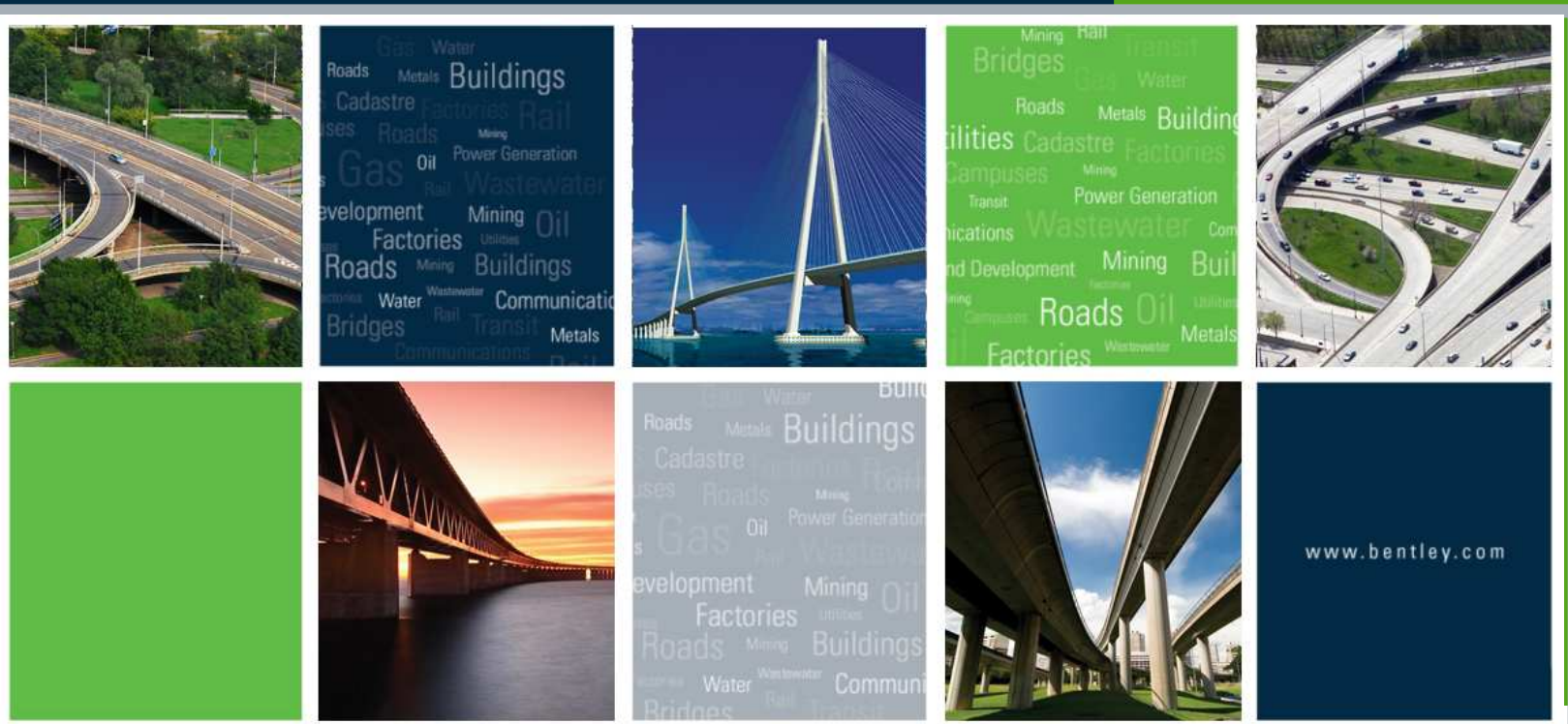
2009 ROADS AND BRIDGES CONFERENCE



Resurfacing and Overlay Made Easy with New Overlay Tools in Roadway Designer

Joe Waxmonsky, Bentley Civil

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Sustaining Infrastructure

Why Overlay?

Why Overlay?

- Accommodate wedging / leveling
- Milling
- Widening
- Crown correction
- Longitudinal smoothing
- Superelevation correction
- Cost minimization

What To Expect…

- Optimized vertical alignment without the "washboard effect".
- Leveling / stripping components
- Corrected superelevation
- Distinct volumes to minimize construction cost
- Several tolerance settings for overlay design

Why New Tools?

- A majority of all roadway construction projects today require overlay and or widening (rehabilitation) versus new construction.

- Machine control construction becoming the "norm" even with rehabilitation projects.

- Need new tools in Roadway Designer to better optimize quantities and follow specific standards like minimum overlay thickness or max. overlay depths.

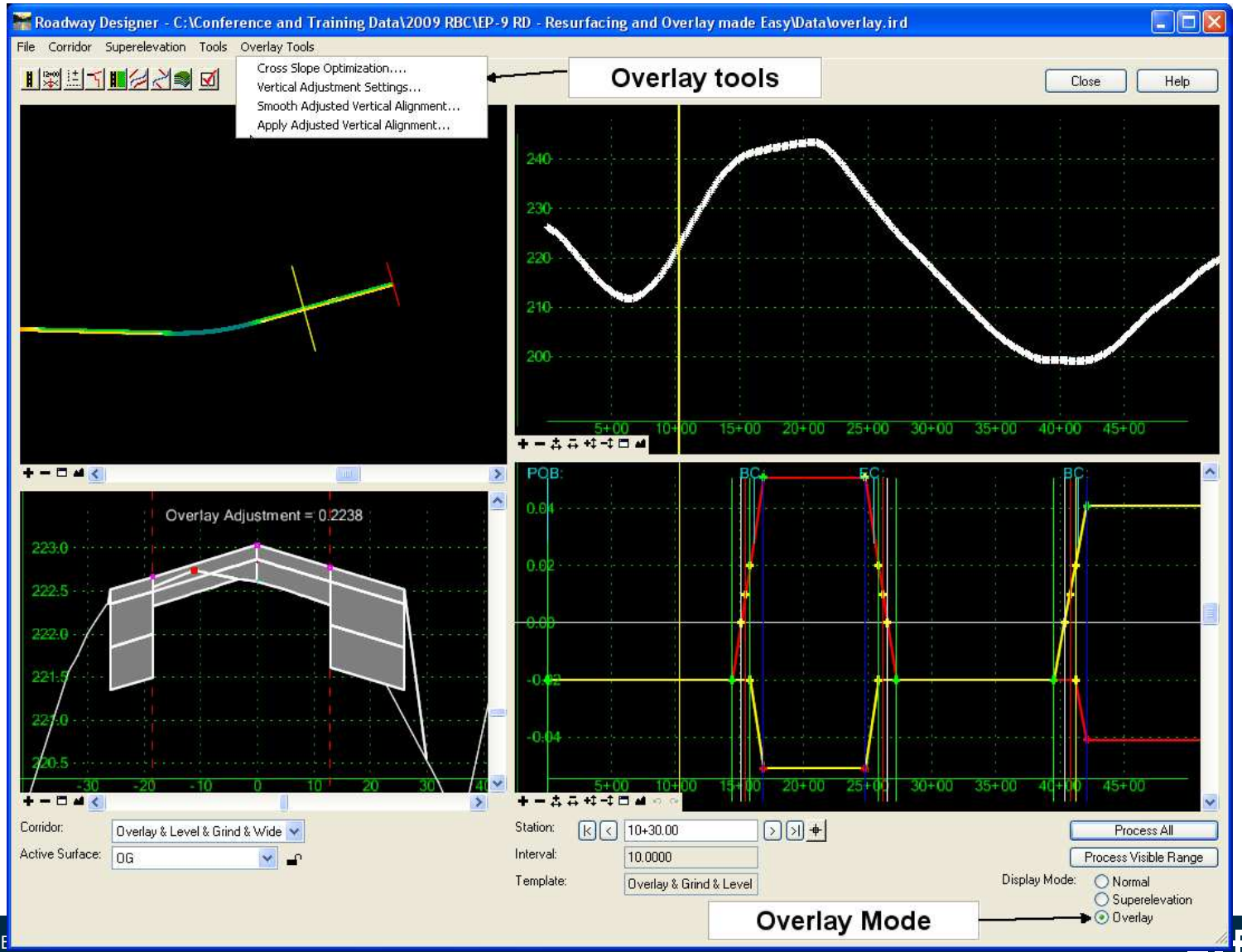
- Need ability to optimize proposed profiles to lessen the "washboard effect".

- Need ability to "*match what's out there*" to minimize cost.

What Abilities Will These Tools Provide?

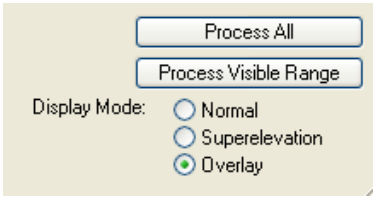
- Existing cross slope optimization with slope and elevation tolerances
- Minimum overlay thickness / maximum milling (scarification) depth analysis examining template points and optionally all ground points
- "Smooth" the vertical profile.
- Apply the adjusted profile.
- Crown correction / match existing milling
- Bituminous and Milling estimate of cost based on unit rates.

Introducing Roadway Designer's Overlay Toolset

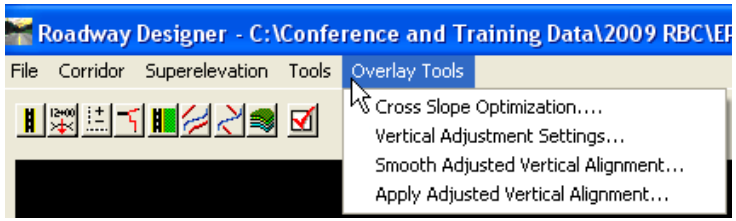


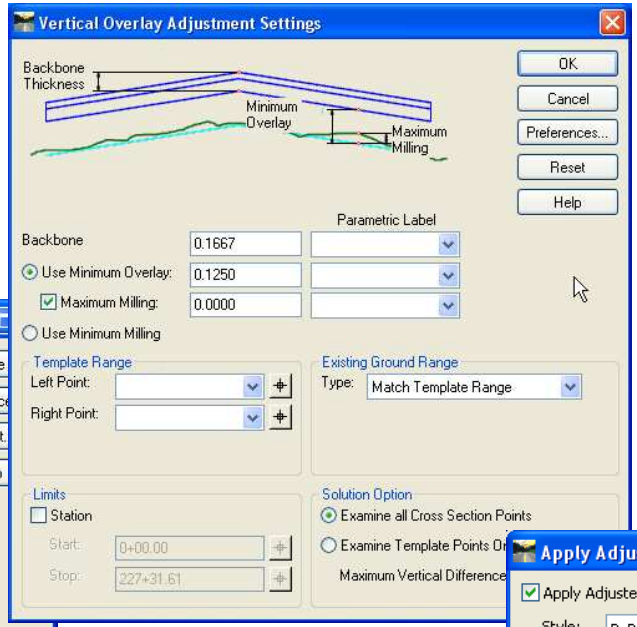
Overlay Display Mode

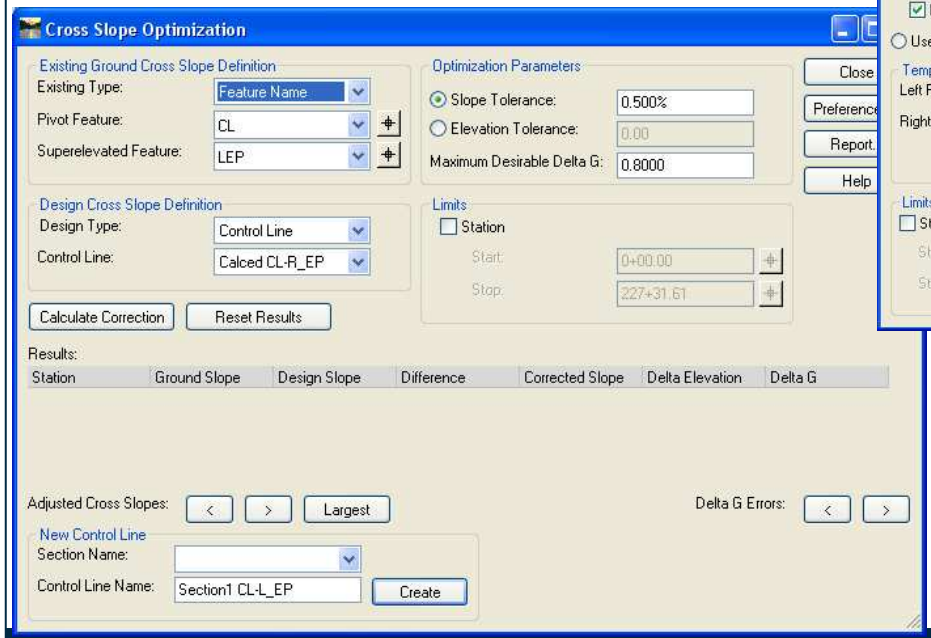
A new Display Mode has been added to Roadway Designer

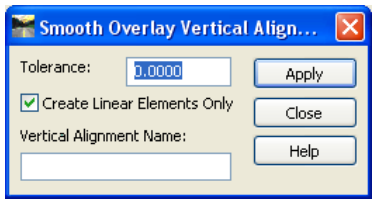


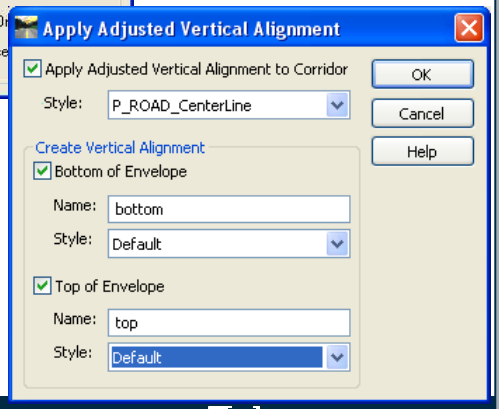
In the "Overlay" Display Mode, the "Overlay Tools" drop down menu entry becomes active











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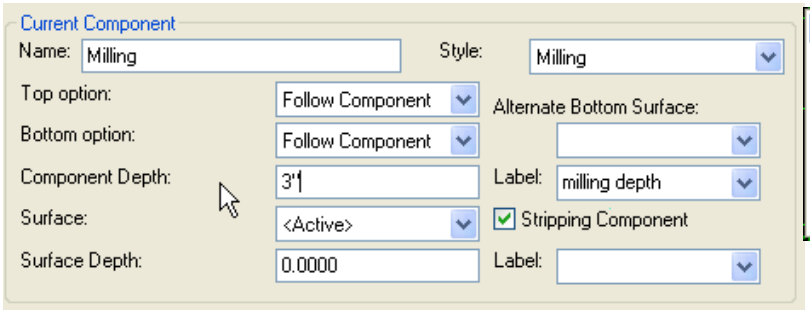
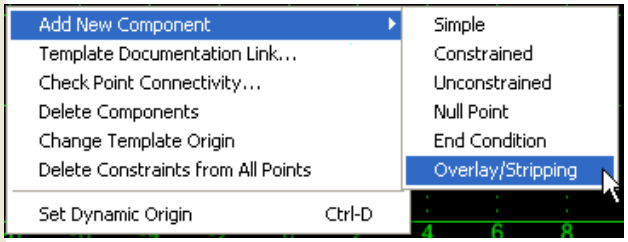
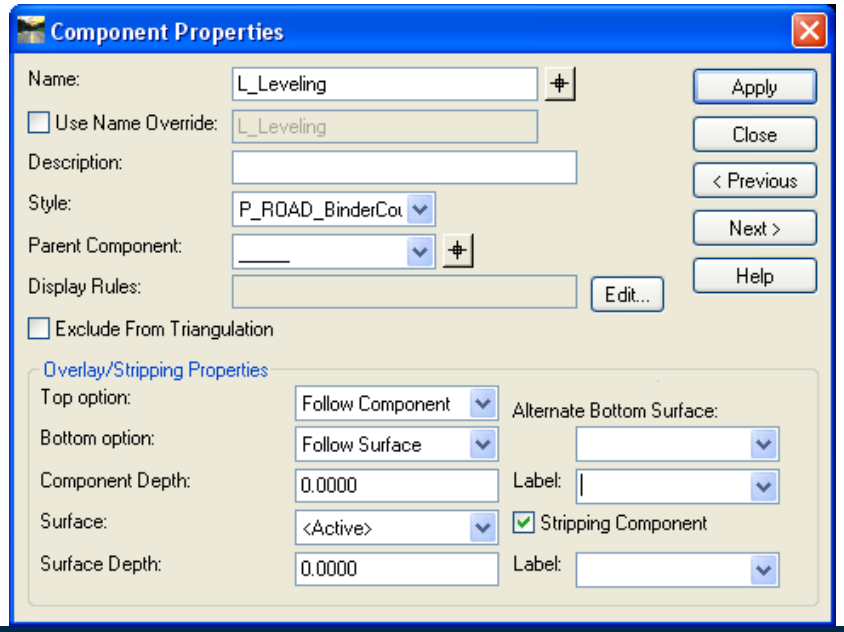
New Component Type

A new component type → Overlay / Stripping

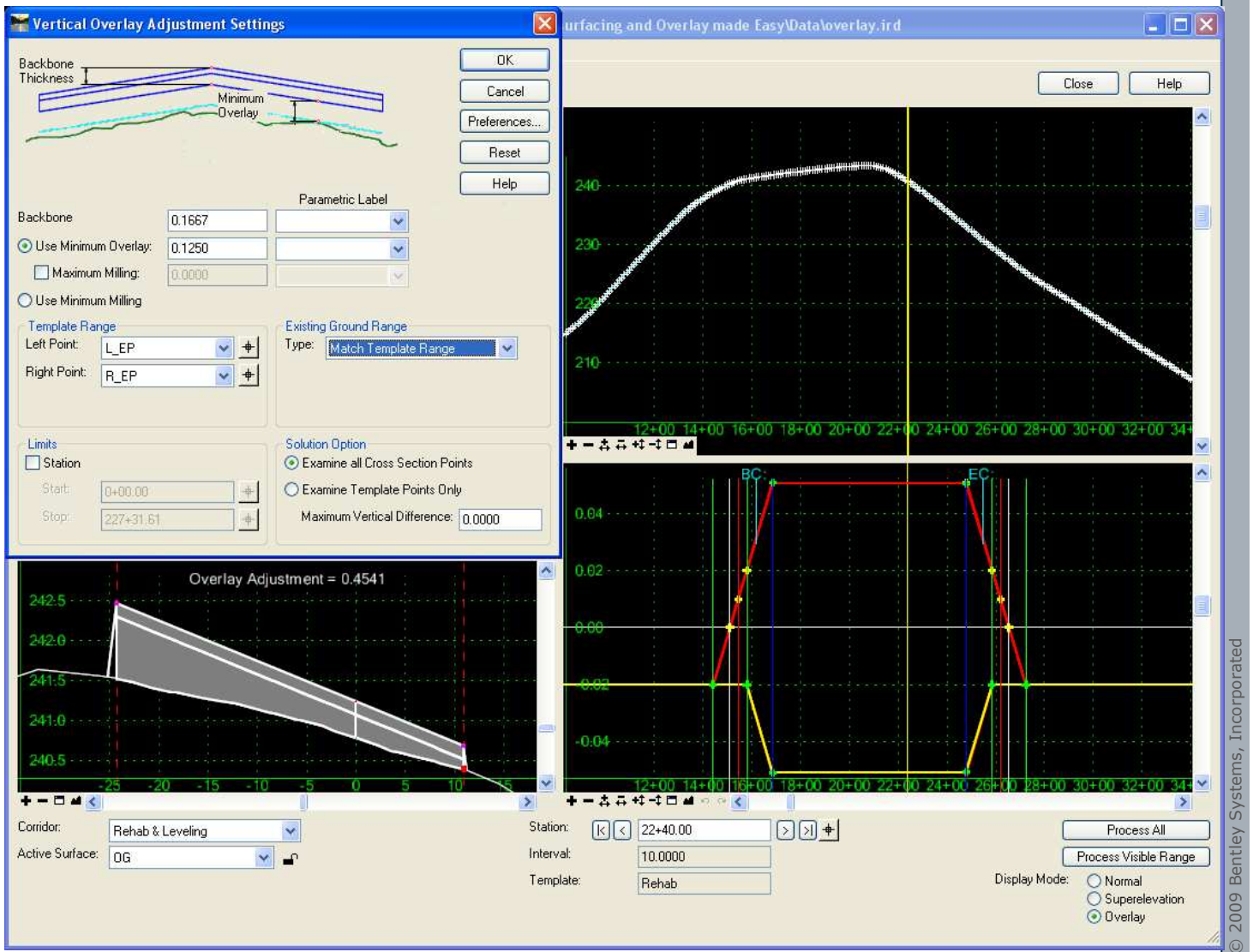






Vertical Optimization with Superelevation correction

- Designer first applies the required superelevation based on project standards.
- Optimize the vertical profile utilizing the design superelevation



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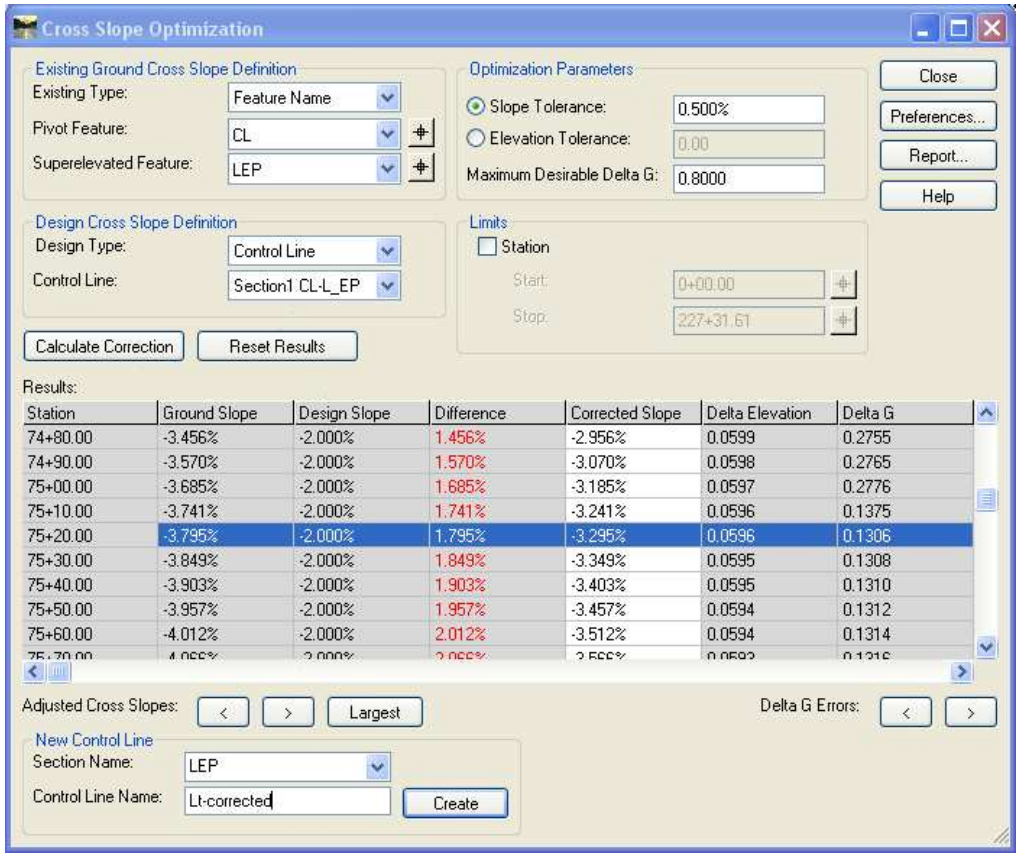
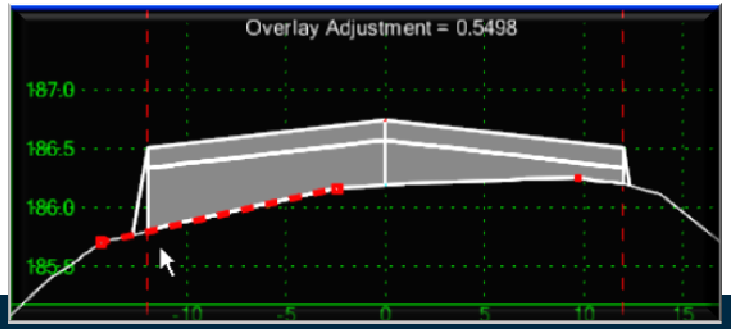
Cross Slope Optimization

- Analyzes the existing cross slope and Delta G between sections.
- Takes into account theoretical design standard superelevation.
- Adjust the proposed cross slope based on user defined tolerances.
- Creates new point control lines.
- Allows for user interaction to manually adjust computed slopes.





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Cross Slope Optimization Report

Cross Slope Optimization Station Report

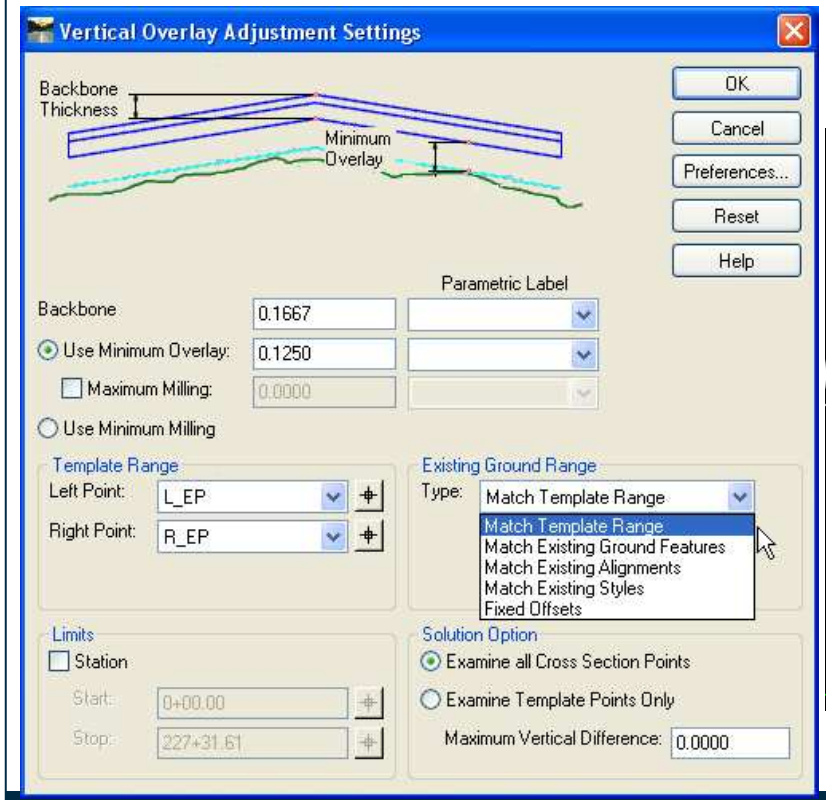
Report Created: 4/29/2009
Time: 9:46am

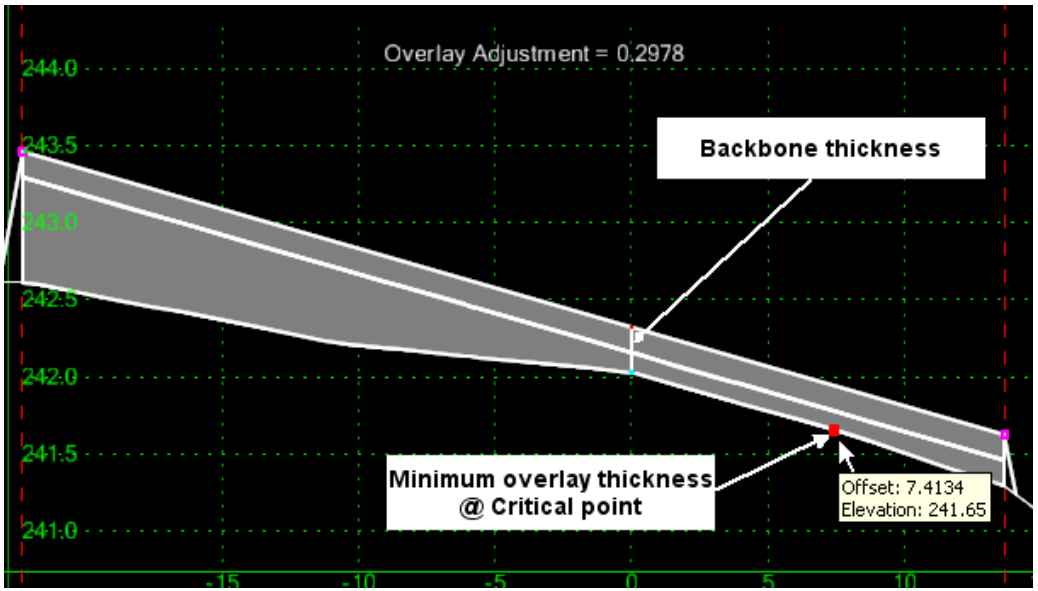
Corridor: Overlay Sample
File Name: C:\NCDOT Overlay\Overlay Sample.ird
Input Grid Factor: 1.000000
Note: All units in this report are in feet unless specified otherwise.
Existing Ground Data: Type: Alignment
Pivot: L
Superelevated: lt_ex_eop
Design Data: Type: Control Line
Control Line: Section1 CL-EEOP_L
Optimization Parameters: Tolerance Type: Slope
Slope Tolerance: 2.00%

Station	Existing Slope/Elevation	Design Slope/Elevation	Difference Slope/Elevation	Corrected Slope/Elevation	Delta G
20+20.00	0.18% 0.02	-1.95% -0.21	-2.13% -0.23	-1.82% -0.20	0.00
20+30.00	-1.76% -0.19	-1.14% -0.13	0.62% 0.07	-1.14% -0.13	0.71

Vertical Overlay Adjustment

- Design via minimum overlay and optional maximum milling.
- Design via minimum milling
- Utilize Parametric Constraint labels to vary depths throughout a project
- Examine template points only or all points including existing ground
- Multiple choices when setting offset limits for analysis





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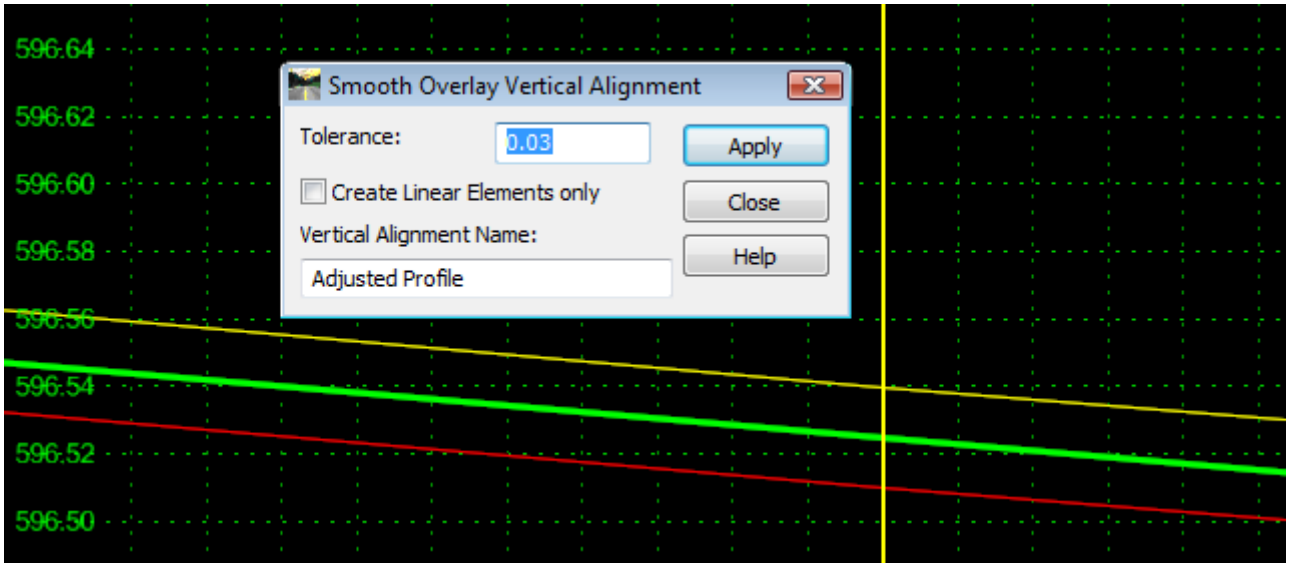
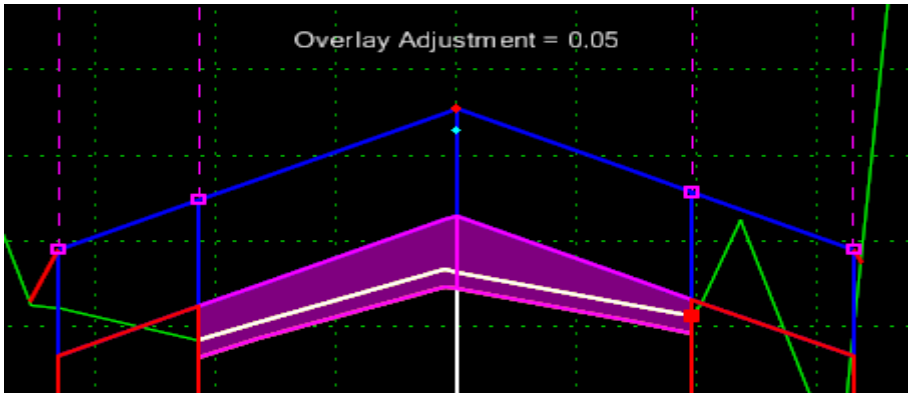
Vertical Overlay Adjustment

- Creates a vertical profile design window.
- Linear Regression is utilized to “best fit” the design profile.





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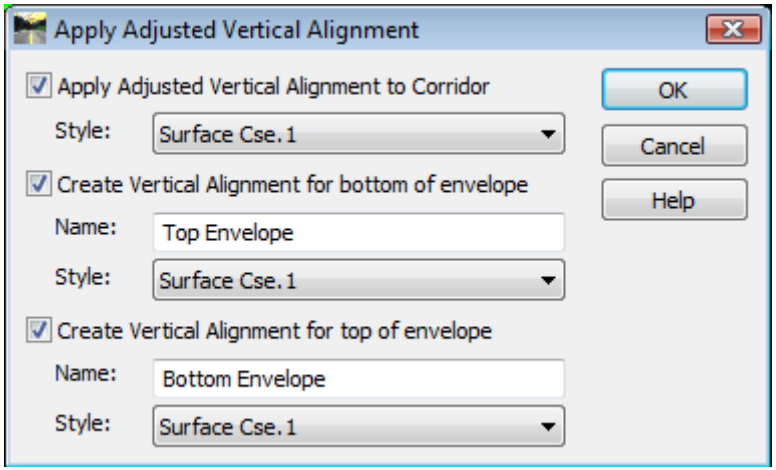
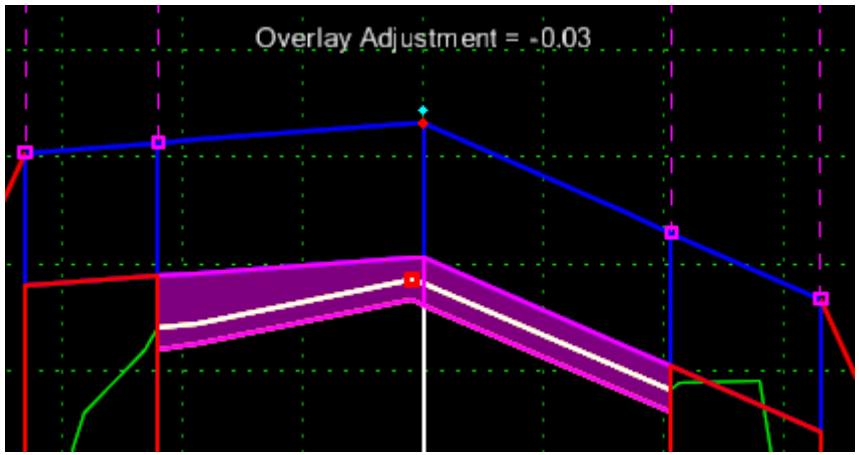
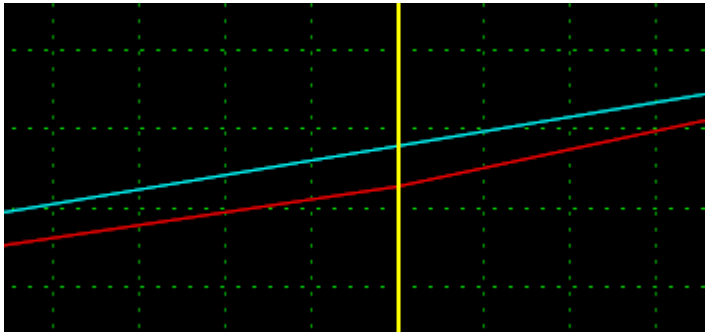
Vertical Overlay Adjustment

- Applies adjusted profile automatically.
- Allows designer to store top and bottom envelope profile for manual tweaking.







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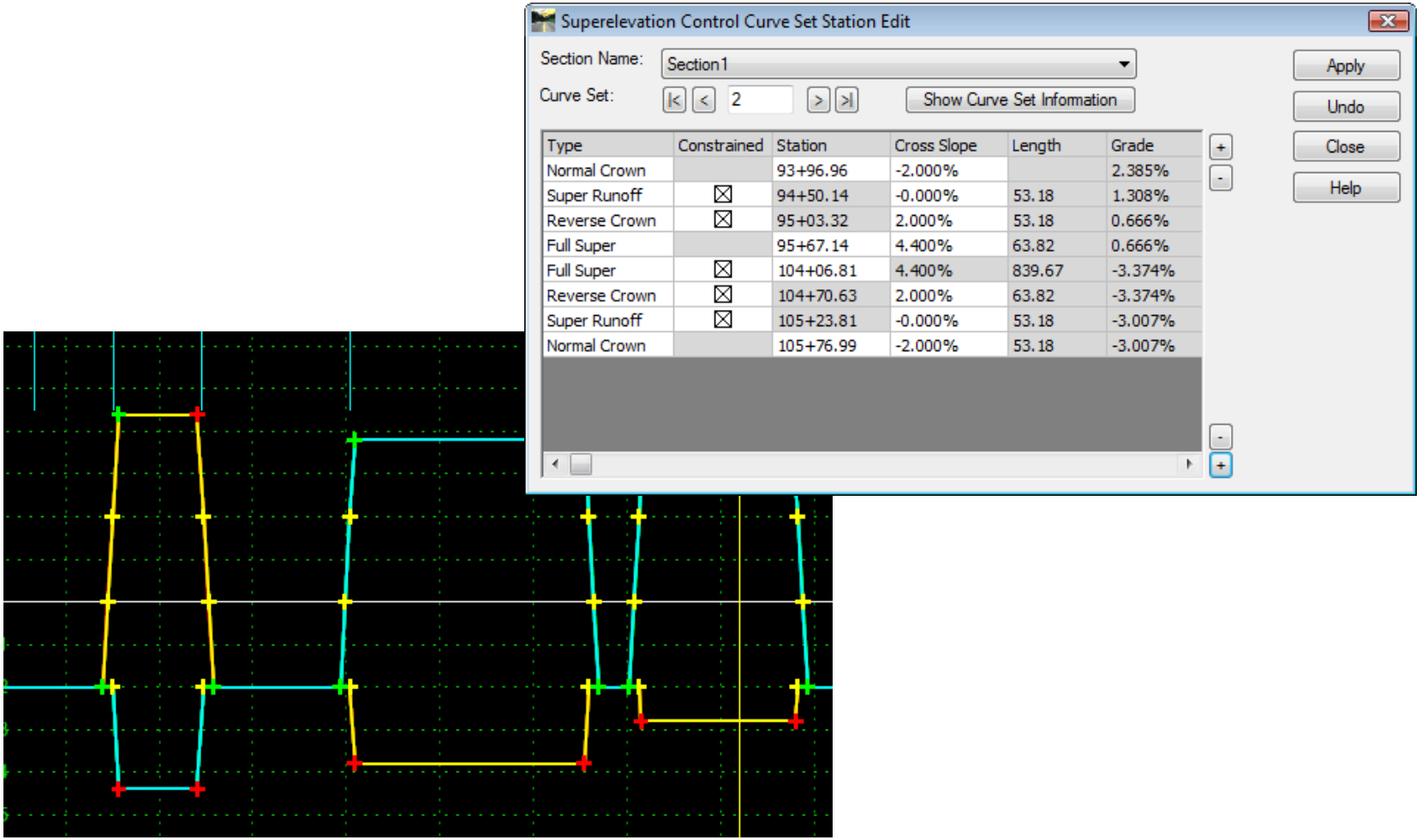
Corrected Superelevation

- Combine Optimized Vertical with Theoretical Superelevation



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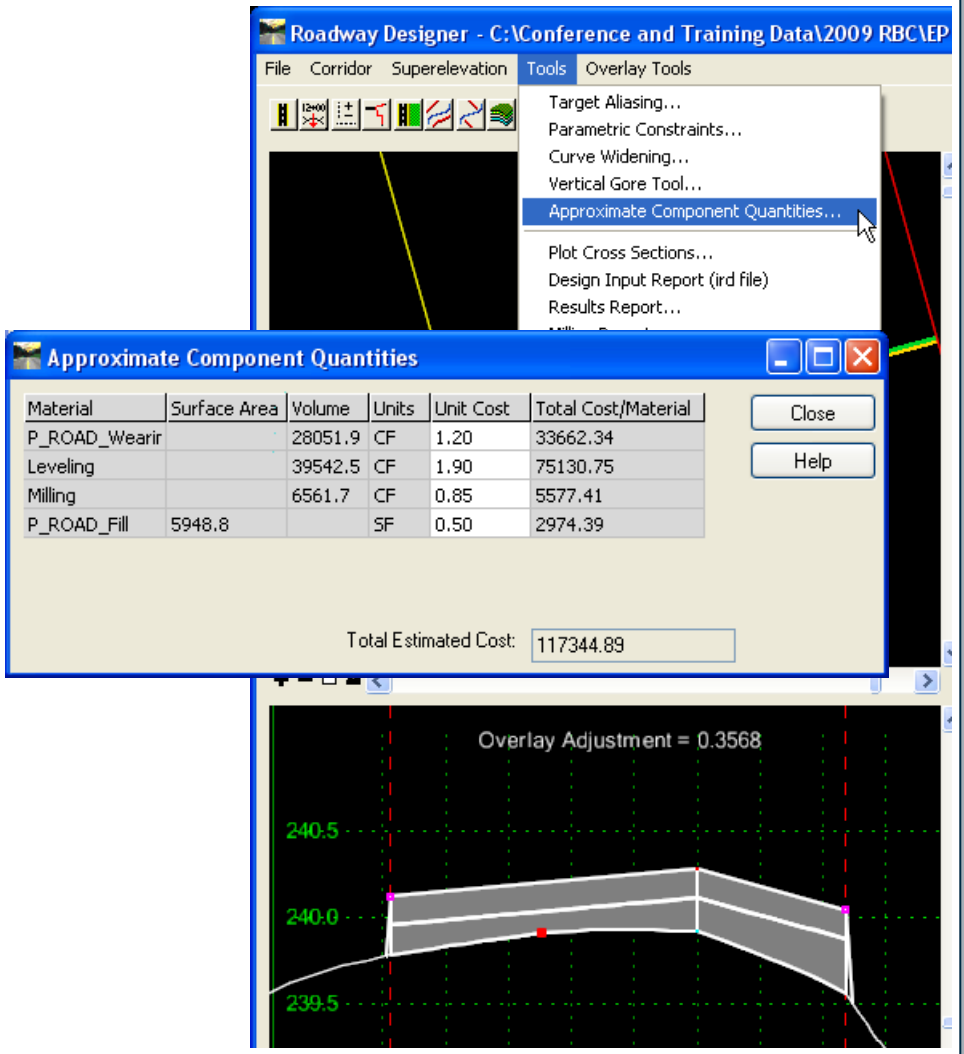
End Area Quantities / Material Cost

- User definable Unit Cost
- Computes end areas and volumes of each component
- Streamlines the design / cost analysis



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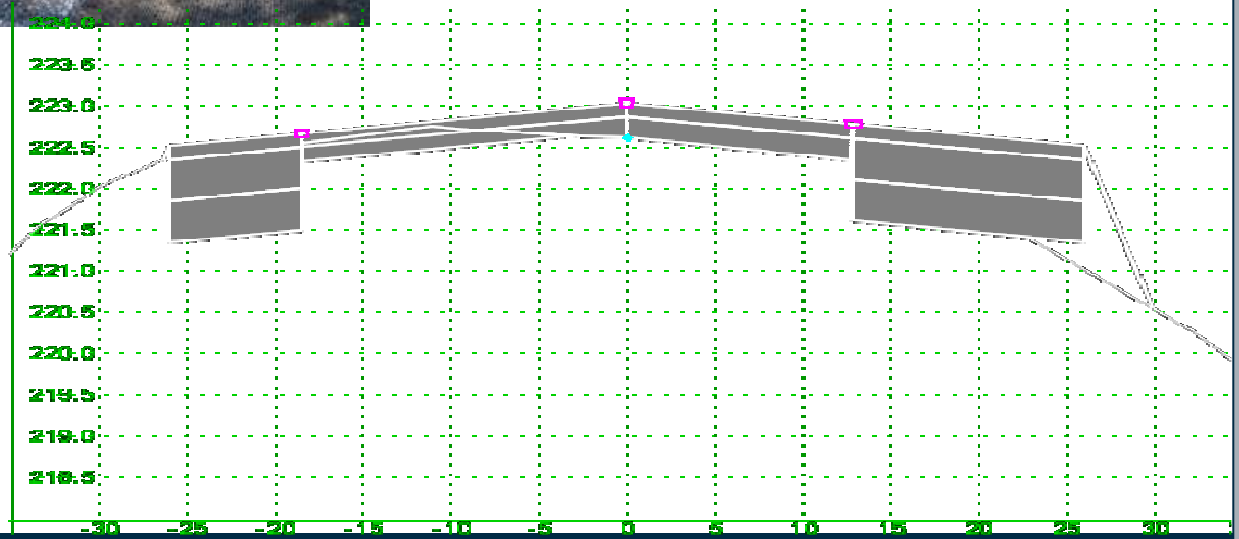
Live Demonstration



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Questions?