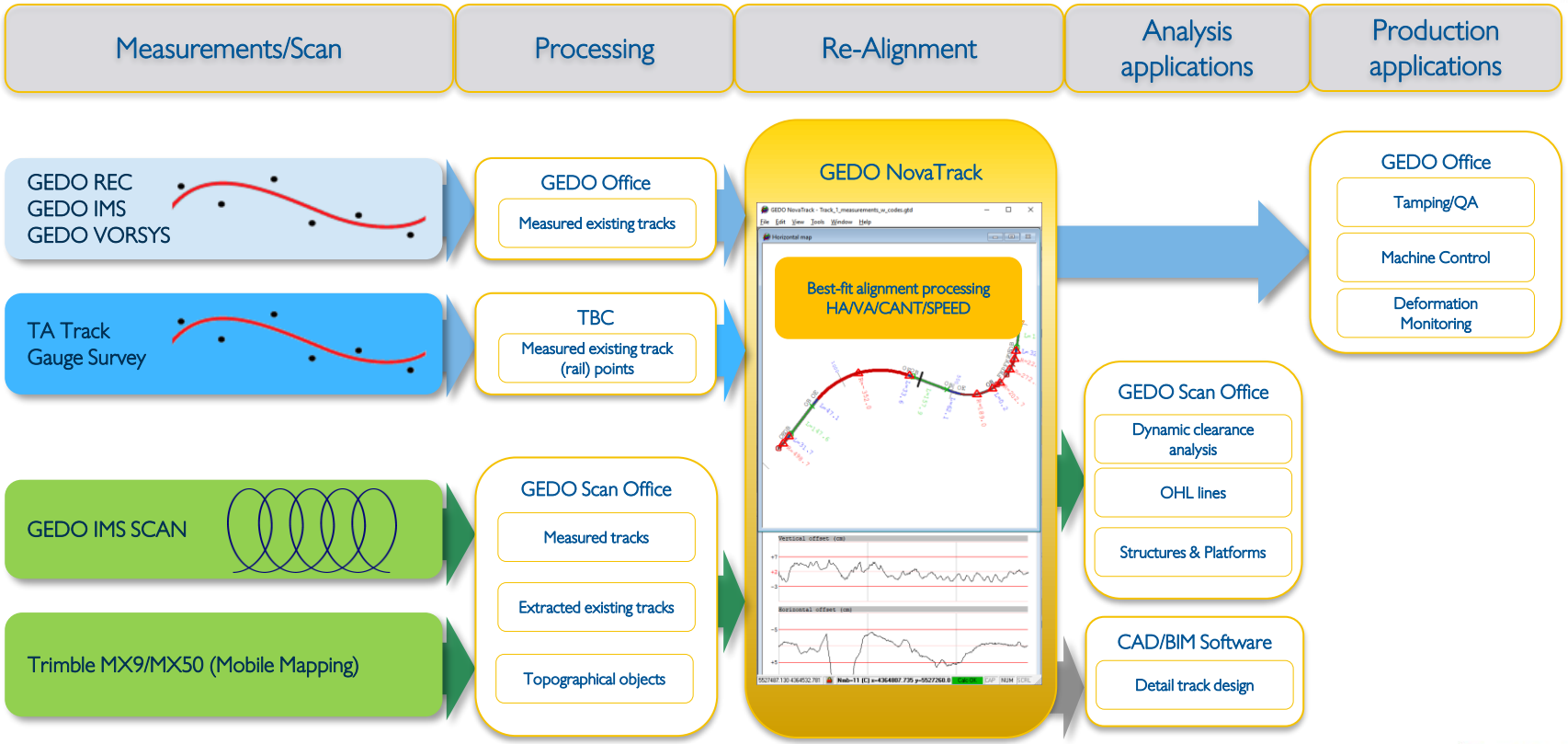
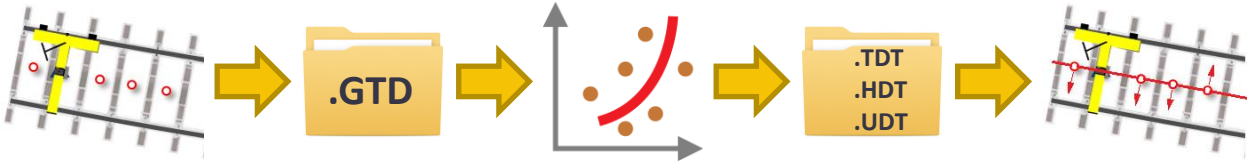
Data flow - from field to rail specific application



Alignment processing workflows

Recommended workflows for track re-alignment



A Complete re-alignment

HA/VA method

1. Import .GTD track data
2. Semi-automatic or automatic HA fitting
3. Adjustment HA elements. Reduction HA offsets
4. Automatic VA fitting, reduction of VA offsets
5. Cant and speed calculation (optional)
6. Design alignment export to .TDT/.HDT/.UDT files

B Horizontal re-alignment

HA method

1. Import .GTD track data
2. Semi-automatic or automatic HA fitting
3. Adjustment HA elements. Reduction HA offsets
4. Design alignment output to .TDT file

C Vertical re-alignment

VA method

1. Import .GTD track data
2. Automatic VA fitting
3. Design alignment output to .HDT file

D Verification of alignment

Verification method

1. Import .GTD track data
2. Import design alignment
3. Check HA/VA offsets and compliance with rules

Track survey data input. Option #1

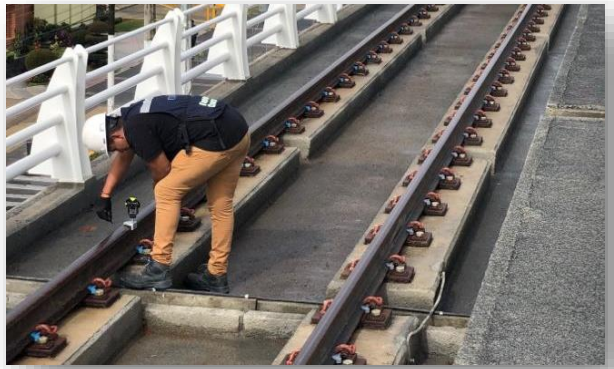
Input measurement data:

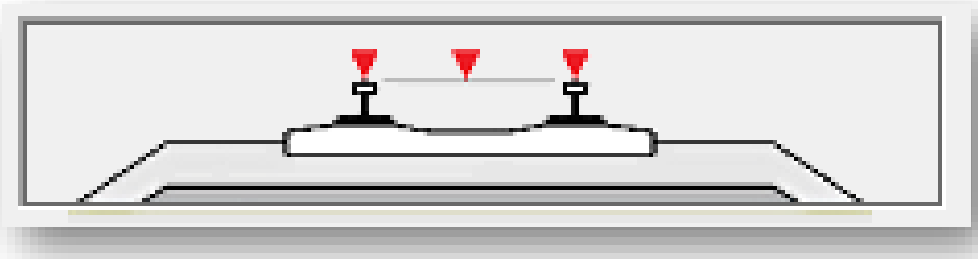
- Track measurements in the GEDO Track Data .GTD format:
  - Center line (X, Y)
  - Elevation (H, lower rail)
  - Measured Cant

Track survey data input. Option #2

Data input from other track survey sources:

- Track points in .XML (.cgPoint) or .CSV format:
  - point name and code (code for left/right rail or axis)
  - point coordinates (left/right rail or axis)
  - coordinate precision 5 decimals or more

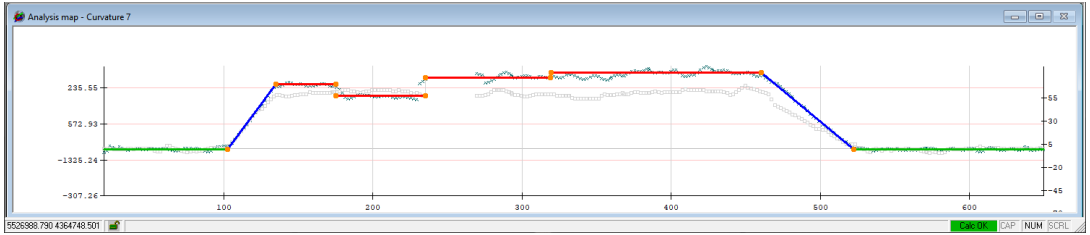




Requirements for track measurement data (input)

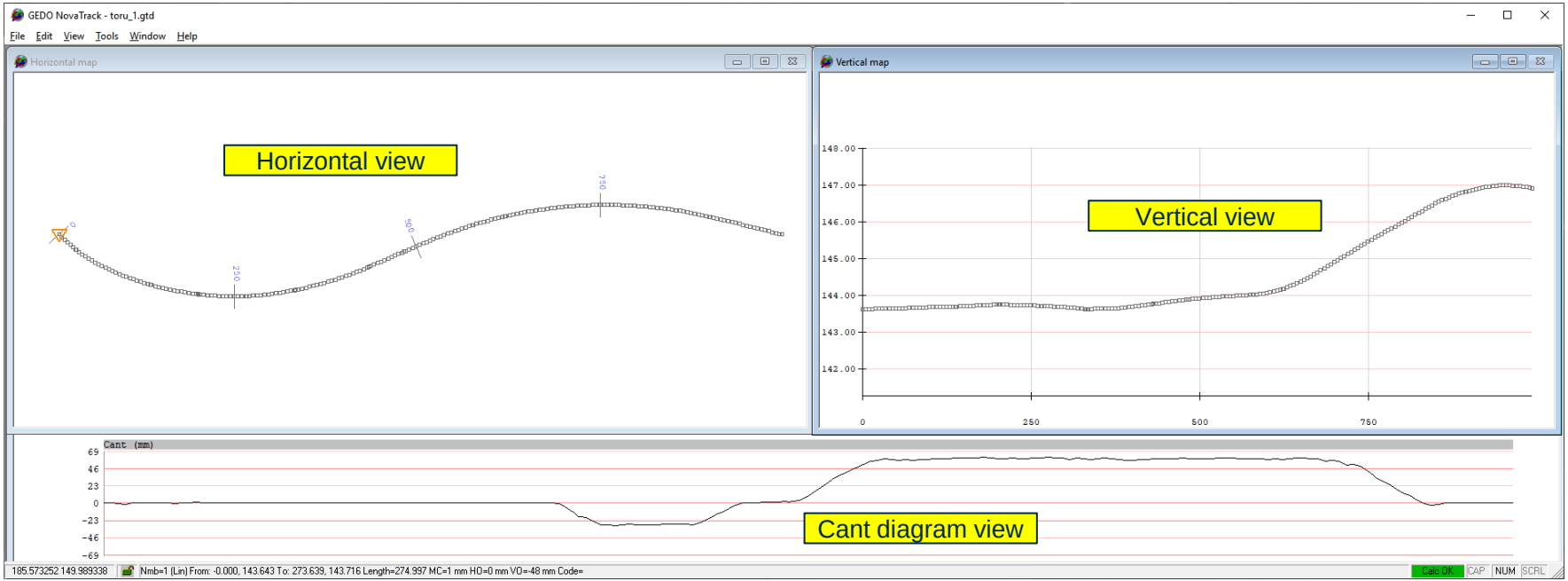
Input data specification:

- Interval between measured points
  - depending on track quality/complexity/application: 0.5 – 3 m
- Measured point coverage:
  - measurements must start/end in a straight or radii element (at least 50 m)
  - measurements should not start/end in the transition
  - the gaps are allowed in the measurement data



Workflow. Step 1. Data input.

- Import of measured track data (.GTD)



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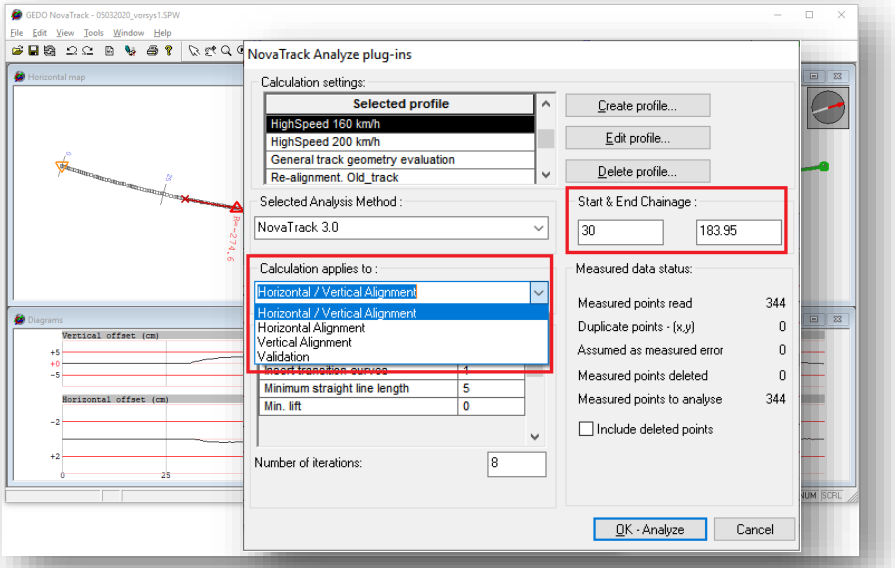
Workflow. Step 2. Selecting calculation settings

- Selecting chainage range: from – to chainage
- Selecting calculation profile (based on application or track type)
- Selecting alignment calc. scope: HA/VA, HA, VA or Validation



Workflow. Step 3. Automatic alignment fitting

- Point approximation with alignment elements

A Novatrack 3.0

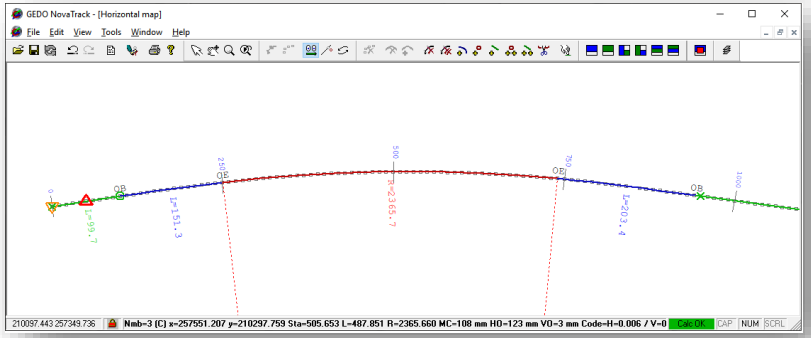
'Pre-design'

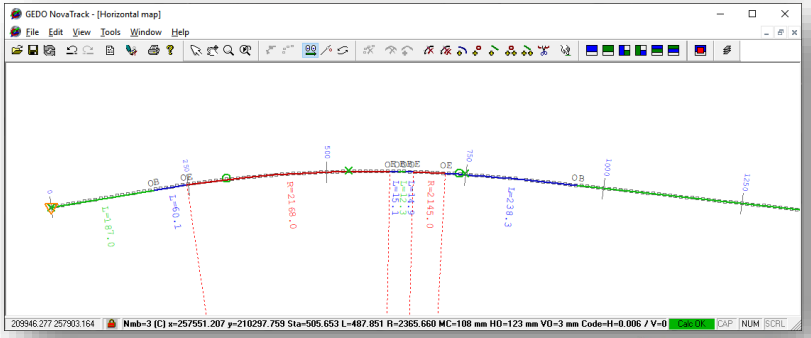
1. Better automatic prediction
2. Consistent geometry
3. Aimed for re-construction

B Regression w/ Transitions

'Smoothing'

1. Follows existing track
2. Erratic combinations of elements
3. Suitable smoothing tamping





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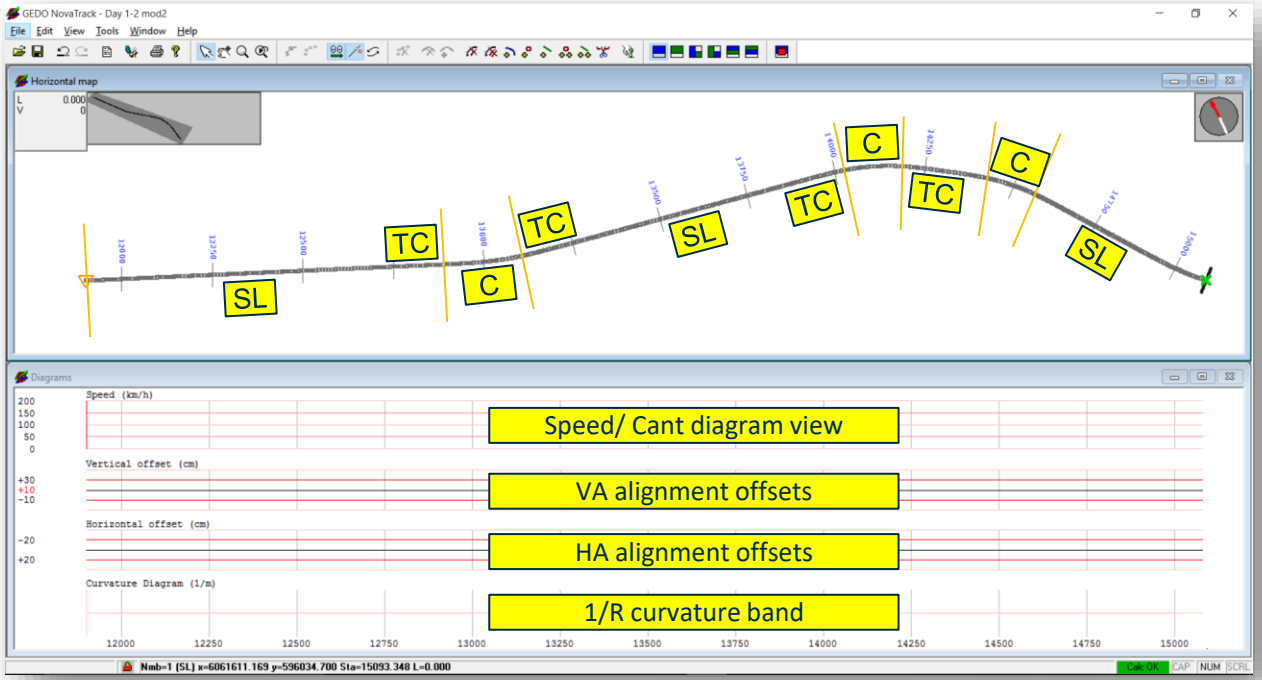
Workflow. Step 4. Automatic fitting result

- Design alignment result after automatic alignment fitting



Straight line

Transition

Radius/Arc

Invalid fitting

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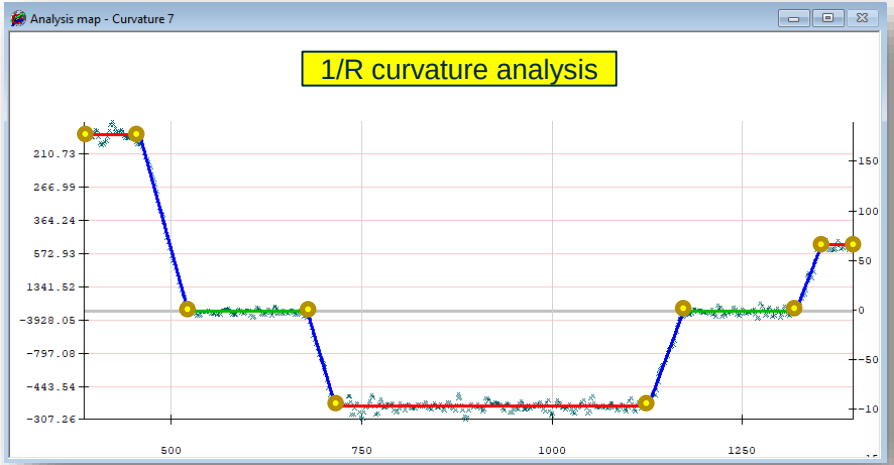
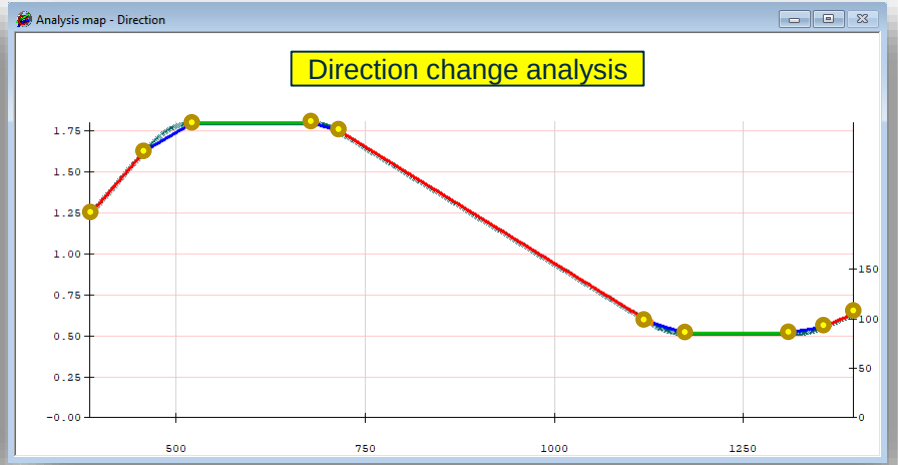
Workflow. Step 5. Semi-automatic alignment fitting

- Using HA curvature/direction analysis diagram:
  - to adjust proposed HA alignment configuration
  - to set preliminar element configuration & tangent point positions

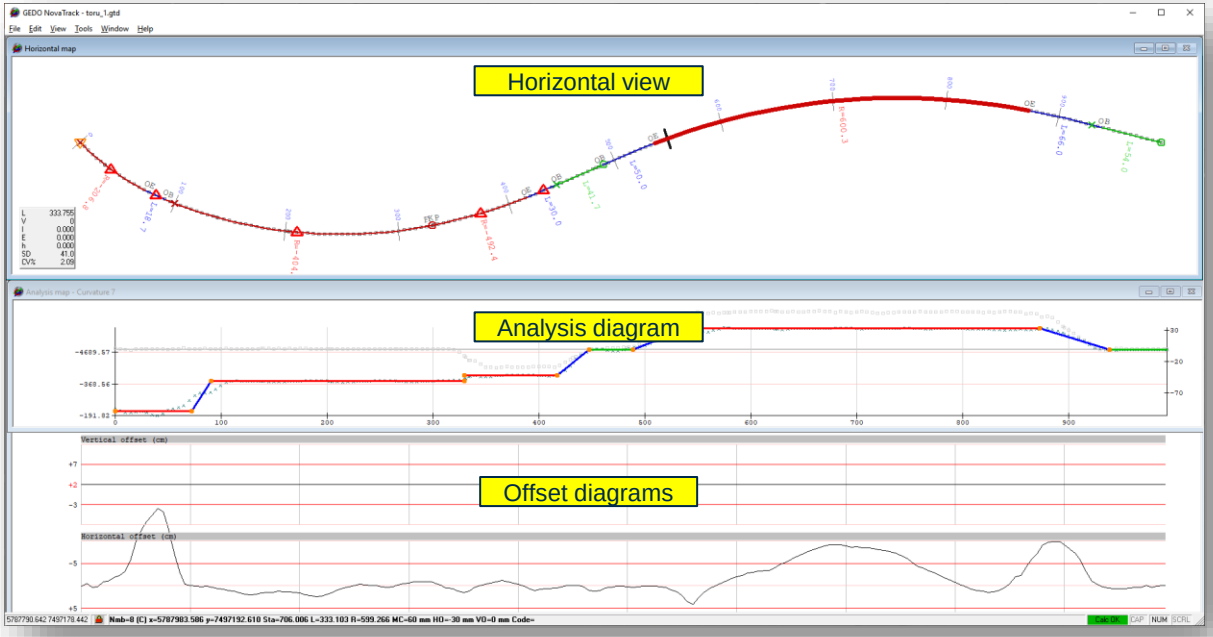


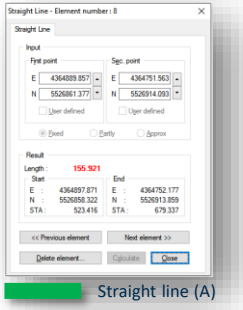


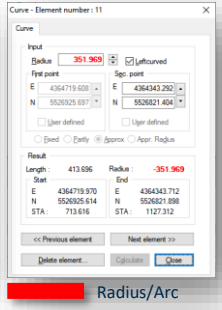
Straight line (A)
Transition
Radius/Arc (A)
Invalid fitting
Preliminary tangent location

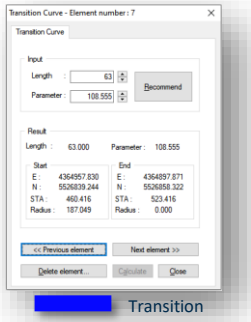
Workflow. Step 6. HA alignment fine-tunning

- Adjusting HA elements to minimize horizontal offsets:
  - direct element editing using parametric data



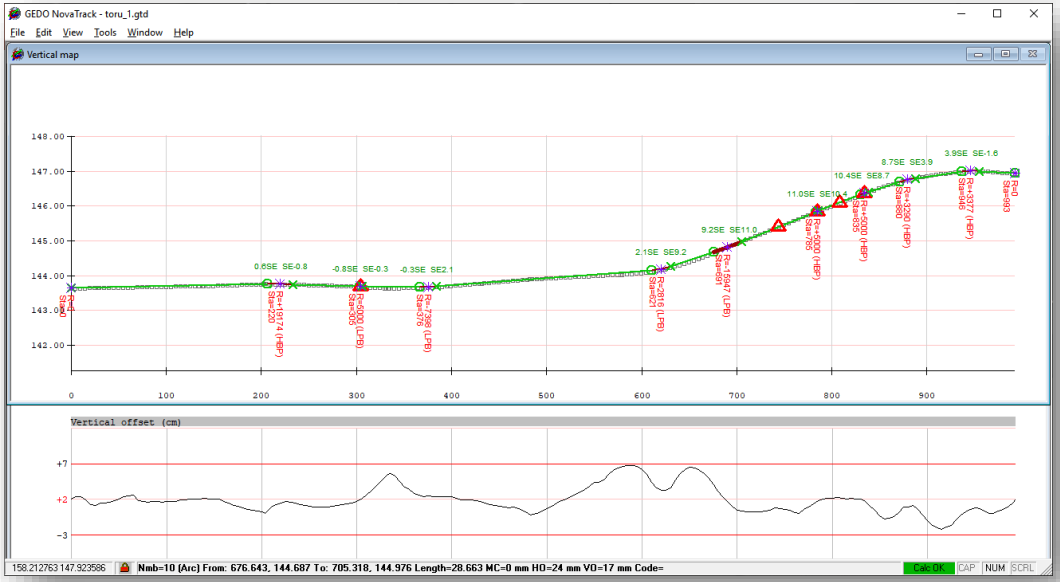


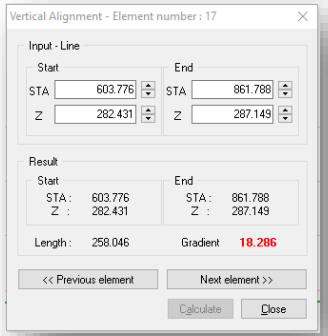


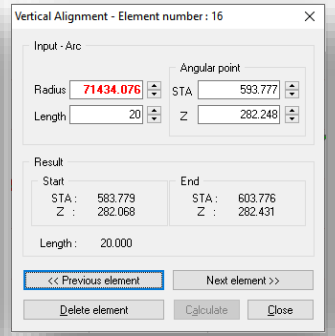


Workflow. Step 7. VA alignment establishment

- Establishment and adjust of VA elements :
  - draft VA alignment smoothing using calculation profile setting
  - VA element parametric editing to minimise vertical offsets







Straight line (A)

Radius/Arc (A)

Variable	Value	Description
analyse_method	1	Selected analyse method
error_tolerance_vertical	0.03	Error tolerance for vertical geometry (m)
nt3_remove_split	103	Initial percentage value for removing split points

Calculation profile settings

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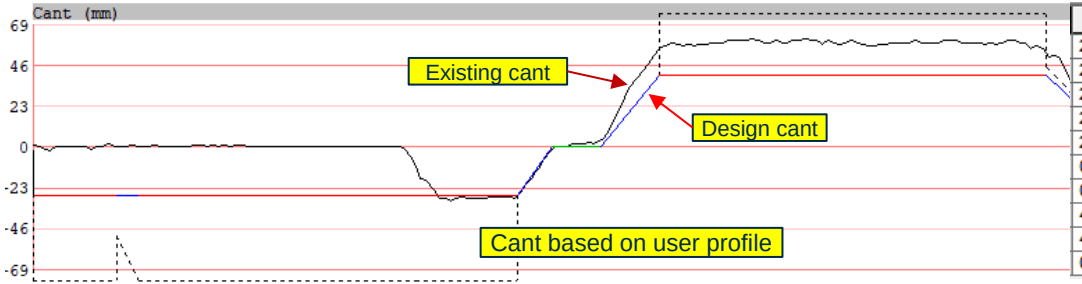
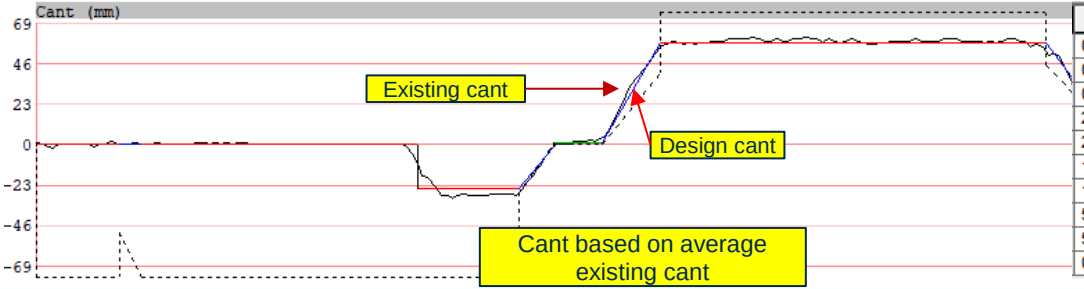
Workflow. Step 8. Calculate design Cant

- Calculate design Cant using one of the available options:
  - Cant calculated based on user profile settings

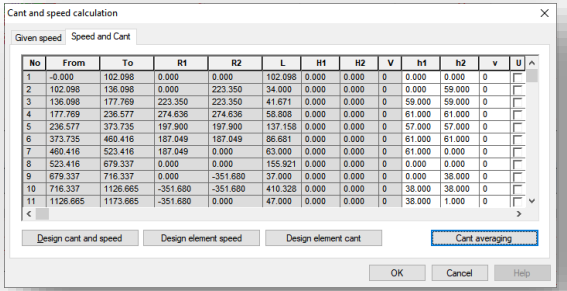


h1	h2
27.000	27.000
27.000	27.000
27.000	27.000
27.000	27.000
27.000	0.000
0.000	0.000
0.000	41.000
41.000	41.000
41.000	0.000
0.000	0.000

  - Cant calculated as an avarage of measured cant



h1	h2
0.000	0.000
0.000	0.000
0.000	0.000
25.000	25.000
25.000	1.000
1.000	1.000
1.000	58.000
58.000	58.000
58.000	0.000
0.000	0.000



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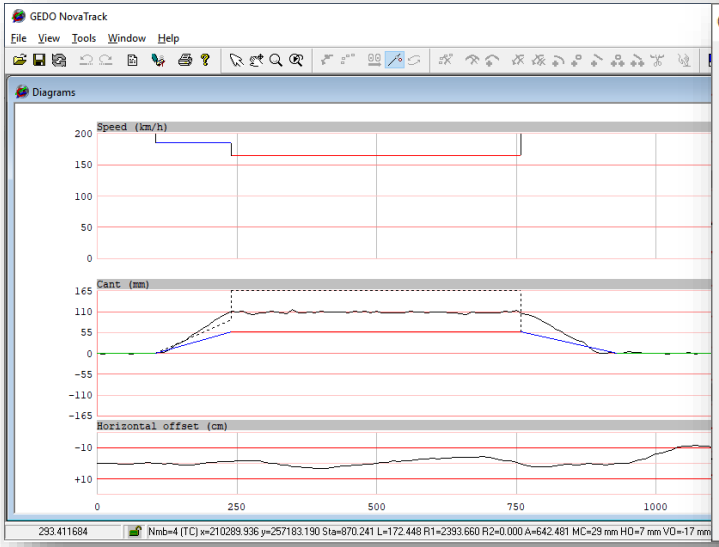
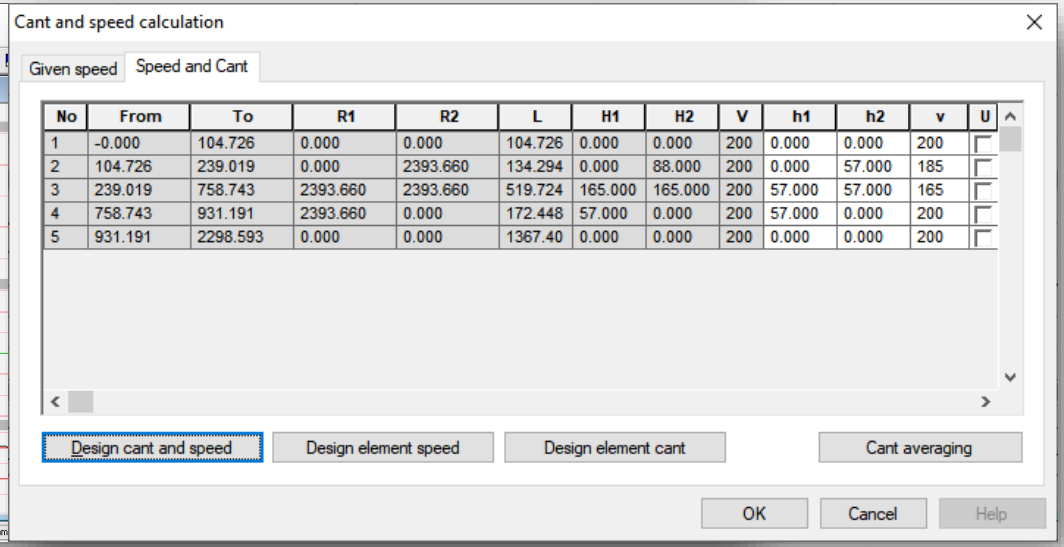
Design speed & cant calculation options

- Cant averaging and based on measured cant
- Cant and speed based on the rule settings
- Speed/cant calculation for individual elements

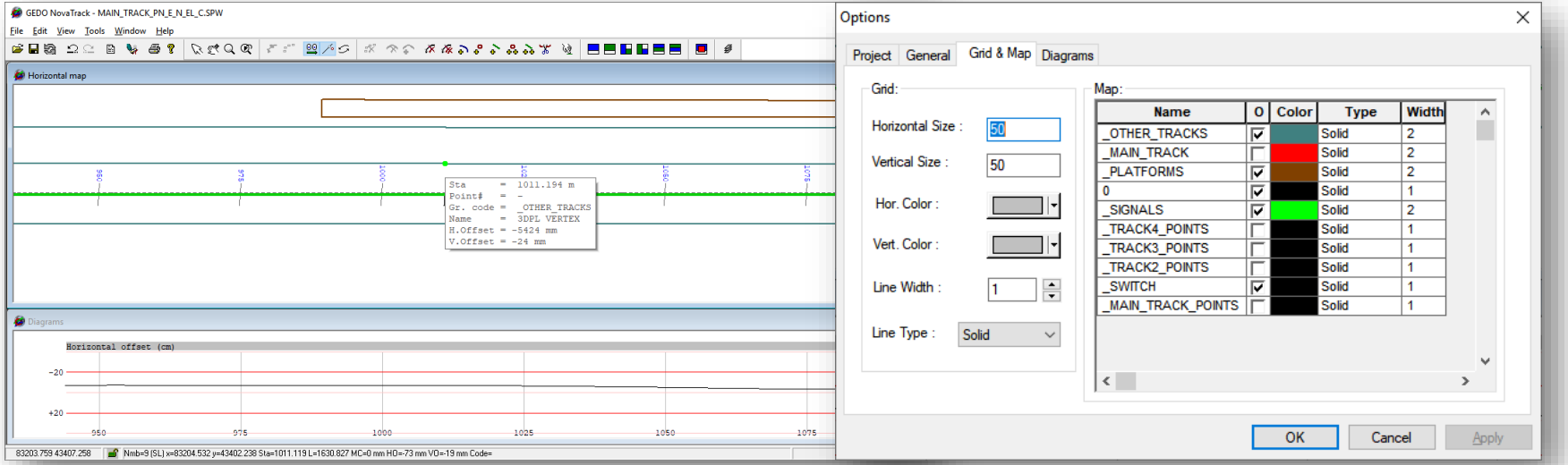




No	From	To	R1	R2	L	H1	H2	V	h1	h2	v	U
1	-0.000	104.726	0.000	0.000	104.726	0.000	0.000	200	0.000	0.000	200	
2	104.726	239.019	0.000	2393.660	134.294	0.000	88.000	200	0.000	57.000	185	
3	239.019	758.743	2393.660	2393.660	519.724	165.000	165.000	200	57.000	57.000	165	
4	758.743	931.191	2393.660	0.000	172.448	57.000	0.000	200	57.000	0.000	200	
5	931.191	2298.593	0.000	0.000	1367.40	0.000	0.000	200	0.000	0.000	200	

Workflow. Step 9. Adding supportive map information

- Optionally import an external track or map data
  - supported format: .GTD, .DXF, .CSV and .LandXML
  - available tooltip information: offsets, chainage, layer code



Data exchange

- Supported file formats

Format	Read	Write	Map read	Description
SPW (.spw)	+	+		Native GEDO NovaTrack project file format
GEDO Track data (.gtd)	+		+	GEDO track data (ASCII)
GEDO Office TDT (.tdt)	+	+		Horizontal alignment (tabular, ASCII)
GEDO Office HDT (.hdt)	+	+		Vertical alignment (tabular, ASCII)
GEDO Office UDT (.udt)	+	+		Cant alignment (tabular, ASCII)
NovaPoint (.tit)	+	+		Horizontal alignment (ASCII)
NovaPoint (.nyl)	+	+		Vertical alignment (tabular, ASCII)
LandXML (.xml)	+	+		Horizontal, vertical and cant alignment
LandXML lines (.xml)			+	Line elements
LandXML cgPoints (.xml)	+		+	Point elements
Data exchange format (.dxf)			+	Point and line elements
Slew-lift report (.alc)		+		Design/as-build slew-lift offset report (space separated)
Design geometry report (.csv)		+		Complete alignment geometry report (semi-column, ASCII)

GEDO NovaTrack Live

03

- Live software demonstration

Questions?

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Thank you!

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