TYLin

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MEMORANDUM

DATE: November 20, 2025

TO: Alfred J. Mittl, PE
Public Works Director
City of Sanibel

FROM: Farzin Zafaranian, PE, Senior Structural Engineer, TYLin
Michael Harter, PE, Transportation Manager, Brindley Pieters & Associates, Inc.

SUBJECT: East Periwinkle Bridge Replacement- Vertical Profile Design

On June 4, 2025, the City of Sanibel awarded a professional services contract to TY Lin International (TYLin) to provide professional engineering services related to the East Periwinkle Way bridge replacement project. TYLin's contractual tasks include existing conditions data collection, permitting, structural design, roadway design, temporary traffic control, drainage design, bridge hydraulic analysis and scour evaluation; geotechnical evaluation; topographic survey; cost opinions; technical specifications; and project management. The contract also tasks TYLin with identifying options to increase the width and height of the boat channel at the bridge, and to increase the width of the span for improved pedestrian access. Subsequent to TYLin presenting 90% plans to the City Council on October 21, 2025, the City of Sanibel requested that TYLin conduct a preliminary study to evaluate the potential impacts of increasing the vertical profile of the proposed bridge beyond the current design elevation that would provide additional vertical navigational clearance for boat traffic.

This memorandum presents those potential impacts associated with increasing the vertical clearance for boats from the current design of one foot higher than the existing bridge to three feet higher than the existing bridge as requested by residents. Questions posed by residents are also addressed.

Existing Site Conditions and Constraints

The existing bridge is located along East Periwinkle Way, approximately 200 feet east of Tulip Lane and 200 feet west of Limpet Drive/Pen Shell Drive. The elevation difference between East Periwinkle Way and these adjacent side streets is minimal, and the side roads remain relatively flat beyond their intersections. The City's shared use path (SUP) is present along the south side of East Periwinkle Way, and a sidewalk is present along the north side of East Periwinkle Way bridge.

A key design constraint governing the bridge's vertical profile is the maximum allowable slope of 5% which is required to ensure pedestrian safety on the SUP and sidewalk, both of which will be incorporated into the new East Periwinkle Way bridge structure. The current bridge design already utilizes this maximum slope to achieve the highest possible vertical clearance without adversely affecting adjacent crossroads or residential properties. To comply with the Florida Design Manual requirements related to sight distance and roadway profile, the roadway speed is reduced from 35 MPH to 25 MPH. Under this configuration, and roadway speed reduction, the new bridge provides one foot of additional vertical navigational clearance compared to the existing structure.

Impact of Increasing Bridge Elevation

As part of this study, the plan and cross-section sketches in **Appendix A** illustrate the extent of potential impacts associated with raising the bridge profile.

- The green/grey area represents the current design, which achieves the additional one foot of clearance with no expected impact to adjacent intersections or residential properties.
- The yellow and magenta areas indicate the estimated zones of impact if the bridge is raised by three feet and five feet from existing bridge structure, respectively.

As shown, increasing bridge height directly expands the footprint of required grading on both the north and south sides to tie into existing ground elevations. Consequently, the higher the bridge is elevated, the more extensive and disruptive the impact becomes to adjacent properties and roadways.

Potential Effects on Adjacent Roads and Properties

The projected area of impact extends beyond the City's right-of-way, affecting Pen Shell Drive, Tulip Lane, and Limpet Drive and some residential driveways along these streets due to the resulting grade differences at their intersections with East Periwinkle Way:

- Pen Shell Drive has two access intersections. The intersection closest to the bridge could be permanently closed, with Kings Crown Drive becoming the single access intersection for homes on Pen Shell Drive to reduce the impact of grade differences at these intersections.
- Tulip Lane has one access intersection which could be relocated westward to reduce the impact of grade differences at this intersection.
- Limpet Drive has one access intersection, and it cannot be closed or relocated. This intersection would need to be elevated, which in turn would affect access during construction and impact residential driveways as a reconstructed Limpet Drive is sloped away from the elevated intersection.

The feasibility of the above potential intersection modifications would require further design development and input from the City and affected property owners. Additionally, right-of-way acquisition would be required with the adjacent property owners, which would be a long and expensive process.

Mitigation Considerations

To reduce grading impacts adjacent to the bridge, retaining walls could be constructed along East Periwinkle Way and along the crossroads in front of adjacent properties. However, this mitigation approach introduces new challenges:

- Visually, it would not create a positive change to the adjacent residents' environment.
- A new drainage system would need to be designed and constructed to avert water ponding on private property during heavy rainfall events due to restricted flow paths alongside the walls.
- If the residents find that retaining walls along their property is acceptable, it will lead to higher construction cost as well as longer duration of construction.

Response to Resident's Email

Mr. Kevin McLellan, one of the city residents, sent an email on November 9, 2025 to share his engineering and cost summary findings to show the potential changes due to raising the bridge. A copy of his email and the attachments are included in **Appendix B**. In his engineering summary, Mr. McLellan mentions that raising the bridge by 3.46 feet over a distance of 173 feet, which is his measurement of distance from center of Pen Shell Drive to the bridge abutment, would result in a slope of 1.73%. And he concludes that based

on this small slope increase, there will be minimal to no impact on the side roads and adjacent properties. What Mr. McLellan fails to consider is that this 1.73% slope will be in addition to the current 5% slope in our proposed design.

The roadway profile in **Appendix C** illustrates this concept more clearly. Below is a quick summary of the notations on the profile sheet:

- The dashed profile is the existing bridge.
- The gold profile is the current design using 5% slope. The elevation change to edge of pavement at Pen Shell/Limpet Drive and Tulip Lane are shown to be 4" and 7", respectively.
- The blue profile shows the impact of raising the bridge by 3 feet from existing bridge while maintaining the maximum 5% slope required by code. The elevation change to edge of pavement at Pen Shell Drive and Tulip Lane are shown to be 27" and 21", respectively.
- The magenta color profile shows the concept proposed by Mr. McLellan which would result in a longitudinal slope of 6.73% that exceeds the maximum allowable slope specified in the FDOT Florida Design Manual.

Engineer's Opinion of Probable Construction Cost

The Engineer's Opinion of Probable Construction Cost for raising the bridge 3 feet higher than the current height is shown in **Appendix D**.

Conclusion

In summary, increasing the vertical clearance of the East Periwinkle Bridge beyond the current design will result in significant impacts to surrounding roadways, residential access, and would likely affect drainage conditions. The existing design was developed based on the City's direction to provide a balanced solution that maximizes vertical clearance within geometric, safety, and community constraints related to adjacent residential properties and without reconstructing adjacent intersections.

Raising the profile any further will involve the following:

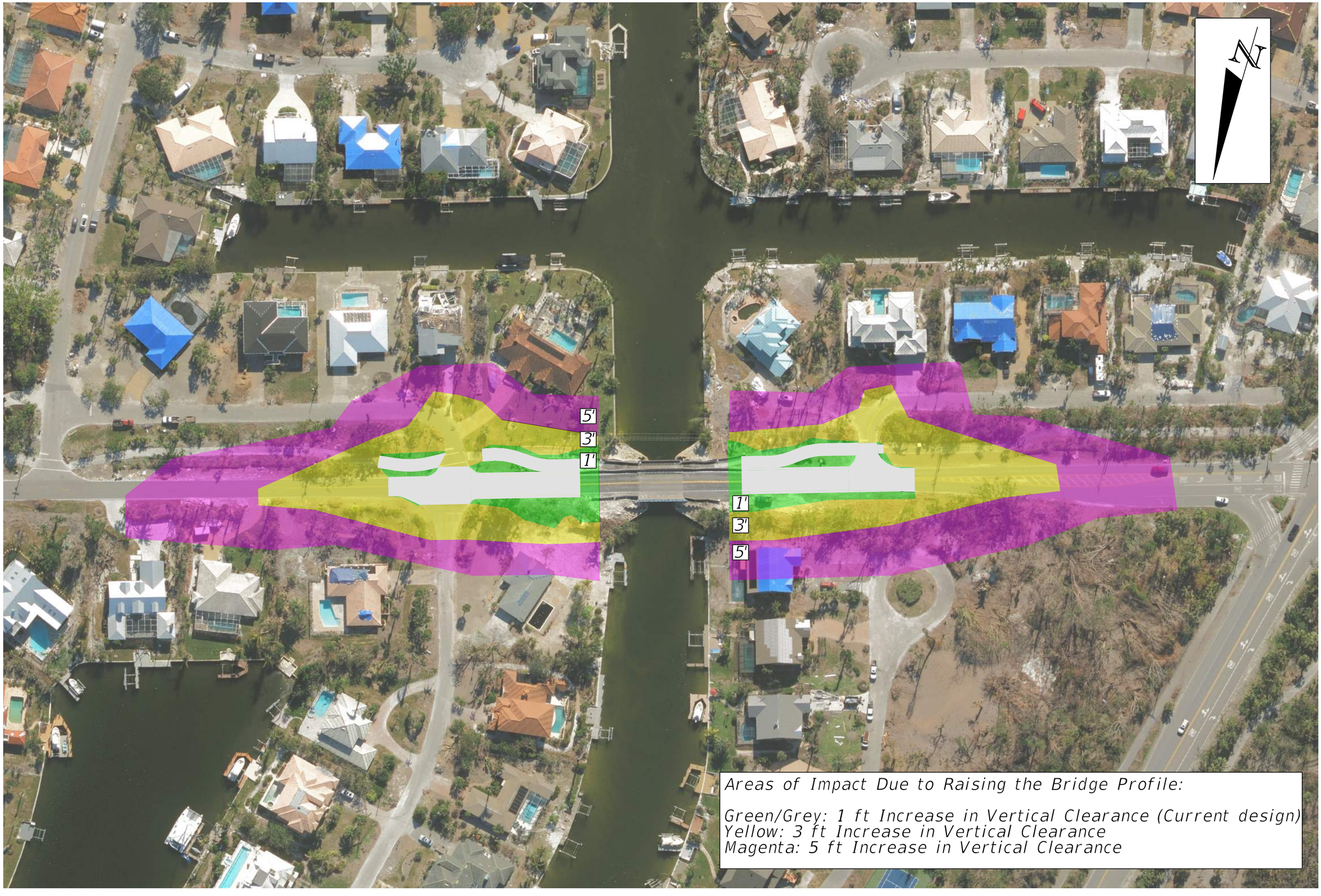
1. Major intersection reconstruction at Tulip Lane, Pen Shell Drive and Limpet Drive.
2. Residential right of way impacts.
3. Residential driveway reconstruction.
4. Increase in project length.

The following additional investigations will be required to fully analyze raising the bridge profile:

1. Survey
2. Geotech
3. Structure and roadway modeling
4. Stormwater design
5. Roadway and bridge 60% design plans
6. Utility relocation design modifications
7. Confirming validity of permits with permitting agencies

Appendix A

Plan and Cross Section of the Impacted Area

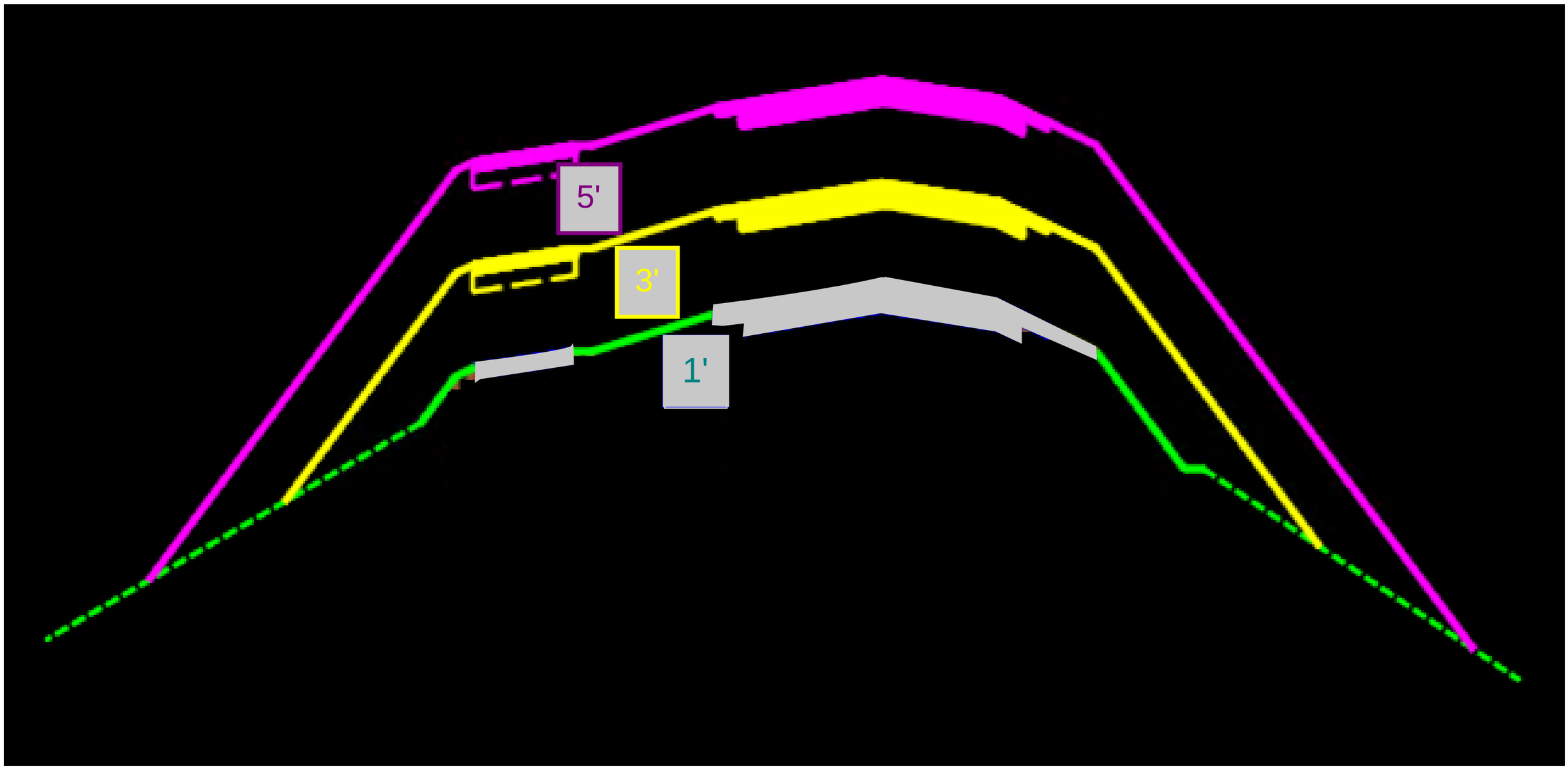


Areas of Impact Due to Raising the Bridge Profile:

Green/Grey: 1 ft Increase in Vertical Clearance (Current design)
Yellow: 3 ft Increase in Vertical Clearance
Magenta: 5 ft Increase in Vertical Clearance

ROADWAY TYPICAL SECTIONS

Grey/Green: 1 ft increase in vertical clearance (current design)
Yellow: 3 ft increase in vertical clearance
Magenta: 5 ft increase in vertical clearance



Appendix B

Copy of Email from Mr. Kevin McLellan

From:	Kevin McLellan <kbmclellan@gmail.com>
Sent:	Sunday, November 9, 2025 9:23 PM
To:	Dana A. Souza; Laura J. DeBruce; Mike.Miller@mysanibel.com; Fred.mittl; Farzin Zafaranian; Sanibel City Council; Scott Krawczuk
Cc:	Chris Peterson
Subject:	Additional comments and analysis on the East Periwinkle bridge project
Attachments:	East Periwinkle Bridge-elevation Engineering Executive Summary.docx; Untitled attachment 00107.htm; East Periwinkle Bridge-elevation Cost Executive Summary.docx; Untitled attachment 00110.htm

Dear Sanibel City Council members, City Manager, Public Works team, and TY Lin colleagues,

I am attaching the engineering analysis that I completed on the East Periwinkle bridge project. I had run this by Ahmad Kareh at Haley Ward but he was unable to do more than acknowledge that the general plan made sense. Given his own personal time constraints and workload se suggested we hire an expert witness from AIM engineering which we will endeavor to do this coming week. I know some of the council was looking forward to hearing from HW but we will proceed with AIM provided you view this as additional helpful input since we will have to pay out of pocket for this review.

Please find attached our analysis a summary of which is here:

- The roadway approaches on each side of the proposed new bridge could be raised 3.46' (total vertical navigational clearance) while maintaining a 2pct road grade on both sides, consistent with FDOT guidelines
- **There would be no / minimal impact to the adjacent intersections**
- **The approximate cost for doing so, ignoring any cost already associated with installing the planned bridge would be ~$800K (high end of the range)**. This would cover fill, paving and guard rails (if needed) for the approach roadways to the bridge

Therefore, we would re-emphasize that the city should reconsider the current plan and:

a) Keep the current bridge design as designed by TY Lin; the design appears to be sufficient other than the limited increase in vertical navigational clearance. We support all other aspects of the design (e.g., expanding the width of the navigational channel

b) Elevate the roadway approaches to achieve the 3.46' vertical navigational clearance under the proposed bridge, per the study attached.

c) Require the contractor to include the cost of the roadway approach as part of the bid for an $8M bridge project (negligible change and within the scope of already required roadway mods)

We will pursue hiring an expert witness to validate our analysis if needed (pls advise).

We would appreciate the opportunity to present our findings to the City Council, on behalf of the community. We have significant interest in this project and each week, we are receiving new emails from residents who support our position.

Regards,
Kevin McLellan
698 Anchor Dr
617-510-3497

East Periwinkle Bridge Roadway Approach Grade Executive Summary

To achieve an additional +3 feet of navigational clearance beneath the East Periwinkle Bridge, the approach roadway from the center of Pen Shell Drive (nearest intersection) to the canal edge (bridge abutment) should rise +3.0 feet over 173 feet, corresponding to a 1.73% roadway grade.

With the roadway approach limited to 2.00% grade over the same 173 ft run, the maximum achievable navigational clearance is approximately +3.46 feet.

Objective:

Estimate the roadway grade required to achieve an additional 3 feet of navigational clearance beneath the East Periwinkle Bridge, without altering the bridge superstructure. The goal is to raise the entire bridge (both abutments and deck) uniformly by +3 feet by adjusting the roadway approaches.

1. Key Reference Points

- Bridge length: approximately 180 feet (center-to-center of abutments).
- Measurement point: center of Pen Shell Drive to edge of the canal (bridge abutment).
- Measured distance: approximately 173 feet (horizontal run).

2. Design Intent

- Maintain existing bridge geometry and superstructure.
- Raise the bridge elevation at both abutments by +3.0 feet to gain +3.0 feet of navigational clearance under the bridge.
- Adjust only the roadway approach from Pen Shell Drive to the canal edge.

3. Calculations

Formula: Grade (%) = (Rise / Run) × 100

Grade = (3 ft / 173 ft) × 100 = 1.73%

Result:

- Required roadway approach slope = 1.73%
- Equivalent angle ≈ 0.99°
- Total elevation change from Pen Shell center to canal edge = +3.00 feet

Incremental rise along roadway:

Distance from Pen Shell (ft)	Elevation increase (ft)
50	+0.87
100	+1.73
150	+2.60
173	+3.00

4. Interpretation

A 1.73% longitudinal grade is modest and within FDOT and AASHTO roadway design standards for low-speed approaches. This approach achieves the desired +3 ft navigational clearance increase entirely through roadway adjustment. No modifications to bridge span, structure, or deck profile are required.

5. Maximum Clearance with 2% Roadway Grade

Using the same 173 ft approach distance and limiting the roadway to a 2.00% grade (0.02 ft/ft):

Rise = Run × Grade = 173 ft × 0.02 = 3.46 ft

Result:

- Elevation increase at abutment = +3.46 ft
- Equivalent angle ≈ 1.15°
- Maximum navigational clearance gain achievable with a 2% approach over this run = ~+3.46 ft (assuming the bridge is uniformly lifted at both abutments)

Incremental rise along roadway (2% grade):

Distance from Pen Shell (ft)	Elevation increase (ft)
50	+1.00
100	+2.00
150	+3.00
173	+3.46

East Periwinkle Bridge – Roadway Approach Cost Calculation Executive Summary

Purpose: Provide a clear summary of the planning-level cost calculation methodology for raising both roadway approaches to achieve an equal-rise of +3.46 ft at the East Periwinkle Bridge abutments, and to summarize the expected range of construction costs.

- Minimal (Raise + Mill/Overlay): Estimated at $100,000–$150,000 per approach, depending on site drainage and tie-in conditions.
- Full Reconstruction (New Base, Curb, Drainage, Sidewalks): Estimated at $250,000–$400,000 per approach, depending on utility adjustments and MOT requirements.
- Total (Both Approaches): Rough planning range $200,000–$800,000.

These ranges reflect 2025 planning-level unit costs and assume typical 30-ft roadway width with modest drainage and MOT needs. Final design and bid pricing will refine these estimates.

1. Overview

The cost estimates were developed to evaluate the roadway modifications needed to uniformly lift the bridge structure by +3.46 ft, increasing navigational clearance beneath the bridge. Both approaches (Pen Shell – east, and Tulip – west) are raised equally so that the bridge deck remains level and geometry consistent.

Approach	Run (ft)	Rise (ft)	Grade (%)
East (Pen Shell)	173	3.46	2.00
West (Tulip)	187	3.46	1.85

2. Calculation Methodology

a) Geometry & Fill Volume

To determine the volume of embankment fill required to achieve the rise:

Formula: V = (Run × Width × (Rise/2)) / 27 × 1.2

Where:

- Run = length of approach (ft)
- Width = roadway width = 30 ft (placeholder)
- Rise/2 = average fill depth for a linear ramp
- 1.2 = 20% swell/compaction adjustment

This gives the fill volume (CY) for each approach.

b) Pavement Surface Area

Formula: A = (Run × Width) / 9

This gives the surface area (SY) used for milling and resurfacing cost calculations.

3. Cost Structure

Each approach includes two construction scenarios:

1. Minimal (Raise + Mill/Overlay)

- Embankment fill (CY)
- Milling existing surface (SY)
- Asphalt surface (1.5 in) (SY)
- Drainage/structure adjustments (LS = $20,000)
- Driveway tie-ins, striping, signage (LS = $10,000)
- Erosion control & sod (LS = $8,000)

2. Full Reconstruction

- Embankment fill (CY)
- Full-depth asphalt + base (SY)
- Curb & gutter (LF = 300 @ $35/LF)
- Sidewalk 5" concrete (SF = 1,000 @ $12/SF)
- Guardrail/rail transitions (LF = 100 @ $160/LF)
- Major drainage upgrades (LS = $60,000)
- Utility adjustments/relocations (LS = $30,000)
- Erosion control & sod (LS = $12,000)

4. Indirect Costs & Allowances

Category	Minimal	Full Reconstruction
Maintenance of Traffic (MOT) & Mobilization	20%	20%
Contingency	20%	25%
Engineering, Survey & Permitting	20%	22%

5. Summary of Cost Derivation

Example: East Approach (173 ft @ 2.00% grade)

- Compute fill and pavement areas from geometry.
- Apply unit costs to embankment, milling, and asphalt.
- Add lump sum drainage, signage, and erosion items.
- Add MOT, contingency, and engineering markups sequentially.

This yields:
- Minimal scenario: ~Low six-figure cost range per approach.
- Full reconstruction: ~Mid-to-upper six-figure range depending on drainage complexity.

6. Workbook Structure

- East 173ft Rise3.46 – Minimal / Full: itemized direct cost calculations.
- West 187ft Rise3.46 – Minimal / Full: matching format for the west approach.
- Summary (Equal Rise): compares both sides by geometry, rise, grade, and total cost.
- Project Totals: rolls up both approaches for Minimal and Full scenarios.

7. Notes for Engineering Review

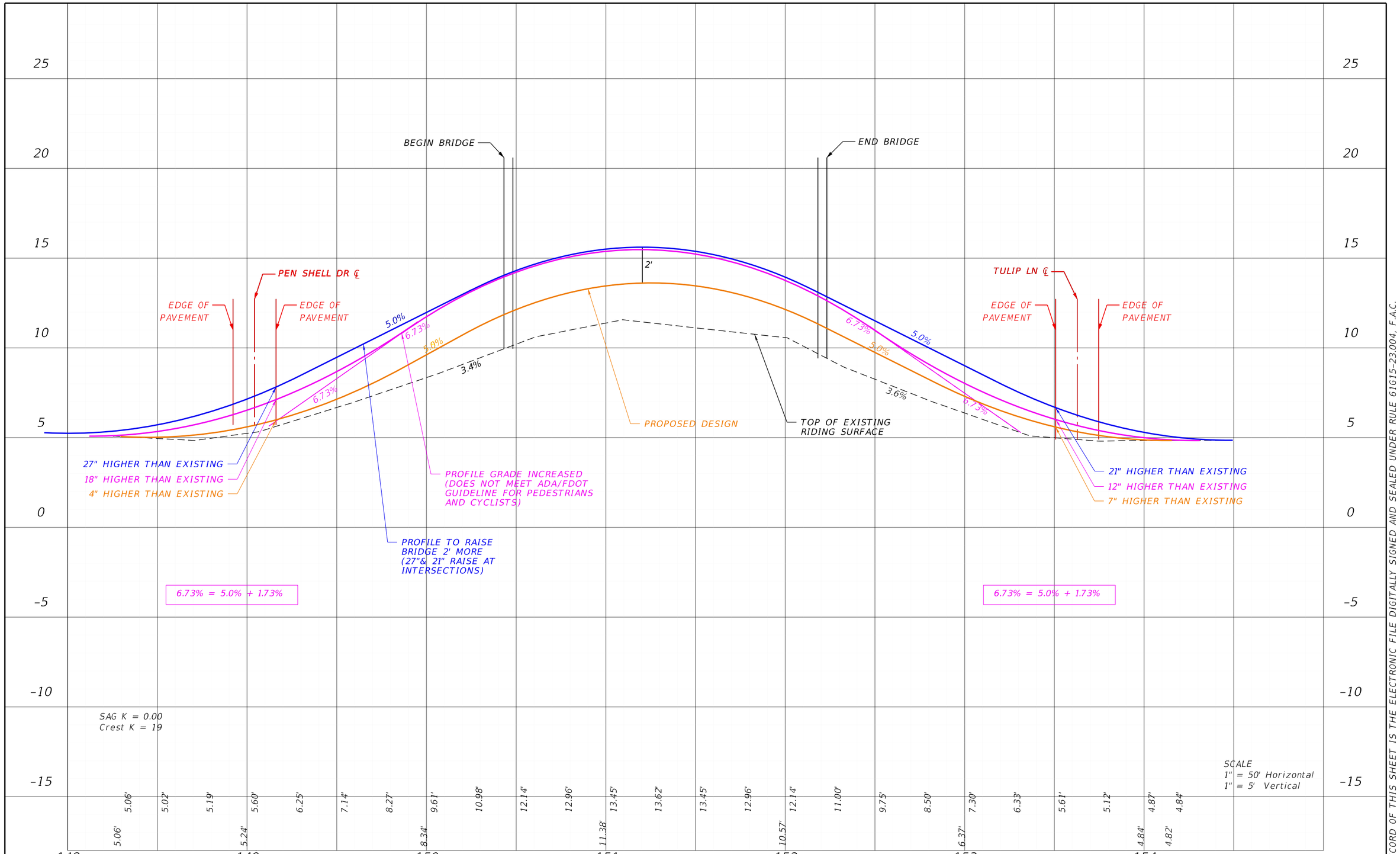
- Width and unit prices are placeholders for planning-level evaluation.
- Field survey and final profiles will refine volumes and confirm drainage needs.
- Indirect percentages can be adjusted based on procurement and phasing.
- Retaining structures or sea wall interfaces, if required, should be priced separately.

Summary Statement

Raising both approaches equally by +3.46 ft results in approach grades of 2.00% (east) and 1.85% (west). The provided cost model estimates the full and minimal construction scenarios for each side, with line-item breakdowns and total project roll-up suitable for early-stage design and funding discussions.

Appendix C

Roadway Profile



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

MICHAEL R. HARTER, P.E.
LICENSE NUMBER: 81665
BRINDLEY PIETERS & ASSOCIATES, INC.
2600 MAITLAND CENTER PKWY, STE. 180
MAITLAND, FL 32751

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
PERIWINKLE	LEE	452819-1-34-01

ROADWAY PROFILE

SHEET NO. 7

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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jhill 11/19/2025 6:48:42 PM

Appendix D

Engineer's Opinion of Probable Construction Cost

Periwinkle Bridge Replacement
Cost Comparison

Scenario 1: Current Design - Raise Bridge 1 Foot Above Existing

Construction Cost Including MOT, MOB, CEI Services		$8,000,000
Design Services		$750,000
	Total cost	**$8,750,000**

Scenario 2: Raise Bridge 3 Feet Above Existing

	Additional Quantities and Cost Beyond Scenario 1			
	Quantity	**Unit**	**Unit Price**	**Total**
Concrete Sheet Pile	210	SF	$115	$24,150
Retaining Wall	410	CY	$1,000	$410,000
Pile 18"	36	LF	$190	$6,840
Pile 24"	36	LF	$250	$9,000
Drainage Structure Inlet	14	EA	$15,000	$210,000
Concrete Barrier Wall with Junction Slab	1,400	LF	$415	$581,000
Additional Asphalt	290	TN	$210	$60,900
Base	1,800	SY	$40	$72,000
Backfill	3,000	CY	$8.0	$24,000
Private Property Restoration	1	LS	$100,000	$100,000
Subtotal				**$1,498,000**
Construction Contingency	1	LS	30%	$449,000
Subtotal				**$1,947,000**
Design Revisions (Roadway, Stormwater, Utility Relocation, Bridge Structure, Survey, Geotech)	1	LS	$520,000	$520,000
Easements/ROW acquisition	1	LS	$100,000	$100,000
Additional CEI	1	LS	$250,000	$250,000
Inflation Due to Project Delay	1	LS	8%	$750,000
Additional MOT	1	LS	15%	$292,000
Additional Mobilization	1	LS	10%	$195,000
			Total Additional Cost	**$4,054,000**
			Total Cost for Scenario 2: Raise Bridge 3 Feet Above Existing	**$12,804,000**