

SUBJECT
SR 51 Vertical Clearance

TO
Julie Fahy

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OUR REF
30093332

DEPARTMENT
Mobility

PROJECT NUMBER
LUC-23-11.75

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SR 51 Vertical Clearance

Horizontal Layout

For the purpose of this memo vertical clearance calculations were performed assuming that all widening will be done to the south of the existing structure. Changes to the widening will require minor changes to the profile but will not change the overall concept. The horizontal layout is attached.

Existing Vertical Clearance

The existing point of minimum vertical clearance is located at the northernmost beam of the SR 51 structure over the crown of the southbound lanes of US 23. This minimum vertical clearance is listed as 14.6' on the bridge inventory report and 15.24 per the original construction plans (LUC-23-12.28, 1958). Field survey performed in 2021 indicates the minimum vertical clearance point at the same location with a value of 14.95'. It was assumed that one new beam line would be added 7.25' north of the last existing beam. Minimum vertical clearance was calculated at this future beam location at the southbound crown and was also calculated to be 14.95'. This value was used for this analysis.

Proposed Vertical Clearance

As part of the scope of this project the proposed minimum vertical clearance provided will be 15.5', achieved either through raising SR 51 or lowering US 23. If SR 51 is raised, the amount the existing beams are raised needs to be similar at each abutment/pier location so as to not significantly affect the camber of the beams.

Existing SR 51 Profile

Per the original construction plans (LUC-23-12.28, 1958) the existing profile on SR 51 consists of a +0.2% approach grade from the west through a 400' sag curve at the west interchange terminal directly into an 800' crest curve over US 23 with no tangent separation. The PVI of this curve is not centered over US 23. A tangent grade leaves this crest curve heading to the east at -1.0% towards the Monroe/Alexis split.

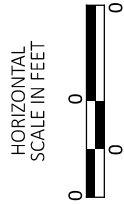
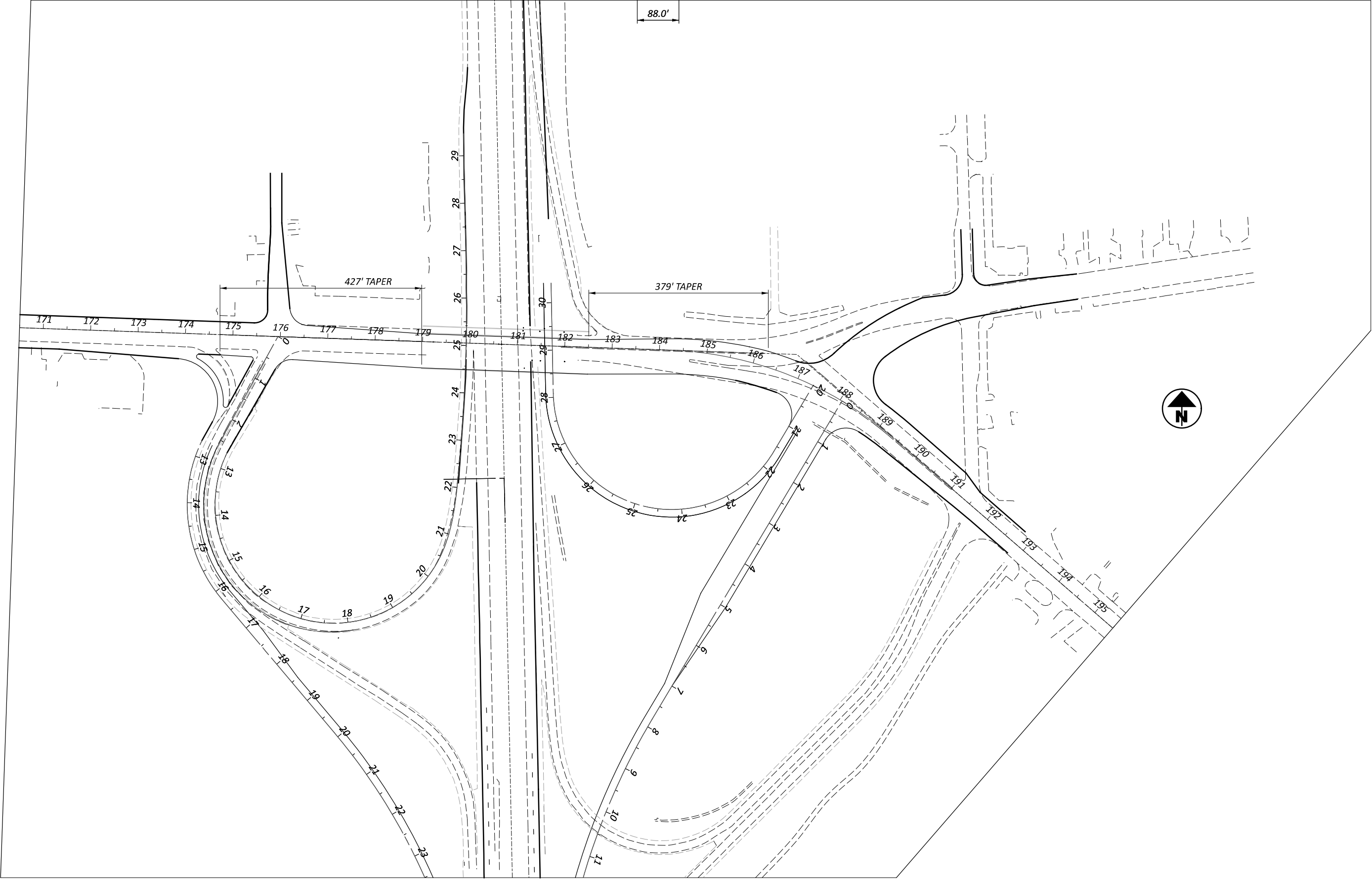
A best fit profile was created from the 2021 field survey while trying to hold the overall vertical geometry of the original construction. The data fit very closely with the field survey and only required a datum adjustment. This is shown as Profile 1 in the attached figure.

Proposed SR 51 Profile

A proposed profile was generated for SR 51 to achieve the required 15.5' vertical clearance by holding the existing 800' crest vertical curve and raising it approximately 7". By holding the existing curve and approach grades the elevation change at each pier/abutment is the same and fits with the existing beam camber. To minimize the length of work and still maintain proper vertical geometry the 0.2% approach grade to the west was held but the 400' sag vertical curve was shortened to 200' and a tangent was placed between the curves. The new 200' vertical curve has a K value of 132. The required sag K for a 40-mph design speed is 64. This pushes the proposed work to the west side of the interchange terminal and will require work in the Glasgow/Monroe intersection. A PVI was added on the eastern approach and tied back to existing after the proposed western interchange terminal before the existing Acres/Monroe intersection. This is shown as Profile 2 in the attached figure.

Proposed SR 51 Profile - Alternate

A second profile was generated based on the geometry of the first but with the intent of not doing any work in the Glasgow/Monroe intersection. The same concept was held, and the crest vertical curve was raised about 7" evenly across the structure. Once off of the structure to the west, a graphic grade was used to blend the profile back to existing before the intersection. This results in an effective shortening of the crest curve to 505' with an approximate K value of 295. The required crest K for a 40-mph design speed is 44. The work to the east was kept the same as in the original layout. This is shown as Profile 3 in attached figure.



SHEET TITLE
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DESIGN AGENCY

DESIGNER

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PROJECT ID

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SHEET

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