



MIDTOWN GREENWAY

APPENDIX B

Mississippi River Bridge Options Report

Midtown Greenway Trail Expansion Study

Mississippi River Bridge Options Report



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Appendix A Cost Estimate Calculations

Executive Summary

The objective of this report is to estimate structure-related costs associated with three options for extending the Midtown Greenway over the Mississippi River. This would allow for the extension of the Midtown Greenway east into St. Paul from its current eastern terminus at West River Parkway in Minneapolis. Three structural options for the Mississippi River crossing have been evaluated in this report. These include:

1. Shared rail plus trail usage of the existing Short Line Bridge, currently a rail-only structure owned and maintained by Canadian Pacific Kansas City Railway (CPKC).
2. Constructing a new trail-only bridge adjacent to the Short Line Bridge, which would remain a rail-only structure. Six new bridge concepts are included for this option.
3. Constructing a new truss superstructure for freight rail and trail usage supported by the existing piers of the Short Line Bridge.

Converting the Short Line Bridge into a trail-only structure was not considered due to ongoing active rail service to multiple industries in the Hiawatha corridor of south Minneapolis.

Estimated costs for each bridge option are shown in Table 1 below. Rehabilitation and painting costs accompanying trail addition to the Short Line Bridge are the primary components of total estimated cost for Bridge Option 1, while the structural additions to host the trail are secondary in magnitude. The cost shown for Bridge Option 1 assumes 30 truss pins would be replaced and whole-bridge painting would be required. For reference, the City of Minneapolis has spent approximately \$30M for repairs and rehabilitation of the City-owned Bridge 9 crossing of the Mississippi River, which is a former railroad bridge that has been converted to pedestrian use. The costs shown for the Bridge Option 2, new trail-only bridge, encompass different bridge types ranging from simple girder concepts to long-span arch concepts. These costs include 25% contingency and 10% mobilization. These costs do not include ongoing inspection and maintenance costs after construction is completed.

Table 1: Midtown Greenway Mississippi River bridge options capital cost comparison

Bridge Option	Cost Estimate (2026 dollars)
Bridge Option 1: Shared rail plus trail on Short Line Bridge	\$30,000,000
Bridge Option 2:	
Concepts A and B (steel plate girder)	\$30,000,000
Concepts A and B (steel or concrete box girder)	\$34,000,000
Concept C (delta girder)	\$36,000,000
Concepts D and E (traditional and contemporary deck arch)	\$42,000,000
Concept F (long-span deck arch)	\$61,000,000
Bridge Option 3: Shared rail plus trail on new superstructure on existing piers	\$55,000,000

Existing Conditions

The existing Short Line Bridge over the Mississippi River has a total length of approximately 1,077 feet and includes seven spans, as shown in Figure 1. The main river crossing spans (Spans 2, 3 & 4) are pin-connected Baltimore Trusses, with a schematic typical section shown in Figure 2. The approach spans (Spans 1, 5, 6 & 7) are through-plate girder spans, with a typical section shown in Figure 3. The bridge deck is comprised of timber ties and track on the north side of the bridge only, although it was originally constructed to support two tracks.

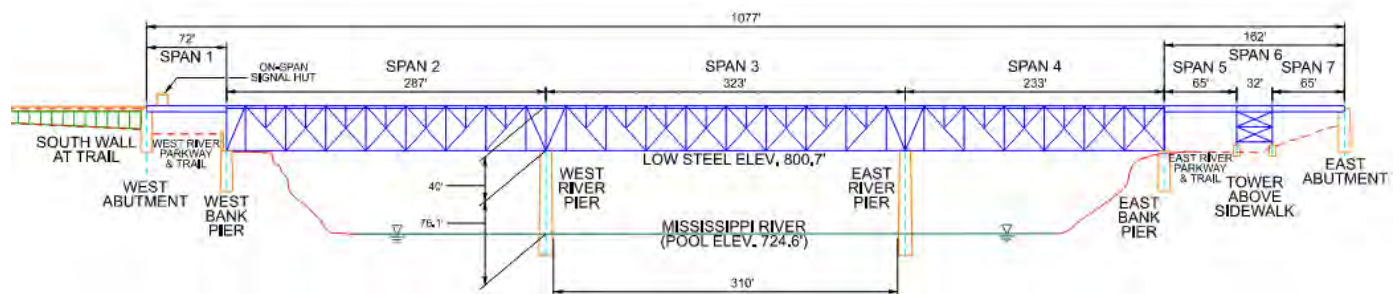


Figure 1: Short Line Bridge elevation

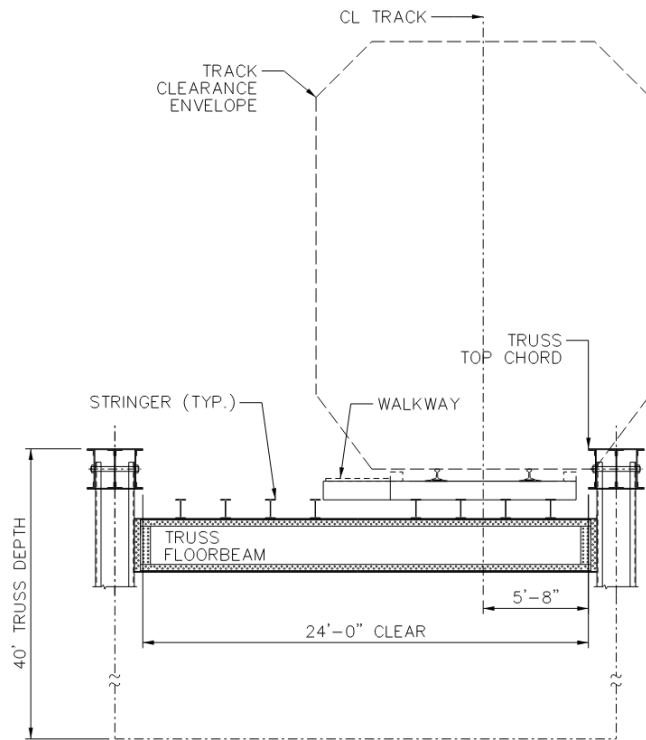


Figure 2: Truss typical section

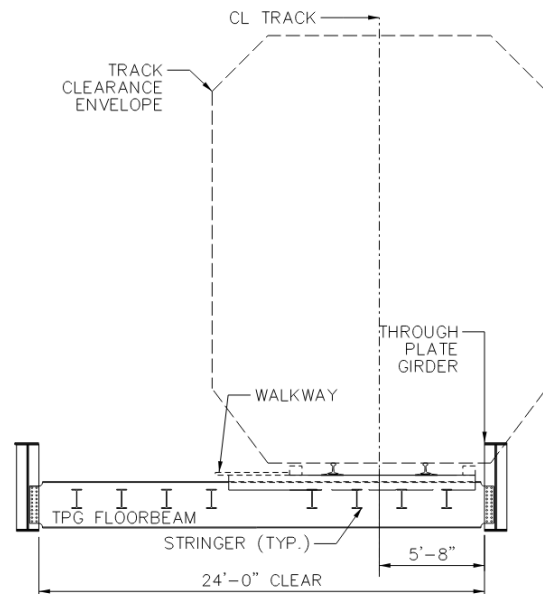


Figure 3: Through plate girder typical section

The existing Short Line Bridge, built in 1902 for the Chicago, Milwaukee, St. Paul and Pacific Railroad, known as the Milwaukee Road, replaced a previously constructed railroad bridge (built in 1880), to accommodate greater load demands then emerging. The Short Line Bridge is owned and maintained by successor railroad CPKC, and services approximately two trains per day on average. Approach Span 1 crosses over West River Parkway with immediately adjacent bicycle and pedestrian trails. Approach Span 5 crosses over East River Parkway, also with immediately adjacent bicycle and pedestrian trails. The truss spans are located over the Mississippi River.

At this time, available information describing the existing structure is limited. CPKC has not made available existing bridge plans and prior structure inspection reports and as a matter of corporate practice does not allow bridge inspections by outside agencies or third parties unless required by law. The information used in this report includes past reports developed to address potential Midtown Greenway expansion, U.S. Army Corps of Engineers site information, photos and limited site measurements.

Bridge Option 1: Rail and Trail on Existing Bridge

This option utilizes the existing Short Line Bridge, and locates a trail structure adjacent to the active track, occupying the unutilized south track bay. While many configurations are possible, a configuration that satisfies several key metrics is described. The typical sections shown in Figures 4 and 5 illustrate a viable design concept that would be simple, repetitive, buildable and removable in segments if needed for underlying bridge maintenance.

Converting the bridge to trail-only usage was not considered due to ongoing freight rail service to multiple industries located in the Hiawatha corridor of south Minneapolis, such as the ADM Atkinson Mill and General Mills Elevator T. There are no plans for business dissolution or discontinuation of regular freight rail service along this industrial spur and thus it is assumed that current rail activity will continue for the foreseeable future.

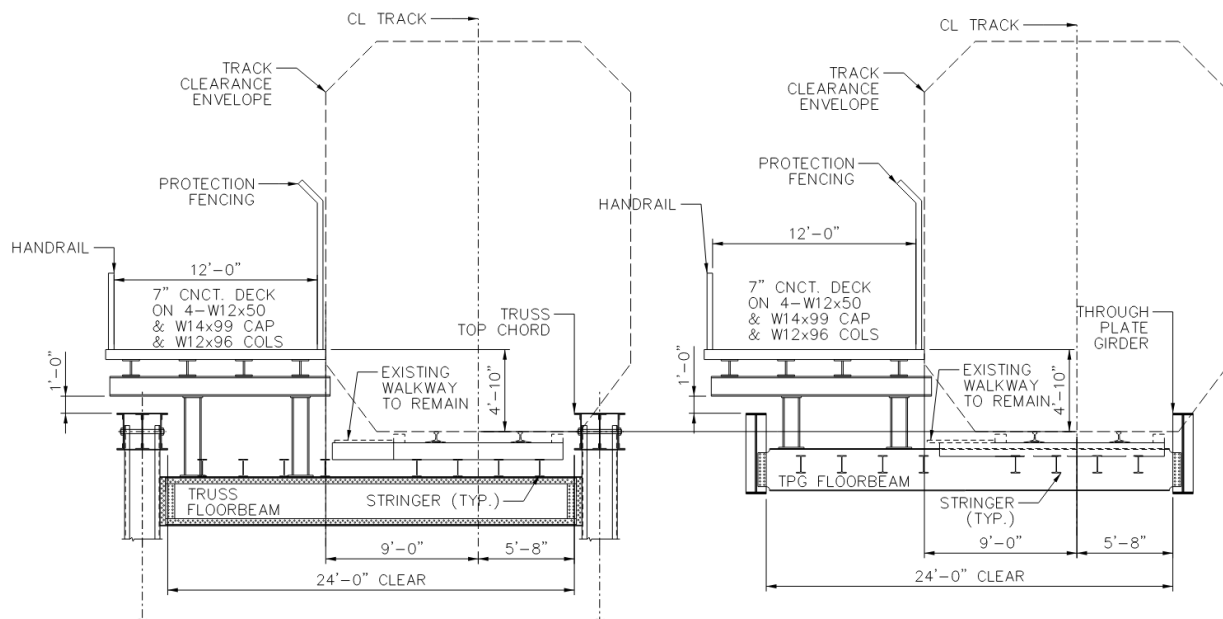


Figure 4: Trail structure on truss spans **Figure 5: Trail structure on through plate girder spans**

The Bridge Option 1 trail structure is composed of a deck span (steel beams with concrete deck) and is supported by structural steel pedestal substructure units installed onto existing floorbeams. Each trail structure span is approximately 18 feet in length, spanning from existing floorbeam to existing floorbeam, placing simple spans in series from end-to-end of the existing Short Line Bridge.

The proposed trail width of 12 feet is obtained by raising the trail deck above the existing structure top chord (or through-plate-girder top flange in the approach spans) to allow cantilevering over the top chord, as shown above in Figures 4 and 5. Sufficient space is provided around the top chord to allow routine visual inspection. In the event the top chord needs unhindered access for maintenance purposes, the trail span(s) and accompanying support

pedestal(s) can be lifted out and set down onto adjacent span trail structure. This could be accomplished using a high-rail crane or using a pneumatic tire crane on adjacent trail.

Since the on-bridge added trail structure is elevated relative to track elevation, there would need to be a trail surface elevation transition region accounted for in the designed bridge approaches. This could be accomplished using retaining walls and/or a continuation of the trail structure. For the purposes of this report, it is assumed that the trail structure would be extended 100 feet beyond the limits of the bridge to accommodate an Americans with Disabilities Act (ADA) compliant slope while providing intermediate level landings.

With the assumed 12-foot trail structure width and deck composition (steel beams with concrete deck), the trail structure would accommodate emergency vehicle access and loading.

A comprehensive manual inspection and on-site investigation of the existing Short Line Bridge would be required to further develop any solutions that include a bicycle and pedestrian trail on the bridge. While the loading imposed by the trail structure is less than the loading that would occur with resumption of two-track rail service, the condition of the bridge is largely unknown. To accurately assess the feasibility of adding a trail to the existing structure, a comprehensive load rating assessment of the existing bridge would be required. The term “load rating” signifies assessing the allowable load carrying capacity of the structure relative to imposed loading.

For the truss spans (Spans 2, 3 & 4), the rating exercise would involve modeling the structure and loading in finite element analysis software to determine the demands introduced to individual truss members. For the approach spans, if significant section loss is observed on the Span 6 tower (adjacent to East River Parkway supporting a through-plate girder approach span), then finite element modeling of the tower would be warranted to assess tower member internal forces. Finally, the through-plate girder approach span superstructures (Spans 1, 5, 6 & 7) can be assessed using spreadsheets instead of finite element modeling due to their relative simplicity. Then, with the demands known, the capacity would be determined for individual members taking their material, geometry and observed section loss conditions into account. With this developed understanding of the demand and capacity conditions present throughout the structure, any members that are overstressed relative to allowable demands would be identified. Once deficiencies are identified, solutions to restore capacity would be evaluated.

Given the age and apparent condition of the structure, it is anticipated that rehabilitation in one or more of the following areas would be required:

- Damage mitigation – rehabilitating or replacing damaged members
- Section loss mitigation - rehabilitating or replacing degraded/rusted members
- Truss pin removal and replacement
- Surface assessment, preparation and painting to prevent further damage from rust and corrosion
- Substructure masonry or concrete rehabilitation (tucking, facing, strengthening)

A comprehensive rehabilitation strategy would be required for Bridge Option 1. The existing design drawings, as-built plans, or shop drawings would need to be acquired to be able to load rate the structure. Every member and connection would be load rated, including gusset plates and rivets. Material testing would be recommended with this option to verify material grades and any location that exhibits signs of corrosion or section loss would need to be measured to confirm the existing member thickness. These trusses are pin connected, which means there is not a redundant load path if a pin were to fail. Due to the age of the structure and the risk associated with pinned connections, a thorough investigation of the pins would also be required. This would include a hands-on inspection and non-destructive testing (NDT) to inspect the pins for internal flaws not visible during a routine inspection. The results from the load rating would determine the location and extent of rehabilitation required for adding a trail to the existing structure. If the rehabilitation requires adding structural members, the substructure would also require an evaluation to ensure the increase in dead load doesn't impact the substructures.

If bridge plans are not available, the information needed for the load rating would have to be taken from field measurements. This would require every member and connection on the bridge to be measured and documented by hand and then translated into working drawings for analysis and rehabilitation.

Estimating the cost of adding the trail structure includes several components considered individually, as itemized in Figure 6 and discussed below.

Bridge Option 1: Rail and Trail on Short Line Bridge	
	Estimated Cost
Added trail structure including approach ramps	\$4,100,000
Structural rehabilitation of existing bridge (exclusive of pin replacement)	\$1,100,000
Pin replacement (assuming 30 pins)	\$6,900,000
Surface preparation and painting	\$18,100,000
Total estimated cost	\$30,000,000

Figure 6: Bridge Option 1 (Rail + Trail) estimated cost

Similar to the cost estimates for other options, the estimated installed cost of the added trail structure is based on unit costs for mobilization (10%) and materials, using the sum of estimated quantities of steel and concrete needed to complete the work, and a 25% contingency. See Appendix A for details.

In the categories of damage and section loss mitigation (i.e., structure rehabilitation exclusive of pin replacement), it is difficult to assign a confident estimate to the likely costs in the absence of a detailed inspection and subsequent rating of the structure. Section loss is assumed to be widespread based on the age of the structure and photos available. Typical repairs for a truss bridge of this age include replacement of stringers and repair of the connections between the stringers and floorbeam, and between the floorbeams and chords. Damaged items (such as

partially or wholly fractured members) should be immediately repaired or replaced. Conducting a rating accounting for current bridge conditions would reveal if and where damage or section loss are compromising the structure's performance. Pending the ability to address this component of cost in an informed manner, the cost is estimated in a blanket manner by applying an estimated unit cost on the basis of bridge square footage.

Figure 7 illustrates the types and quantities of pins present on the Short Line Bridge truss spans. As indicated, there are 168 pins in the body of the trusses and 12 bearing pins. The number of pins that may need to be replaced is unknown prior to investigation. Referring to a similar past project addressing rehabilitation of a pin-connected Baltimore truss owned by Norfolk Southern, it has been assumed that a similar proportion of pins will need to be replaced. That is, for cost estimating purposes it is assumed that 18% of the body-pins will need to be replaced on the Short Line Bridge to match the proportion required for the reference project, where 18% corresponds to 30 of the 168 body-pins on the Short Line Bridge. Further, on the Norfolk Southern bridge, there were three tiers or types of pin replacements envisioned, with varying ancillary operations (pin replaced with no added repairs / reboring required / surrounding structural steel repairs required).

In the Short Line Bridge pin replacement estimate, the Norfolk Southern bridge proportioning of repair types was also adopted pending investigation, to arrive at an average per-pin replacement cost. Finally, and importantly, accompanying this number of pin replacements is an estimate of 8 months of full bridge closure to accomplish the work in an uninterrupted manner. Pin replacement would likely need to be phased with multiple shorter-duration outages to accommodate freight rail usage requirements. This too is an extrapolation of the planned long-duration outage envisioned for the Norfolk Southern bridge. It is noted that the reference Norfolk Southern bridge rehabilitation project did not reach the construction phase. Rather, Norfolk Southern opted to replace the bridge rather than implement repairs due to the excessive amount of time the bridge would need to be closed to rail traffic to implement the repairs.

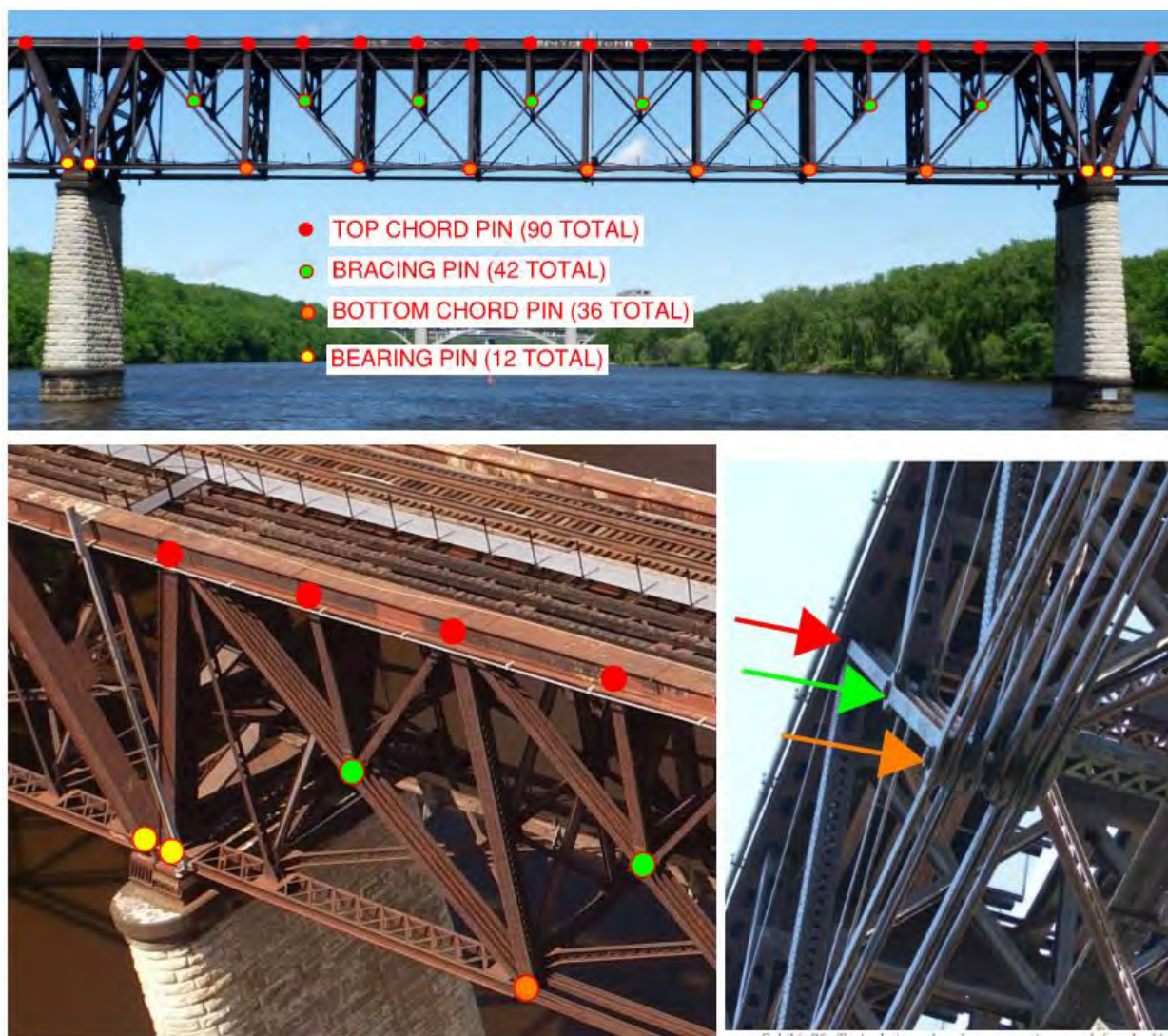


Figure 7: Connecting pins on Short Line Bridge

The painting cost estimate assumes the entire bridge would be painted, which is typically performed as part of major truss bridge rehabilitation projects. For very old bridges like the Short Line Bridge, painting the structures as part of rehabilitation is especially important to prevent further deterioration of bridge conditions due to ongoing rust and corrosion. The supplied estimate references past projects to arrive at separate unit costs for painting the truss spans versus painting the through plate girder approach spans, then combines these subtotals for a total estimate.

It is noted that the nearby repurposing of Bridge 9 over the Mississippi River (rail truss bridge) to exclusive trail use has had rehabilitation costs of approximately \$30,000,000 as noted by the City of Minneapolis, not including the initial conversion to trail usage. Bridge 9 is shown in Figure 8 below.



Figure 8: Bridge 9 steel deck truss over the Mississippi

Bridge Option 2: New Trail-only Bridge

Bridge Option 2 consists of a new bridge for the Midtown Greenway over the Mississippi River, downstream of the existing Short Line Bridge, with a separation distance range of 50 feet to 95 feet between structures. The new bridge would be for exclusive use by people walking, running, cycling, or rolling, along with snow removal and emergency vehicles as needed. There are multiple feasible structure types for spanning the Mississippi River at this location.

Each new bridge concept presented below follows these parameters:

- Constant 20-foot out-to-out deck width and 1,077 foot structure length to match the Short Line Bridge total length. The structure could widen at several overlook locations to include pause points for pedestrian and cyclist users. Additional deck area for overlooks is not included, however, in the rough order of magnitude cost estimates presented below for each concept. Each concept would have a total deck area of 21,540 square feet.
- No above-deck structural elements. Above-deck structural elements would likely increase the risk of collisions with birds as the Mississippi River is a migratory corridor for over 300 species of birds. Nonstructural elements such as railings and lighting would extend above the deck for each concept.
- Piers aligned with the existing Short Line Bridge piers. The Mississippi River has a navigation channel defined by the US Coast Guard at this location. Aligning piers of a new parallel crossing with those of the existing Short Line Bridge would ensure required navigation channel horizontal clearance limits are satisfied for Span 3 between the West River Pier and East River Pier, as shown previously in Figure 1. Aligning the piers should

also mitigate the need to investigate a change in flood elevation, avoiding a Letter Of Map Revision (LOMR).

- Structural elements within the vertical limits of the existing Short Line Bridge above the existing navigation channel in Span 3. Placing all structural elements within the vertical limits of the existing Short Line Bridge deck truss in Span 3 would ensure the existing navigation channel vertical clearance limits are satisfied. Aligning the new structure within the vertical limits of the existing bridge would also reduce the likelihood of additional migratory bird strike collisions. Concept F is a single-span deck arch crossing of the Mississippi and includes structural elements below the bottom elevation of the Short Line Bridge trusses in Span 2 and Span 4. The structural elements of all other concepts remain within the vertical limits of the Short Line Bridge in Spans 2 and 4.
- The superstructure of each option could utilize either steel or concrete construction except as noted below.
- The total structure length of 1,077 feet assumes a high-level crossing with a top of deck elevation approximately equal to that of the Short Line Bridge and with abutments located adjacent to the existing Short Line Bridge abutments. These cost estimates do not include any retaining wall construction or other approach work that may be needed to tie the bridge into the existing and proposed Midtown Greenway at either end of the Mississippi River crossing at the existing railroad corridor embankments. These costs are accounted for in the overall corridor estimates in the Final Study Report.

Concept A: Constant-depth girder

This concept would span the Mississippi with three main spans of 287'-323'-233', aligned with the main spans of the Short Line Bridge, plus a 72' west approach span across West River Parkway, and two 81' east approach spans to the existing east railroad embankment. Steel plate girders would likely be the low-cost option for this concept. Steel or concrete box girders could also be utilized for this concept and would provide closed forms and reduced visible bracing in comparison to steel plate girders. Example steel plate and box girder pedestrian bridges are shown in Figures 9 and 10 below. Box girder structures are estimated to have a 15% cost premium above a steel plate girder superstructure. Construction would require several temporary towers located in the Mississippi River in addition to new piers in the river at permanent support locations. Figure 11 below shows an elevation view of Concept A, and Figure 12 shows a typical cross-section of the plate girder superstructure.



Figure 9: Steel plate girder pedestrian bridge. (Photo from Southern Steel Engineers).



Figure 10: Steel box girder pedestrian bridge. (Photo from KI Studios).

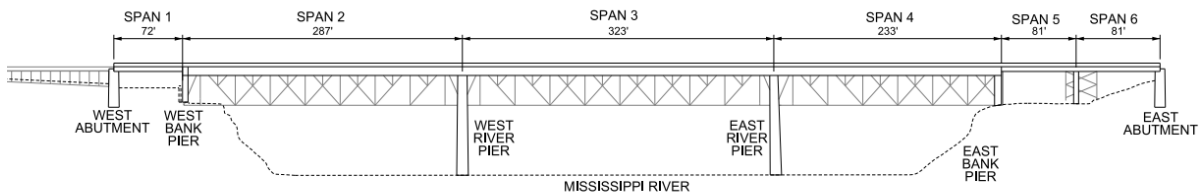


Figure 11: Concept A constant-depth girder elevation view

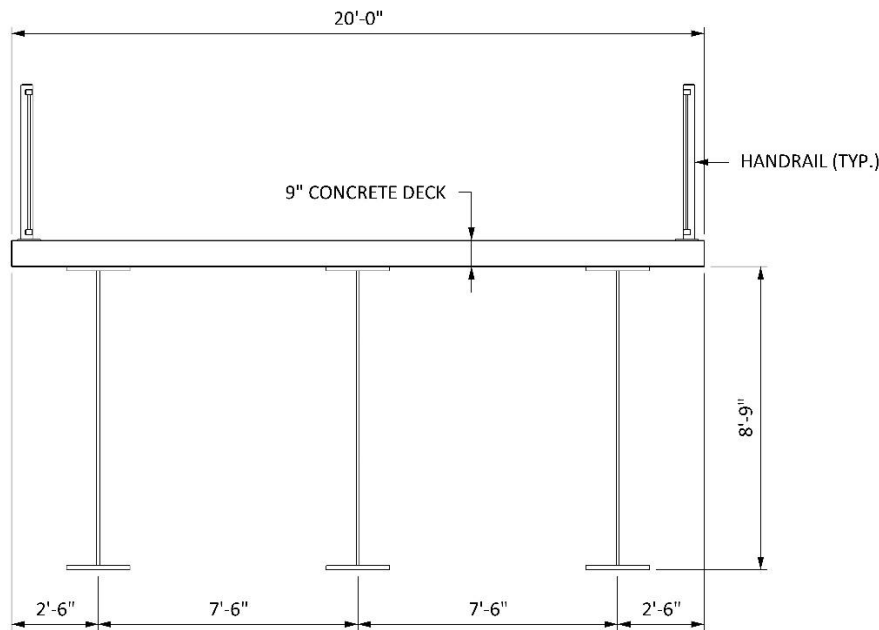


Figure 12: Concept A steel plate girder cross-section. The proposed deck width is the same for each new trail-only bridge concept.

Concept B: Variable-depth girder

This concept would utilize variable-depth girders for the main river crossing spans. It would otherwise have span lengths identical to those of Concept A. This concept may have a moderate cost premium above a constant-depth steel plate girder structure. The variable-depth girders used in this concept could be steel plate girders, steel box girders, or concrete box girders. Variable-depth steel box girders would have a cost premium over variable-depth steel plate girders. Construction complexity would be similar to Concept A, unless a concrete box girder structure is selected, in which case temporary supports would be required to support the girder casting on the steeply sloped riverbanks. The remainder of the concrete box girder could be constructed in balanced cantilever extending from the river piers without the need for temporary towers. A variable-depth steel box girder structure would require temporary towers in the river but would not require extensive temporary supports on the riverbanks and therefore may be easier to construct at this site. The pedestrian bridge in Alicante, Spain shown in Figure 13, utilizes variable-depth concrete box girders. Figure 14 below shows an elevation view of Concept B.



Figure 13: Pedestrian bridge in Alicante, Spain, showing variable-depth concrete box girders

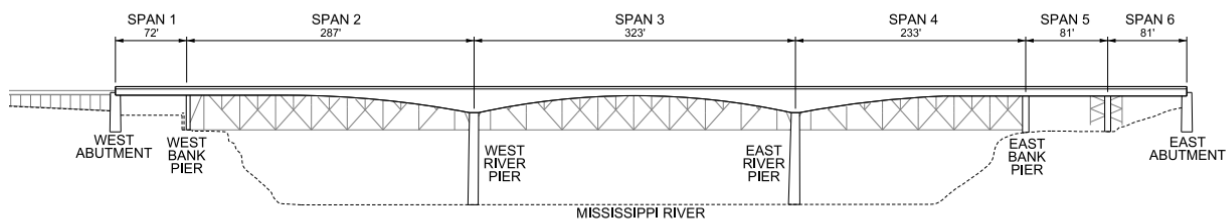


Figure 14: Concept B variable-depth girder elevation view

Concept C: Girder bridge with delta elements

This concept would utilize V-shaped, or “delta” superstructure elements at the west and east river piers on either end of Span 3, to reference the adjacent diagonals of the Short Line Bridge. It would have span lengths identical to those of Concept A and would utilize either plate girders

or box girders. It would likely have a moderate cost premium above a constant or variable-depth girder structure. Construction complexity would be higher than Concepts A or B, requiring additional temporary support of the V-shaped structural elements adjacent to the permanent river piers during girder erection. Figure 15 below shows an elevation view of Concept C.

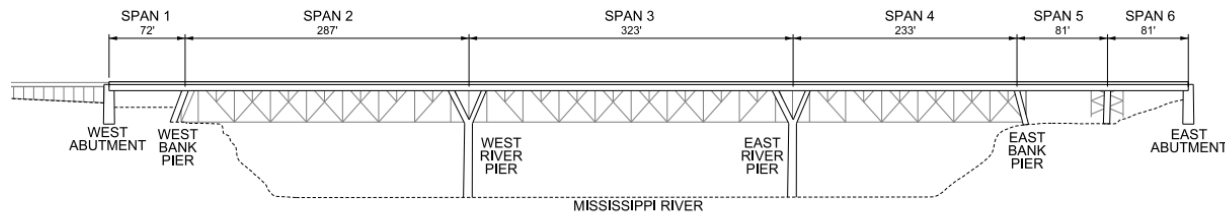


Figure 15: Concept C delta frame elevation view

Concept D: Traditional deck arch

This concept would utilize deck arch spans for the three spans over the river and would have span lengths identical to those of Concept A. This concept would have vertical spandrel columns. The Williams Crossing pedestrian bridge in Tulsa, Oklahoma, which utilizes deck arch spans with spandrel columns, is shown in Figure 16. Either steel or concrete deck arches could be utilized for this concept. This option would have a significant cost premium above constant or variable-depth girder structures. Construction complexity would be greater than for Concepts A – C, as additional temporary towers or falsework would be required to erect the arches over the river. Construction of a concrete arch at this site may be more difficult than a steel arch, since traditional concrete arch bridges are built on temporary supports that extend the full length of the bridge. This type of temporary support can create hydraulic issues in the river and may be more difficult for permitting and environmental approval. Figure 17 below shows an elevation view of Concept D.



Figure 16: Williams Crossing pedestrian bridge, Tulsa Oklahoma (Photo by The Architect's Newspaper)

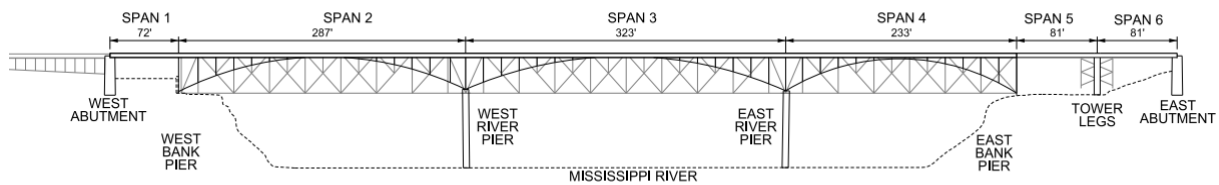


Figure 17: Concept D traditional deck arch elevation view

Concept E: Contemporary deck arch

This concept would utilize deck arch spans for the three spans over the river and would have span lengths identical to those of Concept A. This concept would have significantly fewer spandrel columns than the traditional deck arch option. Figure 18 shows a visualization of a contemporary deck arch pedestrian bridge (with uncoated weathering steel) for another conceptual design study. Either steel or concrete deck arches could be utilized for this concept. This concept would have a significant cost premium above constant or variable-depth girder structures. Construction complexity would be similar to Concept D. Figure 19 below shows an elevation view of Concept E.



Figure 18: Contemporary deck arch visualization with curved rib

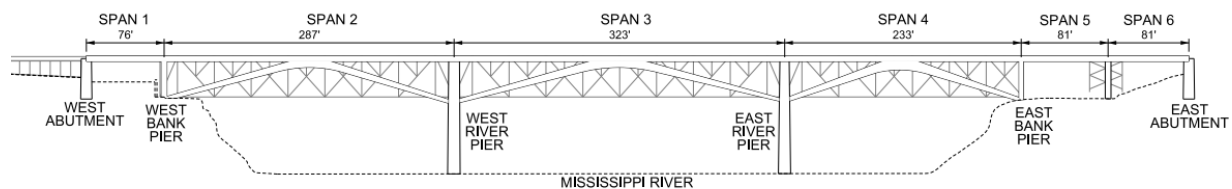


Figure 19: Concept E contemporary deck arch elevation view

Concept F: Long-span deck arch

This concept would utilize an approximately 725 foot single deck arch span over the river to provide an option with no piers in the Mississippi River. This concept would have a significant cost premium above all other concepts and would require greater disturbance to the banks of the river gorge to construct the foundations in comparison to other concepts. Construction complexity would also be the greatest of any concept, requiring more robust temporary towers in the river to support the arch weight prior to closure. Figure 20 below shows an elevation view of Concept F.

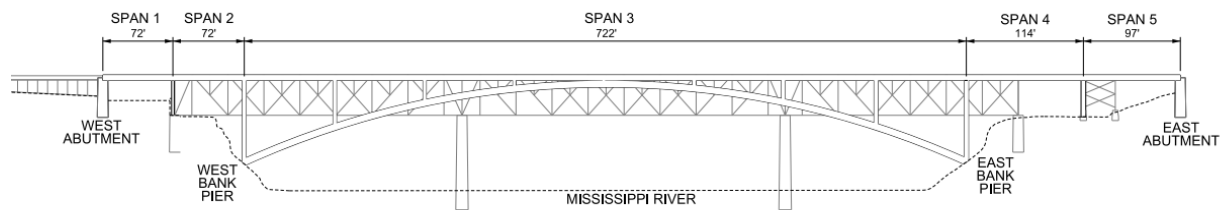


Figure 20: Concept F long-span deck arch elevation view

Bridge Option 2 Cost Estimates

Cost estimates prepared at this conceptual design stage are intended only to provide an approximate order of magnitude construction cost. Further refinement of Bridge Option 2 concepts to consider structural quantities and means and methods of construction would be necessary to provide more detailed estimates. Costs estimated at this design stage may nonetheless be useful for estimating total project costs and comparing different concepts. The cost estimates presented here are based on the 21,540 estimated square footage of deck only, with no calculation of quantities other than deck area.

Michael Baker International prepared a compilation of recently-constructed pedestrian bridge costs and found an average cost in 2025 dollars for girder-type bridges of approximately \$1,000 per square foot, and \$1,500 per square foot for arch-type bridges. (These costs per square foot do not include a 10% mobilization premium to the constrained project site or contingency). Use of box girders instead of steel plate girders is assumed to result in a 15% cost premium for Concepts A and B, and the addition of delta-type elements in Concept C is assumed to result in a 20% cost premium over the Concepts A and B steel plate girder. A long-span structure such as Concept F may approach \$2,500 per square foot. Costs for Concepts D, E, and F are estimated using box girder costs per square foot for approach spans, and \$1,500 per square foot for the Concept D and E deck arch spans over the river, and \$2,500 per square foot for the Concept F deck arch span over the river. Estimated costs for each of the Bridge Option 2 concepts are shown in Table 2 below, and include an additional 25% contingency and 10% mobilization applied to the base cost.

Table 2: Costs for new trail-only bridge structure (Option 2)

Bridge Option 2 Concept	Approximate Cost (2026 dollars)
Concepts A and B (steel plate girder)	\$30,000,000
Concepts A and B (steel or concrete box girder)	\$34,000,000
Concept C (delta girder)	\$36,000,000
Concepts D and E (traditional and contemporary deck arch)	\$42,000,000
Concept F (long-span deck arch)	\$61,000,000

Bridge Option 3: Rail and Trail on New Bridge

Bridge Option 3 consists of new bridge superstructure for the full length of the existing bridge. Existing abutments and piers are reused with the exception of the east bank tower. A new substructure unit to replace the tower is assumed. The main spans over the river would be a shared truss, maintaining single-track service on the current track alignment with the trail installed parallel to the track as shown in Figure 21. Note that the track access walkway is shifted from the north to the south in this configuration. The approach spans would structurally separate the rail and trail. The rail would be carried on through plate girder spans, while the trail would be carried on deck plate girder spans as shown in Figure 22. The adjacent and independent superstructures would be supported on a common cap at a given bearing line. Specifically, a steel substructure similar to existing conditions would be used at the existing bank piers; the existing abutments would be reused, and the east bank tower would be replaced with a multicolumn bent, reducing the number of spans from seven to six. The elevation view for Bridge Option 3 is shown in Figure 23.

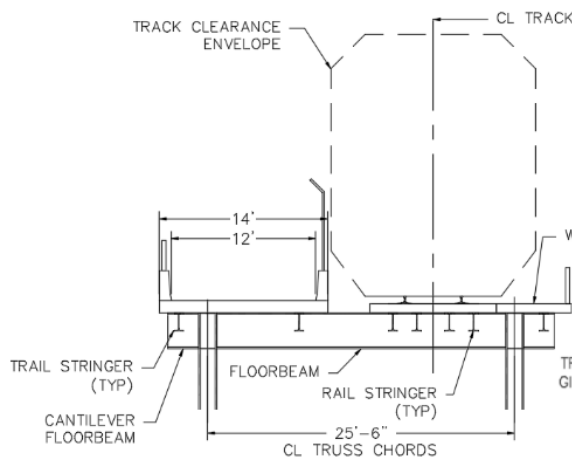


Figure 21: Bridge Option 3 cross section at the truss spans

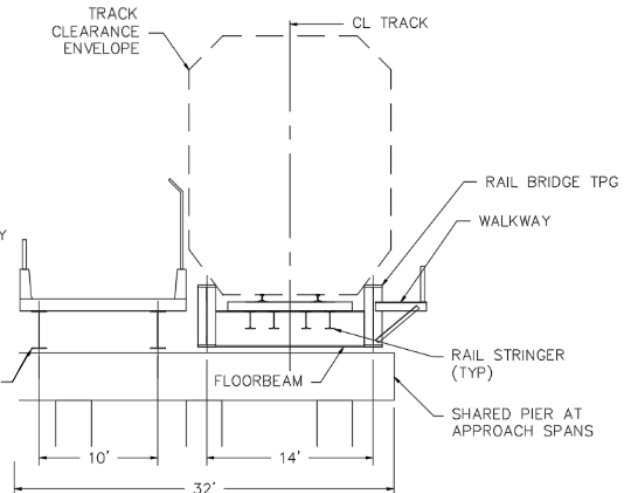


Figure 22: Bridge Option 3 cross section at the approach spans

Bridge Option 3 would provide a trail clear dimension of 12 feet across the full length of the bridge. The trail structure would be designed for maintenance vehicles, a snooper truck, emergency vehicles, and snow removal equipment as appropriate. A wider trail may be feasible; however, the cantilever extension may create unbalanced loading at the existing substructures that would need to be evaluated.

The deck system for the Bridge Option 3 truss consists of a concrete deck for the trail and open deck for the rail. The decks would be supported on stringers which frame into a shared floorbeam between the two truss lines. A modern truss would avoid pinned connections and would be designed to be redundant.

The same deck systems are carried onto the approach spans, with concrete deck on plate girders for the trail and open deck on stringers between through plate girder floorbeams for the rail. The continued use of open deck in the approach spans is required in the west approach due to constrained vertical clearance over West River Parkway. It is feasible, however, to transition to ballasted deck in the east approach spans if desired. The separated superstructures in the approach spans would allow for shallower through plate girders at the rail bridge, would improve user safety, and would simplify long term maintenance of the approach spans.

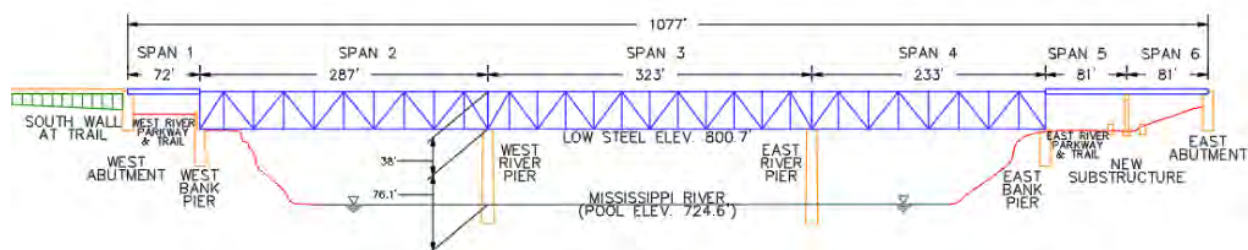


Figure 23: Bridge Option 3 elevation view

One benefit of reusing the substructures is the cost savings from avoiding new bridge piers for the trusses. However, reusing the piers would create a construction staging challenge to install the new bridge without significant disruption to rail operations. For rail bridges of this length, the bridge spans are typically slid or floated into and out of place during a short-term closure. For this location, the longest truss span could be replaced by floating out the existing span and floating in the new span during a weekend closure. For the two side truss spans and the approach spans, there is no barge access, so these spans would have to be slid using temporary bents for the existing bridge to be slid out, and a second temporary bent to support the new bridge before it is slid into place. While this is not uncommon for railroad bridge construction, this construction method requires temporary bents and/or large river barges and also carries significant risk to the contractor to be able to complete each span replacement during a short closure period.

Bridge Option 3 Cost Estimate

The cost for modern long-span rail bridges is higher than vehicular or pedestrian bridges due to the increased structural demands of trains and due to the increased risk and complexity of construction to limit closure times. Due to the span lengths involved in reusing existing river and bank piers, it is assumed the existing trusses would be replaced with new trusses. Preliminary design of the replacement truss and approach spans has been conducted to arrive at the approximate weight of steel that would be required. As noted, the logistics involved with removal and replacement of the trusses would be extensive, requiring temporary structures to be installed in the river to facilitate slide operations. Given the relative complexity of truss fabrication, delivery and installation, a significant multiplier is applied to the unit weight of steel for preliminary cost estimating purposes, in lieu of assessing temporary works directly. See Appendix A for details. The cost shown in Table 3 includes an additional 25% contingency and 10% mobilization applied to the base cost.

Table 3: Costs for rail and trail on new bridge superstructure (Option 3)

Bridge Option 3	Approximate Cost (2026 dollars)
Shared rail + trail on new superstructure on existing substructure + 1 new pier	\$55,000,000

Cost Estimate Summary

Cost estimates for each bridge option are summarized in Table 1 of this report and are reproduced in Table 4 below. As noted previously, each alternative includes an additional 25% contingency and 10% mobilization applied to the base cost.

Bridge Option 1 could result in a lower cost Mississippi River crossing depending on the condition of the Short Line Bridge, but carries considerably high cost risk given that the existing bridge condition is unknown. This option merges new structure with much older structure and would require significant ongoing investment to inspect and maintain the older portions of the bridge. Inspection and maintenance costs would be higher for Option 1 (relative to Option 3) due to added inspection requirements for pin connections and more frequent member replacement or rehabilitation expected for the older portions of the modified bridge. For both Options 1 and 3 which maintain rail service, an inspection program in conformance with Federal Railroad Administration (FRA) requirements would need to continue. The bridge will require annual inspection with reports completed and filed in a Bridge Management System, subject to internal audits.

Inspection efforts and estimated costs consider three types of bridge inspections that would be needed for Option 1. (1) Annual routine inspection at an estimated cost of \$50,000 each could be conducted using snooper, rope access or drone inspection. Drone inspections are less

expensive to conduct (approximately 25% to 35% less), but are also less thorough. In the event of a significant drone finding, snooper or rope access is likely to follow. (2) Since the existing truss includes nonredundant steel tension members (NSTMs), NSTM inspections, at an estimated cost of \$90,000 each, will be needed. A commonly used interval for NSTM inspections are every other year. In Option 3, the replacement truss spans can be configured to provide redundancy, thereby eliminating the need for bi-annual NSTM inspection. Finally, (3) underwater and sonar inspection of the piers on a five-year interval at an estimated cost of \$10,000 each is considered best practice. Approximate average inspection costs for each bridge option are shown in Table 5.

An estimate of ongoing maintenance costs for Option 1 is limited to predicting that the bridge will need to be repainted in approximately 40 years.

Bridge Options 1 and 3 include potential risks for both rail operations and trail users in the event of vandalism or an accident.

Bridge Options 2 and 3 would have less cost risk, since the project sponsoring agency(ies) would have greater control over costs through the selection of the new bridge type, but may have greater total cost depending on the type of structure selected.

Bridge Option 2 would likely have a lengthier environmental process as a new crossing would involve a more complex environmental review process than modifications to the Short Line Bridge or placing a new superstructure on the existing bridge piers. Ongoing maintenance and inspection costs are not included in Table 4 but would be lower for a new bridge compared to the 125-year-old, pin-connected truss Short Line Bridge. New bridge options can avoid painting costs if uncoated weathering steel or uncoated concrete are utilized.

Table 4: Midtown Greenway Mississippi River crossing options capital cost comparison

Bridge Option	Cost Estimate / Range (2026 dollars)
Bridge Option 1: Shared rail plus trail on Short Line Bridge	\$30,000,000
Bridge Option 2:	
Concepts A and B (steel plate girder)	\$30,000,000
Concepts A and B (steel or concrete box girder)	\$34,000,000
Concept C (delta girder)	\$36,000,000
Concepts D and E (traditional and contemporary deck arch)	\$42,000,000
Concept F (long-span deck arch)	\$61,000,000
Bridge Option 3: Shared rail plus trail on new bridge, reusing existing substructure + 1 new pier	\$55,000,000

Table 5: Approximate annual inspection cost estimates per bridge option

Bridge Option	Estimated average annual inspection cost (2026 dollars)	Notes
Bridge Option 1: Shared rail plus trail on Short Line Bridge	\$72,000	Average annual cost of routine and NSTM inspection (alternating each year) plus underwater inspection every five years
Bridge Option 2: New trail-only bridge	\$27,000	Routine inspection every two years plus underwater inspection every five years
Bridge Option 3: Shared rail plus trail on new superstructure	\$52,000	Routine inspection every year to meet FRA requirements plus underwater inspection every five years

Appendix A:

Bridge Option Cost Estimate Calculations

Project Midtown Greenway
 Subject: ALT 1, ALT 2 Cost Estimate Summary

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

Option 1: Rail + Trail on Short Line Bridge

	Estimated Cost
Added Trail Structure including Approach Ramps	\$ 4,014,400
Structural Rehabilitation of Existing Bridge (exclusive of pin replacement)	\$ 1,027,440
Pin Replacement (assuming 30 pins)	\$ 6,900,000
Surface Preparation and Painting	\$ 18,049,160
Total Estimated Cost =	\$ 29,991,000

Option 1: Rail + Trail on Short Line Bridge

	Estimated Cost
Added Trail Structure including Approach Ramps	\$ 4,100,000
Structural Rehabilitation of Existing Bridge (exclusive of pin replacement)	\$ 1,100,000
Pin Replacement (assuming 30 pins)	\$ 6,900,000
Surface Preparation and Painting	\$ 18,100,000
Total Estimated Cost =	\$ 30,200,000

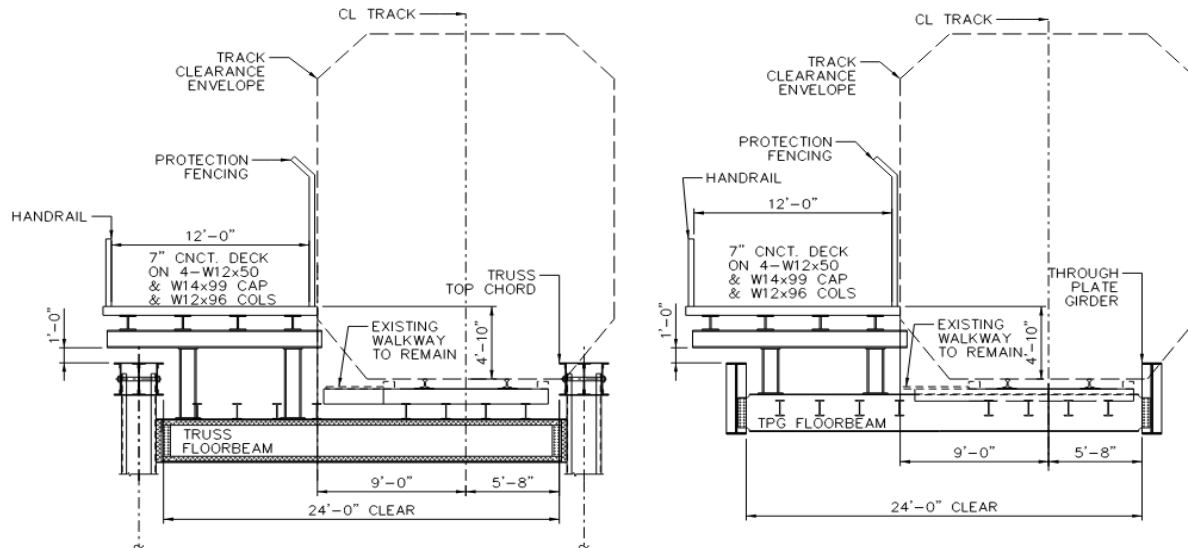
Project Midtown Greenway
 Subject: ALT 1 (Rail + Trail) Added Structure

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

Develop a preliminary cost estimate for installing trail structure onto existing bridge L5733 while maintaining rail service.



Type	Span	
TPG	1	72 ft
Truss	2	287 ft
Truss	3	323 ft
Truss	4	233 ft
TPG	5+6+7	162 ft
	TOTAL	1077 ft

Typical Trail Span = 18 ft
 n.spans = 60
 n.subs = 61

Superstructure

Concrete Deck Thickness =	0.58 ft
Concrete Deck Width =	13.00 ft
Concrete Deck Length =	1077.00 ft
Concrete Deck Volume =	8167.25 cf

For deck reinforcement: Assume equal top and bottom layers with #4 @ 12" longitudinally and #5 @ 12" transversely

n.long = Width / 1 ft CTS * 2 =	26.00 bars
long length =	1077.00 ft
Length of #4 bars =	28002.00 ft
Weight of #4 bars =	18705.34 lbs
n.tran = Length / 1 ft CTS * 2 =	2154.00 bars
tran length =	13.00 ft
length of #5 bars =	28002.00 ft
weight of #5 bars =	29206.09 lbs
Total LBS reinforcing steel =	47911.42 lbs

Project Midtown Greenway
 Subject: ALT 1 (Rail + Trail) Added Structure

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Span Beam Weight = 50.00 plf
 No. Beams in Section = 4.00
 Span Beam Length = 4308 ft
 c * Span Beam Weight = 269250 lbs
 c = 1.25

Note: variable c is used to amplify the steel weight to cover supplemental diaphragm steel and bearing assemblies

Treat protection railing as steel for initial estimate

Outboard Railing = 25.00 plf
 Inboard Railing = 50.00 plf
 Railing Length = 2154 ft
 Railing Weight = 80775 lb

Convert total superstructure weight into a unit load for subsequent use in estimating dead load effects on the LL Comparison Worksheet.

Deck Width = 13.00 ft
 Deck Thickness = 0.58 ft
 Deck Unit Weight = 1.14 klf

Beam & Framing weight = 269250 lb
 Railing Weight = 80775 lb
 Steel Weight = 350.025 kips
 Bridge Length = 1077
 Superstructure Steel Unit Weight = 0.33 klf

Substructure

Cap Beam Length = 13.00 ft
 Cap Beam Unit Weight = 99.00 plf
 No. Cap Beams = 61.00
 Cap Beam Weight = 78507 lb

	On Truss Spans	On TPG Spans
Column Length =	<u>4.75</u> ft	<u>3.08</u> ft
Column Unit Weight =	<u>96.00</u> plf	<u>96.00</u> plf
No. Cols =	<u>96</u>	<u>26</u>
Column Weight =	43776 lb	7688 lb

Convert total substructure weight into a unit load for subsequent use in estimating dead load effects on the LL Comparison Worksheet.

Truss Span Length = 843 ft
 Columns on Trusses = 43776 lb
 Caps on Trusses = 61450 lb
 On Truss Substructure Steel Unit Weight = 0.12 klf

TPG Span Length = 234 ft
 Columns on TPG = 7688 lb
 Caps on TPG = 17057 lb
 On TPG Substructure Steel Unit Weight = 0.11 klf

The difference between On-Truss and On-TPG substructure unit weight is trivial. Use only On-Truss in subsequent calcs.

Proposed Trail Structure combined Unit Dead Load (Deck+Super+Sub) = 1.59 klf

Project Midtown Greenway
 Subject: ALT 1 (Rail + Trail) Added Structure

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Summary including Trail Extension OFF Bridge

Concrete Volume =	302	CY
Reinforcing Steel Weight =	47911	lbs
Steel Weight =	479996	lbs
Installed Concrete Unit Cost =	\$ 1,020.06	per CY (MDOT 2024 Avg Bid for Bridge Slab Cnct 3YHPC-M)
Installed Reinforcing Steel Unit Cost =	\$ -	per LB
Fabricated & Erected Steel Unit Cost =	\$ 5.00	per LB
Concrete EST Cost =	\$ 308,559	
Reinforcing Steel EST Cost =	\$ -	
Steel EST Cost =	\$ 2,399,978	
TOTAL =	\$ 2,708,537	
Recall Bridge Length =	1077.00	ft
Est Unit Cost = TOTAL / Bridge Length =	2514.89	/ft
Ramp Extension Length =	200.00	ft
Est Ramp Cost =	\$ 502,978	
Revised TOTAL Cost =	\$ 3,211,515	
Contingency Percentage =	25%	
Estimate Total Cost with Contingency =	\$ 4,014,400	

Project Midtown Greenway
 Subject: Pin Replacement Estimate

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

As discussed in the Narrative, assign a unit cost on the basis of area to estimate repair and rehabilitation costs to address existing conditions in preparation for addition of trail loading.

TGP Width =	25.0	ft
TGP Length =	234.0	ft
TPG Area =	5850	sf
TPG Repair Unit Cost =	20.0	/sf
TPG Repair Cost =	\$ 117,000	
Truss Width =	27.0	ft
Truss Length =	843.0	ft
Truss Area =	22761	sf
Truss Repair Unit Cost =	40.0	/sf
Truss Repair Cost =	\$ 910,440	
Estimated Repair Cost =	\$ 1,027,440	

Project Midtown Greenway
 Subject: Pin Replacement Summary

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

PIN REPLACEMENT - assign average cost to use per pin replacement

Pin Replacement Method 1, Est Avg Cost per Pin = \$ 211,081
 Pin Replacement Method 2, Est Avg Cost per Pin = \$ 230,420

Average Est Cost per Pin = \$ 220,751
 Average Cost per Pin to USE = \$ 230,000

Assumed No. of Pins to Replace = 30

Pin Replacement Cost Est = \$ 6,900,000

Project Midtown Greenway
 Subject: Pin Replacement Estimate #1

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

Develop a preliminary cost estimate for replacing pins on pin-connected Bridge L5733. Maintain reference NS Bridge repair proportioning and unit costs, while adjusting for inflation.

Total No. of Non-Bearing Assembly Pins = 168

Proportion of Pins to Replace = 18%

No. of Pins to Replace = 30

		n.pins
Type 1 = Remove Pin & Prepare the Hole (without any repair) =	46.67%	14
Type 2 = Remove Pin & Prepare the Hole (with reboring repair) =	33.33%	10
Type 3 = Remove Pin & Prepare the Hole (with pin plate repair) =	20.00%	6

2011 to 2025 Inflation Factor = 875/475 = 1.84

Mobilization/Demobilization = 10.00% of Sum Items 2-7

Item No.	Description	Estimated Quantity		2010 Unit Price	Inflation Factor	Br. L5733 EST Unit Price	Br. L5733 EST Total Amt
1	Mobilization/Demobilization	1	LS	\$ 100,000	-	\$ 575,676	\$ 575,676
2	Preconstruction Insp. & Field Measurement of Pins to be Replace	30	EA	\$ 3,000	1.84	\$ 5,526	\$ 165,789
3	Type 1 = Remove Pin & Prepare the Hole (without any repair)	14	EA	\$ 55,000	1.84	\$ 101,316	\$ 1,418,421
4	Type 2 = Remove Pin & Prepare the Hole (with reboring repair)	10	EA	\$ 115,000	1.84	\$ 211,842	\$ 2,118,421
5	Type 3 = Remove Pin & Prepare the Hole (with pin plate repair)	6	EA	\$ 83,000	1.84	\$ 152,895	\$ 917,368
6	Furnish Fabricated Pins	30	EA	\$ 12,570	1.84	\$ 23,155	\$ 694,658
7	Install Fabricated Pins	30	EA	\$ 8,000	1.84	\$ 14,737	\$ 442,105
TOTAL =							\$ 6,332,439
Average Per Pin Cost =							\$ 211,081

Project Midtown Greenway
 Subject: Pin Replacement Estimate #2

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

The Gay Street Bridge in Knoxville TN is a pin-connected spandrel arch truss highway bridge. In 2004, TnDOT replaced 125 "pin joints and gussets". There were three joint locking configurations available as shown in attached Gay St Rehab plan excerpts. The L5733 bridge is not fundamentally different from the Gay Street bridge, but will have larger pins and more members framing into the pins. As with the NS Bridge comparison, a complexity factor is assigned to compensate for additional individual members framing into a given pin joint.

US 84 Mississippi River Bridge Pin And Link Replacement

Background

Replacing U29 and U49 Lower Pins

- Not many successful examples of resetting or replacing highway truss pins
 - Railroads have successfully completed pin replacements but pins typically do not have as much dead load as highway bridges
- Most examples are stringer/ girder pins
- Key to success is locking joint and creating a bypass

Gay Street Bridge (Knoxville, TN)

- Spandrel arch truss bridge
- Replaced 125 pin joints and gussets
- Created a pin bypass
- Regional steel contractor awarded project
- Bridge Closed during rehabilitation



MDOT HNTB

25

Gay Street Bridge Reopens - April 2004 - City of Knoxville



Gay Street Bridge Reopens - April 2004
 Posted: 04/12/2004

A Knoxville trolley on Monday ferried Mayor Bill Haslam, City Council members and TDOT officials on the first trip over the newly opened Gay Street bridge.

The 107-year-old bridge has been closed since December 2001 to undergo \$15.7 million in repairs to the steel truss structure.

"The Gay Street Bridge serves as an important link for residents, workers and businesses in downtown and South Knoxville," said Mayor Haslam. "An estimated 12,000 vehicles used the bridge daily and this work ensures safe passage for them and new users for years to come."

The structure had scored a "poor" on safety inspections, one step above the lowest rating of "critical."

Work included replacing crumbling concrete on the deck and support piers and rusted pinjoints and bearings.

The city of Knoxville paid for 20 percent of construction, and the Federal Bridge Replacement Program funded the remaining costs.

The Tennessee Department of Transportation is serving as project manager; Ray Bell Construction Co. is general contractor.

Some painting remains to be completed on the bridge and railings, and traffic lanes maybe closed in upcoming weeks as the work is concluded.

[View All News](#)

Gay Street Bridge Rehab 2004:

Work performed included deck and pier concrete repairs, bearing replacement, pin / pin-gusset replacement.

Total Cost of Gay Street Rehab = \$ 15,700,000

Assumed mobilization = 10%

Remaining balance for material/construction = \$ 14,130,000

Assumed proportion of remaining balance dedicated to Pin / Pin+Gusset Work = 80%

Assumed Pin Replacement Cost = \$ 11,304,000

Assumed Total No. of Pins Replaced = 127

Cost per Pin = \$ 89,008

2004 to 2025 Inflation Factor = 875/338 = 2.59

2026 Cost per Pin = \$ 230,420

Project Midtown Greenway
 Subject: Painting Estimate

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Note: Input cells throughout are orange.

Painting costs for the Short Line are estimated by referring to detailed bids for two unnamed reference projects, and extrapolating the bids to paintable area on the Short Line bridge while adjusting for inflation.

Reference Project A is an arch truss highway bridge repainting project and is taken as representative of the effort involved with painting the Short Line trusses. Details of the reference project estimated costs are as follows:

Reference Bridge Photo:



Year of Bid =	2019
Paintable Area =	145,100.00 SF
Paint Ex. Str. Steel =	\$ 2,521,173 53.6%
Containment =	\$ 2,095,755 44.5%
Disposal =	\$ 66,843 1.4%
Health & Safety =	\$ 22,895 0.5%
TOTAL =	\$ 4,706,666 100.0%

2019 Unit Cost = \$ 32.44 \$ / SF

2019 to 2025 Inflation Factor = 875/590 = 1.48

Estimated 2025 Unit Cost = \$ 48.11 \$ / SF

Back into an approximate solidity ratio for the Reference Bridge:

Avg Truss Height =	35.00 ft
Est Truss Width =	50.00 ft
Out-to-Out Volume =	1750 cf / ft
Solidity Ratio =	0.0040
Solid Volume =	7 cf/ft
Nominal Member Thickness =	0.042 ft
Nominal Area =	169 sf/ft
Est Bridge Length =	860.00 ft
Paintable Truss Area =	145,100 sf

Estimate paintable area of Short Line Truss Spans by applying an assumed 4x factor on the Reference Bridge solidity ratio:



Truss Height =	40.00 ft
Truss Width =	27.00 ft
Out-to-Out Volume =	1080 cf / ft
Solidity Ratio =	0.0161
Solid Volume =	17 cf/ft
Nominal Member Thickness =	0.042 ft
Nominal Area =	416 sf/ft
Span 2 =	287 ft
Span 3 =	323 ft
Span 4 =	233 ft
L =	843 ft
Paintable Truss Area =	351,109 sf
Estimate Truss Painting Cost =	\$ 16,890,568

Project Midtown Greenway
 Subject: Painting Estimate

Michael Baker
INTERNATIONAL

Comp by JBT Date 7/30/25 Check MSF Date 9/3/25

Reference Project B is a suspended (therefore shallow relative to span length) through plate girder highway bridge repainting project and is taken as representative of the effort involved with painting the Short Line through girder approach spans. The TPG construction is very similar to Short Line. Details of the reference project estimated costs are as follows:

Reference Bridge Photo:



Estimate paintable area of Short Line Approach Spans



Year of Bid =	2020
Paintable Area =	316,200.00 sf
Approx Length =	945.00 ft
Approx Width =	60.00 ft
Unit Area =	334.60 SF/FT

Painting Ex. Str. Steel =	\$ 2,823,070	45.6%
Containment =	\$ 3,044,388	49.1%
Waste Disposal =	\$ 79,360	1.3%
Health & Safety =	\$ 249,525	4.0%
TOTAL =	\$ 6,196,343	100.0%

2020 Unit Cost = \$ 19.60 \$ / SF

2020 to 2025 Inflation Factor = 875/650 = 1.35

Estimated 2025 Unit Cost = \$ 26.38 \$ / SF

TPG Height =	5.00 ft
TPG Width =	25.00 ft

Out-to-Out Volume =	125 cf / ft
Solidity Ratio =	0.06
Solid Volume =	8 cf/ft
Nominal Member Thickness =	0.042 ft
Nominal Area =	180 sf/ft (target approx 1/2 of Ref Bridge)

Spans 1 + 5 + 6 + 7 =	234 ft
Include 1/4 of Span 6 Tower =	10.00 ft (reduced to compensate for lower tower solidity ratio)
L =	244 ft
Paintable Approach Span Area =	43,920 sf

Estimate Approach Span Painting Cost = \$ 1,158,592

Painting Summary:

Truss Spans =	\$ 16,890,568
Approach Spans =	\$ 1,158,592
Total =	\$ 18,049,160

Project Midtown Greenway
 Subject: Option 2 Estimate

Michael Baker
INTERNATIONAL

Comp by DJB Date 8/29/25 Check SJK Date 1/16/26

Note: Input cells throughout are orange.

Determine approximate costs for each new structure Option using approximate costs indicate below

Deck Width =	20.00	ft
Total Length of Approach Spans (Concepts A through E) =	234.00	ft
Total Length of River Spans (Concepts A through E) =	843.00	ft
Total Length of Approach Spans (Concept F) =	355.00	ft
Total Length of River Span (Concept F) =	722.00	ft

Plate Girder Cost Per Square Foot (Concepts A and B) =	\$ 1,000.00	/SF
Box Girder Cost Per Square Foot (Concepts A and B) =	\$ 1,150.00	/SF
Delta Girder Cost Per Square Foot (Concept C) =	\$ 1,200.00	/SF
Arch Bridge Cost Per Square Foot (Concepts D and E) =	\$ 1,500.00	/SF
Long Span Arch Cost Per Square Foot (Concept F) =	\$ 2,500.00	/SF

Costs with 10%
mobilization and 25%
contingency

Concept A and B Plate Girder Estimated Cost =	\$21,540,000.00	\$29,600,000.00
Concept A and B Box Girder Estimated Cost =	\$24,771,000.00	\$34,100,000.00
Concept C Delta Girder Estimated Cost =	\$25,920,000.00	\$35,600,000.00
Concept D and E Deck Arch Estimated Cost =	\$30,672,000.00	\$42,200,000.00
Concept F Long-Span Deck Arch Estimated Cost =	\$44,265,000.00	\$60,900,000.00

Concepts D, E and F use arch cost per square foot for river spans, and box girder cost per square foot for approach spans.

Project Midtown Greenway
 Subject: ALT 1 (Rail + Trail) Added Structure

Michael Baker
INTERNATIONAL

Comp by JBT Date 12/19/25 Check SJK Date 12/19/25

Note: Input cells throughout are orange.

Option 3 Preliminary Cost Estimate

<i>Concrete DECK Throughout</i>	Concrete Width =	14.00	ft
	Concrete Length =	1077.00	ft
	Concrete Depth =	0.67	ft
	Concrete Volume =	372.30	CY
	Concrete Installed Unit Cost =	1020.00	/CY
	Concrete Cost = \$	379,742	
<i>Truss</i>	Truss Steel Weight =	4,500,000	lb
	Truss Steel Unit Cost = \$	8.00	/lb
	Truss Unit Cost = \$	36,000,000	
<i>TPG + DPG</i>	Approach Steel Weight =	600,000	lb
	Approach Steel Unit Cost = \$	5.00	/lb
	Truss Unit Cost = \$	3,000,000	
<i>Pier</i>	Cap Length =	32.00	ft
	Cap Width =	5.00	ft
	Cap Depth =	5.00	ft
	Cap Volume =	29.63	CY
	Cap Installed Unit Cost =	1020.00	/CY
	\$	30,222	
	N.column = N.DS =	3	
	Col.Diameter =	5.00	ft
	Col.Length =	30.00	ft/ea
	Concrete Vol =	65.45	cf
	Column Installed Unit Cost =	1020.00	/CY
	\$	66,759	
	DS.Diameter =	5.50	ft
	DS.Length =	40.00	ft/ea
	Shaft Installed Unit Cost =	3500.00	/ft
	\$	420,000	
	Pier Subtotal = \$	516,981	
Summary			
	Deck Concrete = \$	379,742	
	Truss Steel = \$	36,000,000	
	Approach Steel = \$	3,000,000	
	Pier = \$	516,981	
	TOTAL = \$	39,896,723	
	Mobilization Percentage =	10%	
	Contingency Percentage =	25%	
	Estimate Total Cost with Mobilization & Contingency =	\$ 54,857,995	
	MROUND to nearest \$1M =	\$ 55,000,000	
	Overall Length =	1077.00	ft
	Approx Width =	28.00	ft
	AREA =	30156	SF
	Unit Cost = \$	1,823.85	/SF