Action Requested/Required:

- [x] Vote/Action Requested
- [ ] Discussion or Presentation Only
- [ ] Public Hearing

Report Date: _____
Hearing Date: _____
Voting Date: _____

Department: Community Development **Presenter(s) & Title:** Bethany Watson, City Engineer

Agenda Item Title:

Discussion and Possible Action on Concept for River Mill District Pedestrian Bridge

Summary:

As discussed at the Retreat, Staff has received concepts for the River Mill District Pedestrian Bridge. At the retreat, Staff was asked to provide additional information on alternative materials, such as Trex and Metal decking. Staff has received additional concept data and cost estimates. Based on information provided by Heath and Lineback, metal decking cost is similar to concrete and while Trex decking is a lower cost alternative, the life expectancy is well below that of Concrete decking. Staff recommends Alternative 1, which is also the consultants recommended alternative due to life expectancy, as well as avoidance of utilities and slope maintenance. The consultants cost estimate for this concept is $5,056,282.00 and life expectancy of over 75 years.

Budget Implications:

Budgeted? ☐ Yes ☐ No ☑ **N/A**

Total Cost of Project: _____ Check if Estimated ☐

Fund Source: General Fund ☐ Water & Sewer ☐ Sales Tax ☐ Other: _____

Staff Recommendations:

Staff recommends moving forward Alternative 1 Concept for the River Mill District Pedestrian Bridge.

Reviews:

Has this been reviewed by Management and Legal Counsel, if required? ☐ Yes ☐ No

Attachments:

Concept Proposal
Concept Proposal Add

RIVER MILL DISTRICT PEDESTRIAN CONCEPT / BRIDGE TYPE STUDY

PREPARED FOR: CITY OF CANTON, CHEROKEE COUNTY
MARCH 2024

Est 1834 CANTON GEORGIA

H&L A BCC COMPANY

Contents

Executive Summary

The purpose of the River Mill District Pedestrian Concept / Bridge Type Study is to examine various feasible alternates for a new bridge structure and approach ramps over the Etowah River, suitable for pedestrians and non-motorized vehicles.

The proposed bridge structures are unique to the site and location, and a separate part of the study focuses on the options and costs of the feasible alternates. The study identifies three categories of structures as follows:

1) **Main Span** – the structure required to cross over the Etowah River.
2) **Approach Ramps** – the structure required to bring pedestrians up to the pedestrian bridge required to cross the Etowah River.
3) **Put-in / Take-out** – an access point for non-motorized boat launches / boat departs along the Etowah River for boaters and kayakers to utilize the Etowah River.

The study identifies the various elements along the concept alignment and defines the various constraints that control structure type selection such as geometry (typical section, plan), design loading and criteria, edge railing, and bridge appurtenances.

The study considers and compares the implications of each bridge and approach alternate to aid in making a final recommendation.

A cost analysis is completed for each alternate to allow an initial understanding of the economics of the decision making. To simplify comparisons, each alternate is priced on a per square foot basis for a typical structure section providing 14'-0" of clear width between the railings.

1. Overview of River Mill District Pedestrian Bridge

The River Mill District Pedestrian Bridge project is located near downtown Canton, Georgia across from the historic 120-year-old former Canton Cotton Mill (shown on Figure 1). The purpose of this project is the inclusion of a new structure crossing over the Etowah River to provide a connector between The Mill on Etowah and a future proposed pedestrian trail running adjacent to the Etowah River. In addition, a put-in/take-out on the riverbank will be detailed to provide boaters and kayakers access to the Etowah River. The put-in/take-out is assumed to be a ramp or set of steps.

The proposed structure alignment was carefully determined to minimize impact on the State's stream buffers, adjacent parking facilities, and any future proposed trail around the proposed site. Along with the River Mill topography, some of the main challenges that were discovered during the survey of the site are the multiple existing utility lines that run adjacent to the project site. These existing utilities dictate the location of the trail alignment on the west bank of the Etowah River. The geometry of the proposed bridge structure will meet AASHTO's Guide for Development of Bicycle Facilities requirements. The approach ramps are to have 14 feet inside rail width and a maximum slope of 5% to meet ADA requirements. The concept design includes a prefabricated steel truss pedestrian bridge with 14'-0" clear width inside railings, and a 12'-0" wide paved trail.

Constructability is a critical element for this project. Due to the wide river crossing and the presence of overhead transmission lines on the East side of the Etowah River, delivering the bridge on the west of the river is the most viable solution. A prefabricated steel truss will be used to span the entire width of the river. The truss will most likely need to be assembled on-site due to its length during shipping.

The main objective of this study is to find the most-efficient, cost-effective, and resilient structure that complements the historical importance of the River Mill surroundings. Aesthetics are considered as an integral part of the concept study. In addition, efforts are made to minimize utility impacts and disturbance to the surroundings area.

Additionally, this study will serve as the concept and establishes the design criteria, guidelines, and parameters for completing preliminary and final plans.

2. Project Location Map

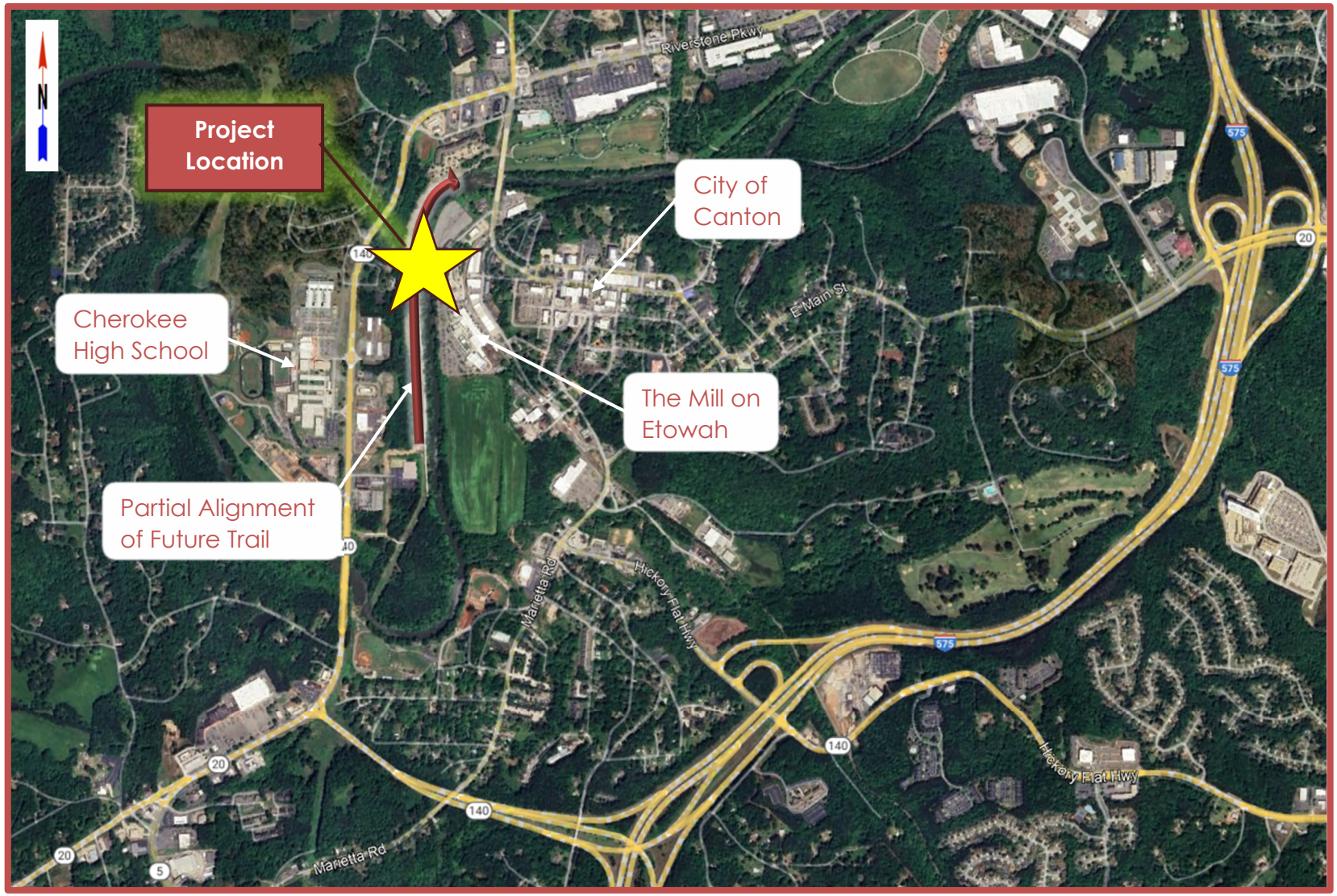


Figure 1. River Mill District Pedestrian Bridge Project Location

3. Structure Requirements

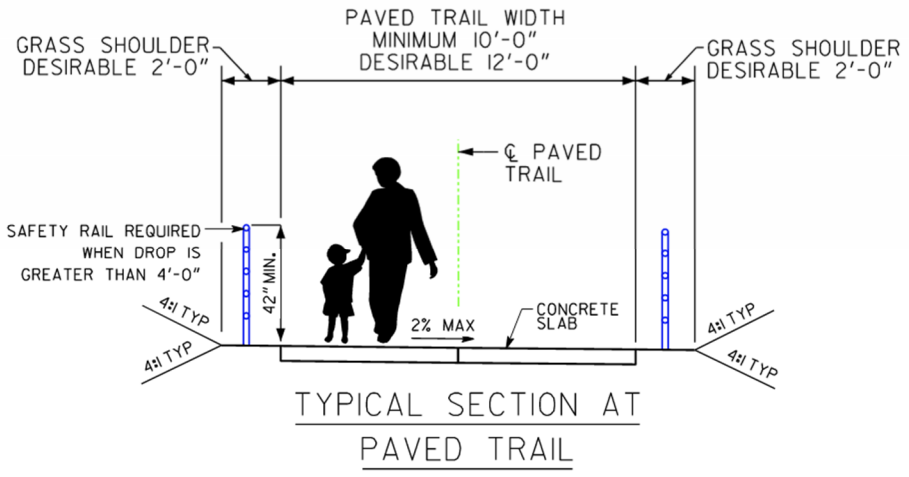
3.1) Controlling Documents and Guidance

Design codes, manuals and documents that define the design criteria for the project are listed:

1. AASHTO LRFD Bridge Design Specifications, 9th Edition 2020
2. AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2009
3. AASHTO Guide for the Development of Bicycle Facilities, 4th Edition 2012
4. GDOT Bridge and Structures Design Manual 2023
5. GDOT Drainage Design for Highways 2020
6. GDOT Pedestrian Streetscape Guide 2019
7. 2010 ADA Standards for Accessible Design

3.2) Paved Trail

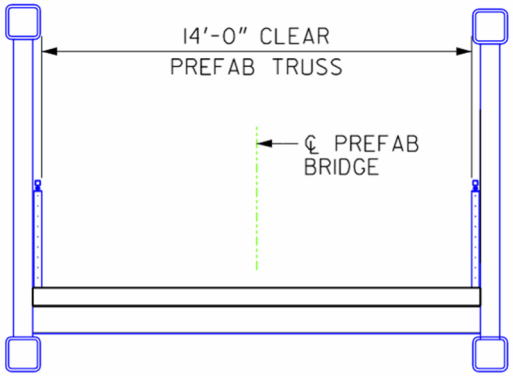
- The typical section of the paved trail consists of consists of a 12'-0" wide trail with 2'-0" shoulders.
- The width of the trail exceeds the minimums of AASHTO and GDOT guidelines, and the width of the shoulders meets the minimums of AASHTO and GDOT guidelines.



TYPICAL SECTION AT PAVED TRAIL

3.3) Bridge Width

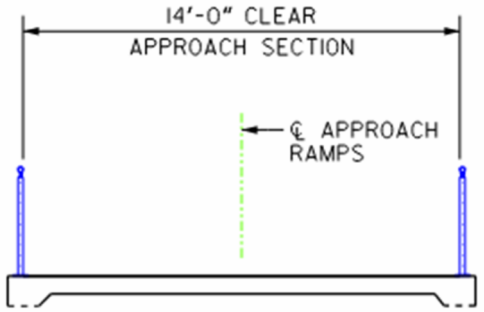
- The typical section of the main span and approach ramps will have a 14'-0" clear width between railings.



TYPICAL SECTION AT
MAIN SPAN

3.4) Handrail

- The handrail height will follow AASHTO requirements for pedestrian bridges with bicycle traffic, which is 42".
- The handrail will typically be top mounted.
- Handrails along the main span alignment will be stainless steel or weathering steel.
- Handrails along the approach ramps and paved trail (where needed) will be steel, painted with a powder coat finish or timber.



SECTION AT
APPROACH RAMPS

4. Constraints

4.1) Utilities

The project site survey was completed on 12/10/2023. During the survey multiple existing utility lines were discovered. Figure 2 shows the approximate locations of the utility lines found nearby that had major impact on establishing the alternate alignments. The existing utilities to the west of the river included: 12" water main line, 24" DIP sewer line, 30" sewer line running parallel with the west bank. The utilities on the east bank of the river included: 8" PVC sewer line and electrical line running across the parking lot of The Mill, 12" water line, buried telephone lines running parallel, and overhead transmission line crossing the Etowah River.

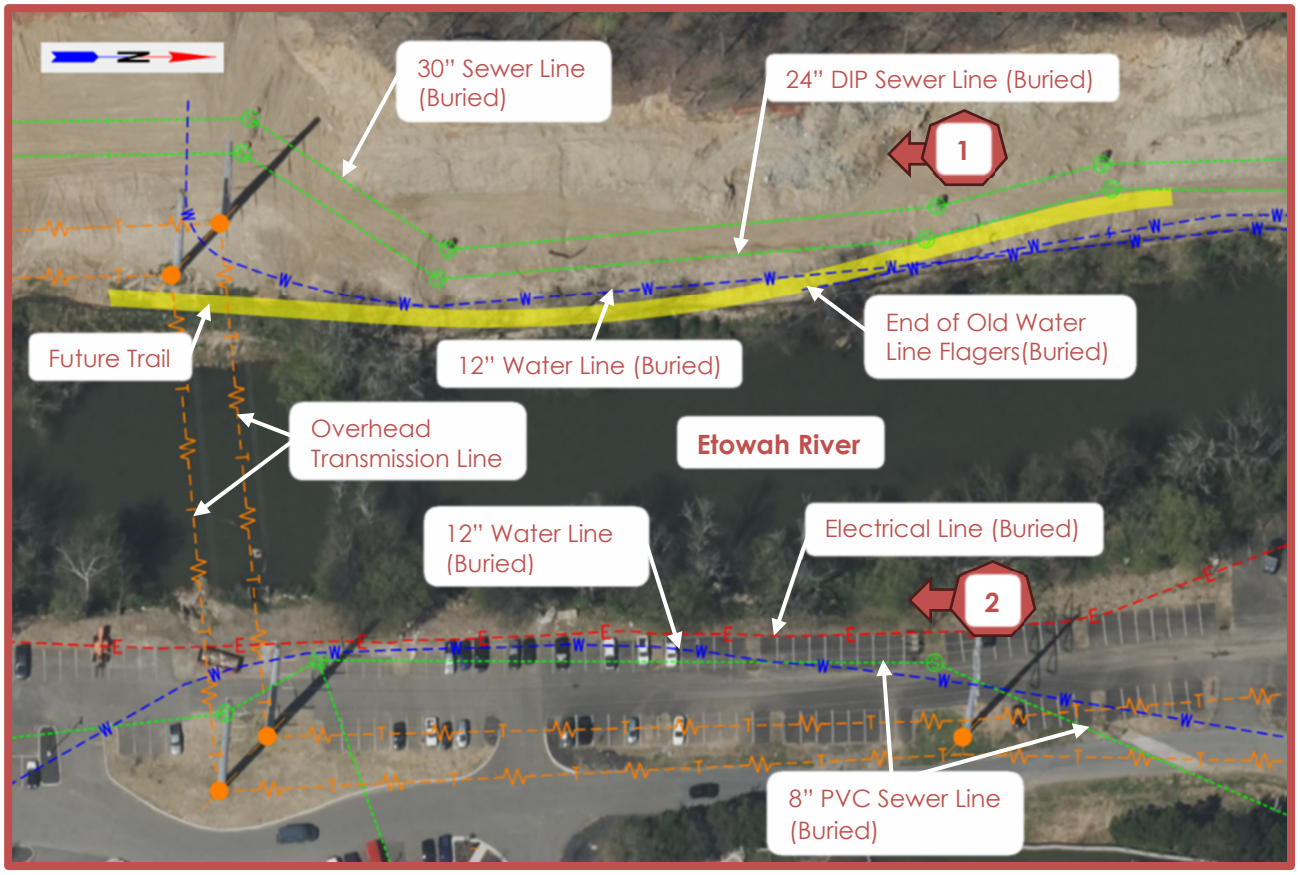


Figure 2. Approximate Location of Existing Utilities Per Survey File

Image Showing the Future Trail, Sanitary Sewer Lines, the Overhead Transmission Line, Looking South from the West Bank of the Etowah River.

Image Showing The Mill on Etowah, the Overhead Transmission Line, Looking South from the East Bank of the Etowah River.

4.2) Existing Parking Lot

Located in the heath of downtown Canton, The Mill on Etowah is a unique space that compliments the local community with its retail marketplace, restaurants, brewery, taproom, creative office, and event space, etc. The existing parking lot servicing The Mill is adjacent to the project site. We considered the significance of this remarkable site and tried to preserve the as many parking lot spaces as possible.

5. Soil and Foundation Recommendation

Geotechnical field investigation for this project was completed by Nova Engineering on 12/20/2023. Based on the geotechnical findings during the site investigation, it was determined that shallow foundations are not a feasible option due to the significant amount of undocumented fill and shallow groundwater encountered. Deep foundation on drilled shafts are recommended to support the prefab steel truss. Steel H-piles with pilot holes can be another foundation option for the prefab truss as they make for a good foundation support in areas of variable rock/dense layers to help minimize wastage of material. Deep foundations on helical piles is the recommended foundation type for the approach ramp sections.

Recommended deep foundation types for the project:

Drilled Shaft

H-Pile

Helical Pile

6. Structure Corridor Aesthetics

The pedestrian bridge, approach ramps, and wall structures will influence the visual integration of the proposed structure corridor. These structures will be seen by many visitors. In that sense, the main objective of the structure corridor aesthetics is for the physical elements of the corridor to visually relate to one another as a unified whole, be integrated into the surrounding environment of the structure corridor, respond to community goals, and compliment the historical importance of the project site.

The following enhancements and materials were considered to ensure an aesthetically pleasing structure is achieved: use of weathering steel prefab truss, enhancement additions to the prefab truss (décor, lettering, etc.), soil nail wall finishes, and concrete formliners for the concrete piers.

6.1) Weathering Steel

The project site location is suitable for the application of weathering steel. Weathering steel is a low carbon metal that contains additional alloy metals such as nickel and copper providing the steel better strength and resilience to corrosion. In addition, the weathering steel prefab truss is a structure that lends itself to aesthetic upgrades such as lettering. An existing steel fabricated truss that crosses the Etowah River in Etowah River Park is a good local example of a letter-enhanced weathering steel prefab truss (see image below).

There are multiple advantages to use of weathering steel such as:

- Offers great aesthetics. Has a rustic appearance that allows it to mimic some of the hues found in the natural environment and improves with age.
- Corrosion-resistant: The most notable component of weathering steel is its ability to resist corrosion.
- Maintenance: requires minimum maintenance and does not need painting for either protection or aesthetic reasons.

Weathering Steel Prefab Truss.

Weathering Steel Prefab Truss Enhanced with Decorative Sign.

6.2) Timber

Timber structures are well known for providing a natural look that works well aesthetically in areas surrounded by trees and vegetation. Timber is a material that would blend in with and complement the natural environment adjacent to and around the Etowah River. Timber is a common material used for boardwalks and handrails and is a suitable and environmentally friendly.

- Offers great aesthetics by blending on to the natural environment of the surrounding area.
- Affordable material that can be used in multiple applications.

Timber Decking

Elevated Timber Approach

6.3) Concrete Formliners

Exposed concrete can be enhanced with the use of formliners and color. When using concrete with texture and color, the minor imperfections either disappear or are perceived as bestowing character to the concrete. Formliners are available in a variety of patterns and textures.

- They can be economically used to cast an architectural finish in concrete piers and provide an enhanced aesthetic look to the exposed part of columns and / or walls.
- The use of custom formliners adds additional construction cost but offers unlimited opportunity to add an aesthetic element to concrete structures.

Hammerhead Bent Enhanced with Decorative Formliner.

Retaining Wall Enhanced with Color and Custom Formliner.

7. Evaluation of Structure Alternates

Multiple alternates were studied for this project. Based on the current topographic constraints and the presence of various existing utilities, three alternates were found to be the most feasible alternates for this project.

An evaluation has been completed to qualitatively compare these alternatives. A cost analysis has been completed to identify the most cost-effective solution. General conclusions are drawn based on this for the preferred alternates for this project.

7.1) Alternate 1 - Overview

Alternate 1 is the Preferred Alternate. The proposed structure layout is shown in Figure 3. This alternate will consist of a concrete deck on concrete box beam approach ramp, a prefab steel truss bridge, and concrete paved trail. On the west bank of the Etowah River, a soil nail wall will be required to hold up the slope of the adjacent hill. This alternative avoids impact to the existing utilities. Also, the use of a wall structure minimizes the use of elevated ramp structures to the west of the river. However, a Wall Foundation Investigation (WFI) will need to be performed by the geotechnical subconsultant at an additional cost (about $30,000) to the project to obtain information on the physical properties of the soil within the proposed wall envelope. On average, most concrete bridge structures are estimated to have a design service life of over 75 years. Steel bridge structures are estimated to have a design service life of over 100 years. The design service life includes applicable inspections and maintenance.

- <u>Superstructure:</u>
  - Main span – 180 ft approximate length of single span prefab steel truss.
  - Approach ramps – total length of approximately 325 ft. This structure will consist of a concrete deck on concrete box beams. Typical span length is assumed to be 40 ft – 50 ft.
  - Soil nail wall – 355 ft (±) length of wall retaining an average of 15 ft soil.
  - Paved trail – total length of approximately 355 ft.
  - Crosswalk – approximate total length of 226 ft.

- <u>Substructure:</u>
  - Main span - concrete hammerheads on drilled shafts.
  - Approach ramps - concrete hammerheads on drilled shafts.

7.1.a) Alternate 1 – Proposed Layout

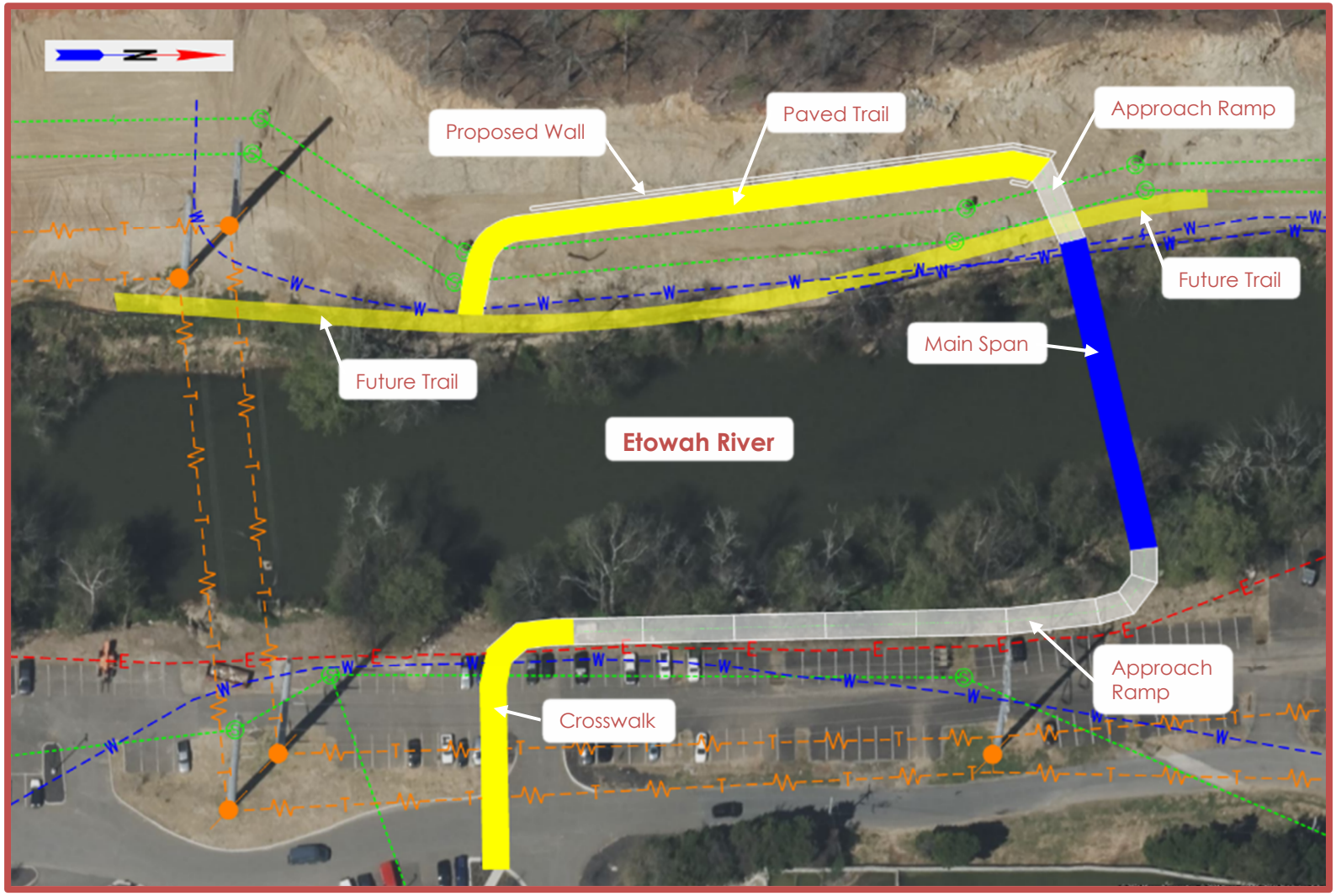
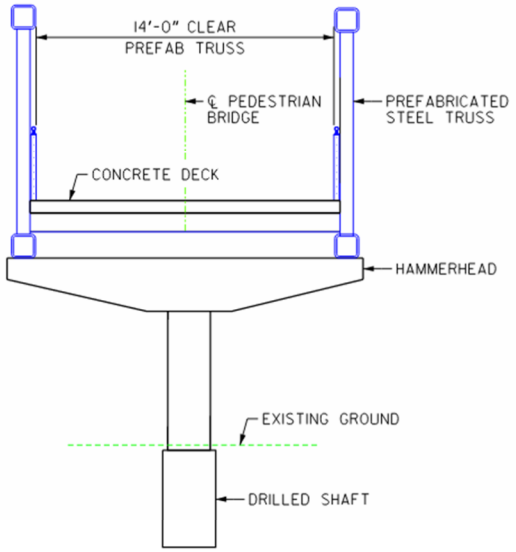
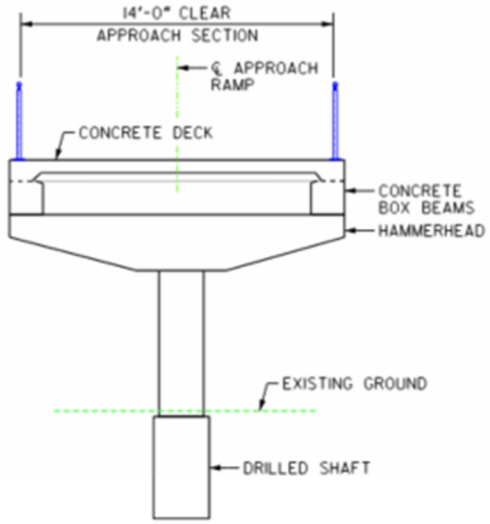


Figure 3. Alternate 1- Preferred Alternate: Proposed Structure Layout

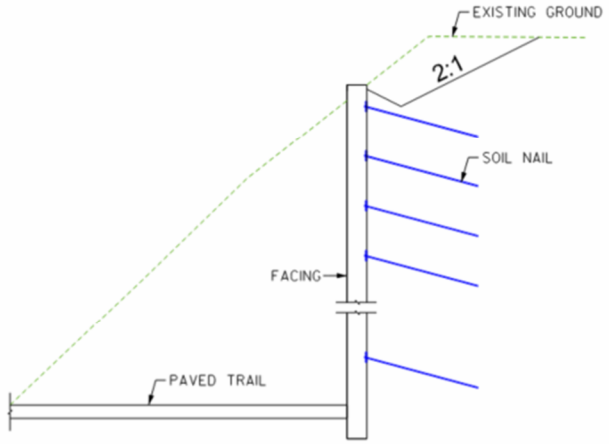
7.1.b) Alternate 1 – Typical Sections & Pros and Cons



TYPICAL SECTION AT MAIN SPAN BRIDGE



TYPICAL SECTION AT APPROACH RAMP



TYPICAL SECTION AT SOIL NAIL WALL

	Pros	Cons
<u>Alternate 1:</u> -East of the River: *concrete deck, concrete box beams, hammerhead on drilled shafts or helical piles* -West of the River: *soil nail wail, paved trail, concrete hammerhead on drilled shafts*	1. High durability / low maintenance 2. Robust design 3. Can use formliners to make the exposed concrete more aesthetically pleasing 4. Can accommodate longer spans 5. Avoids existing utility impact 6. Longer service life (in comparison with timber)	1. Most expensive alternate 2. Longer construction period (in comparison with timber)

7.2) Alternate 2 - Overview

The proposed structure layout for Alternate 2 is shown on Figure 4. To the east of the Etowah River, this alternate has identical layout with Alternate 1. There will be no walls incorporated to the west of the river. Instead, we propose a structure alignment that centers between the two existing buried sanitary sewer lines using single hammerheads on drilled shafts to avoid conflict with the sewer lines. However, it is worth noting that there is still some possibility for impact to the sewer lines during construction. On average, most concrete bridge structures are estimated to have a design service life of over 75 years. Steel bridge structures are estimated to have a design service life of over 100 years. The design service life includes applicable inspections and maintenance.

- Superstructure:
  - Main span – 180 ft approximate length of single span prefab steel truss.
  - Approach ramps – total length of approximately 498 ft. This structure will consist of a concrete deck on concrete box beams. Typical span length is assumed to be 40 ft – 50 ft.
  - Concrete paved trail – total length of approximately 170 ft.
  - Crosswalk – approximate total length of 226 ft.

- Substructure:
  - Main span - concrete hammerheads on drilled shafts.
  - Approach ramps - concrete hammerheads on drilled shafts (to avoid conflict with the sewer lines to the west of the Etowah River).

7.2.a) Alternate 2 – Proposed Layout

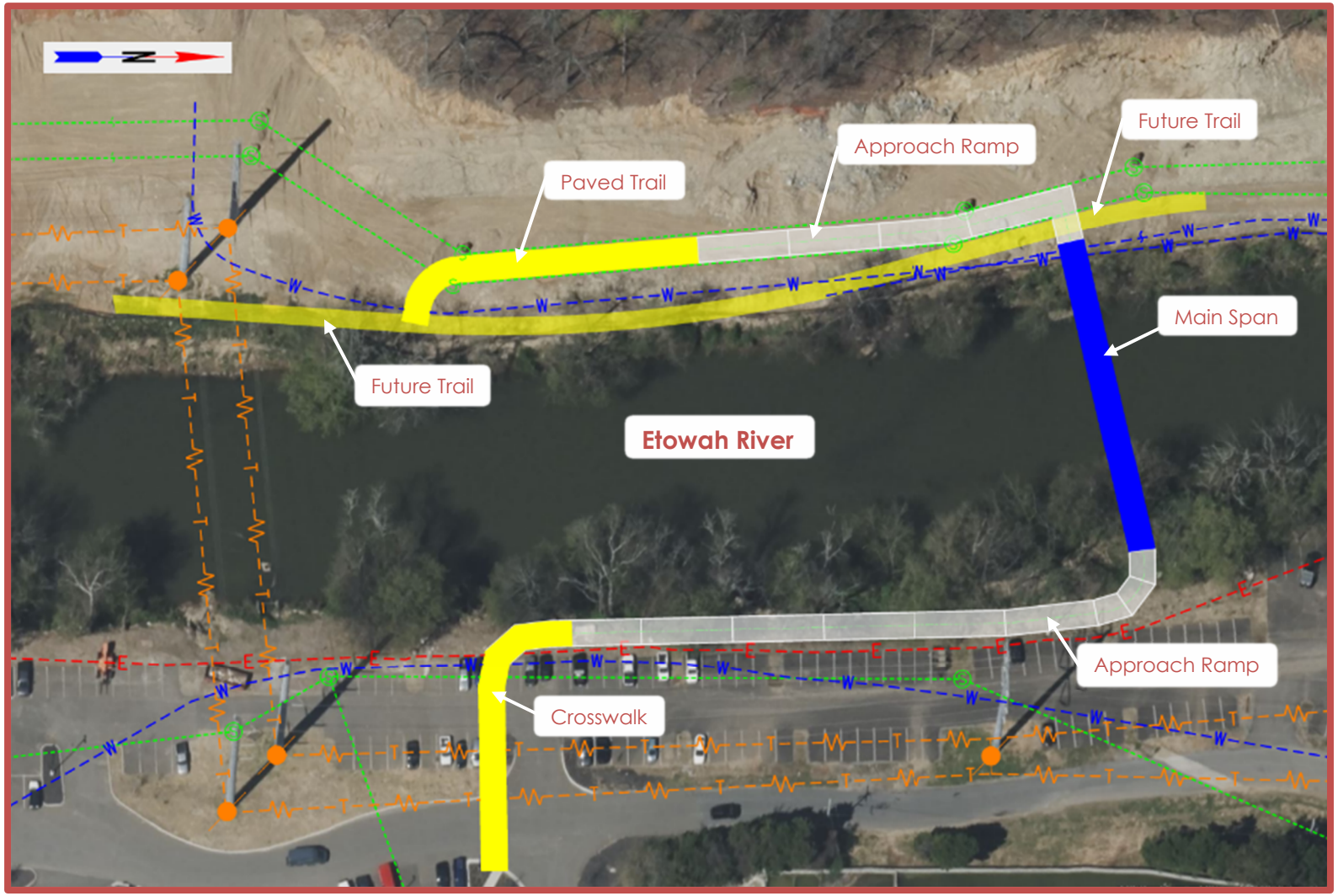
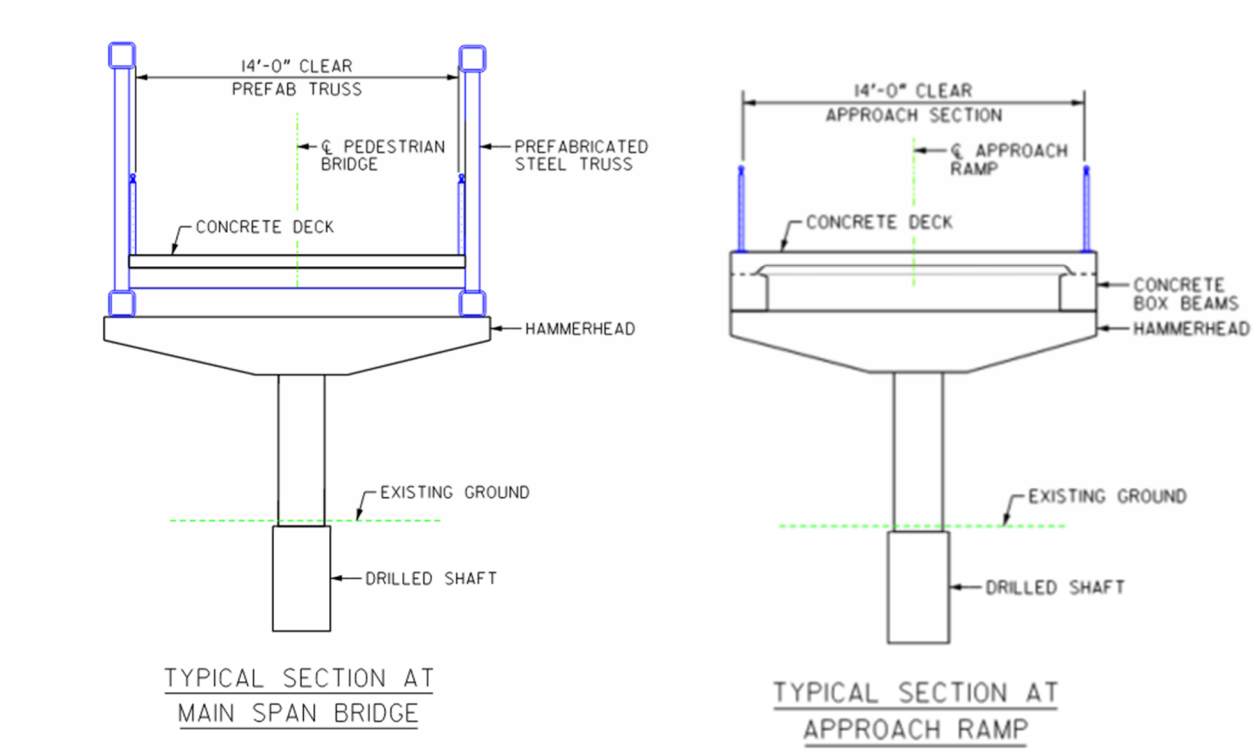


Figure 4. Alternate 2 Proposed Structure Layout

7.2.b) Alternate 2 – Typical Sections & Pros and Cons



	Pros	Cons
Alternate 2: -East of the River: *concrete deck, concrete box beams, hammerhead on drilled shaft* -West of the River: *concrete deck, concrete box beams, paved trail, hammerhead on drilled shaft*	1. High durability / low maintenance 2. Robust design 3. Can use formliners to make the exposed concrete more aesthetically pleasing 4. Can accommodate longer spans 6. Longer service life (in comparison with timber)	1. Longer construction period (in comparison with timber) 2. Structure located within sanitary sewer easement

7.3) Alternate 3 - Overview

The proposed structure layout for Alternate 3 is shown on Figure 5. This alternate follows the same alignment as Alternate 2. The approach ramp section of Alternate 3 will be comprised of mainly timber superstructure members: timber decking, timber railing, and timber stringers. The approaches on the east and west side of the river will utilize both concrete and steel helical piles. The substructure will be designed to avoid conflict with the sewer lines. However, it is worth noting that there is still some possibility for impact to the sewer lines during construction. On average, the design service life of timber structures is estimated to last about 20 - 30 years. Steel bridge structures are estimated to have a design service life of over 100 years. The design service life includes applicable inspections and maintenance.

- Superstructure:
  - Main span – 180 ft approximate length of single span prefab steel truss.
  - Approach ramps – total length of approximately 498 ft. This structure will consist of timber deck and timber stringers on timber posts / helical piles. Typical span length is assumed to be 8 ft - 12 ft.
  - Concrete paved trail – total length of approximately 170 ft.
  - Crosswalk – approximate total length of 226 ft.

- Substructure:
  - Main span - concrete hammerheads on drilled shafts.
  - Approach ramps – timber posts / helical piles / concrete footings.

7.3.a) Alternate 3 – Proposed Layout

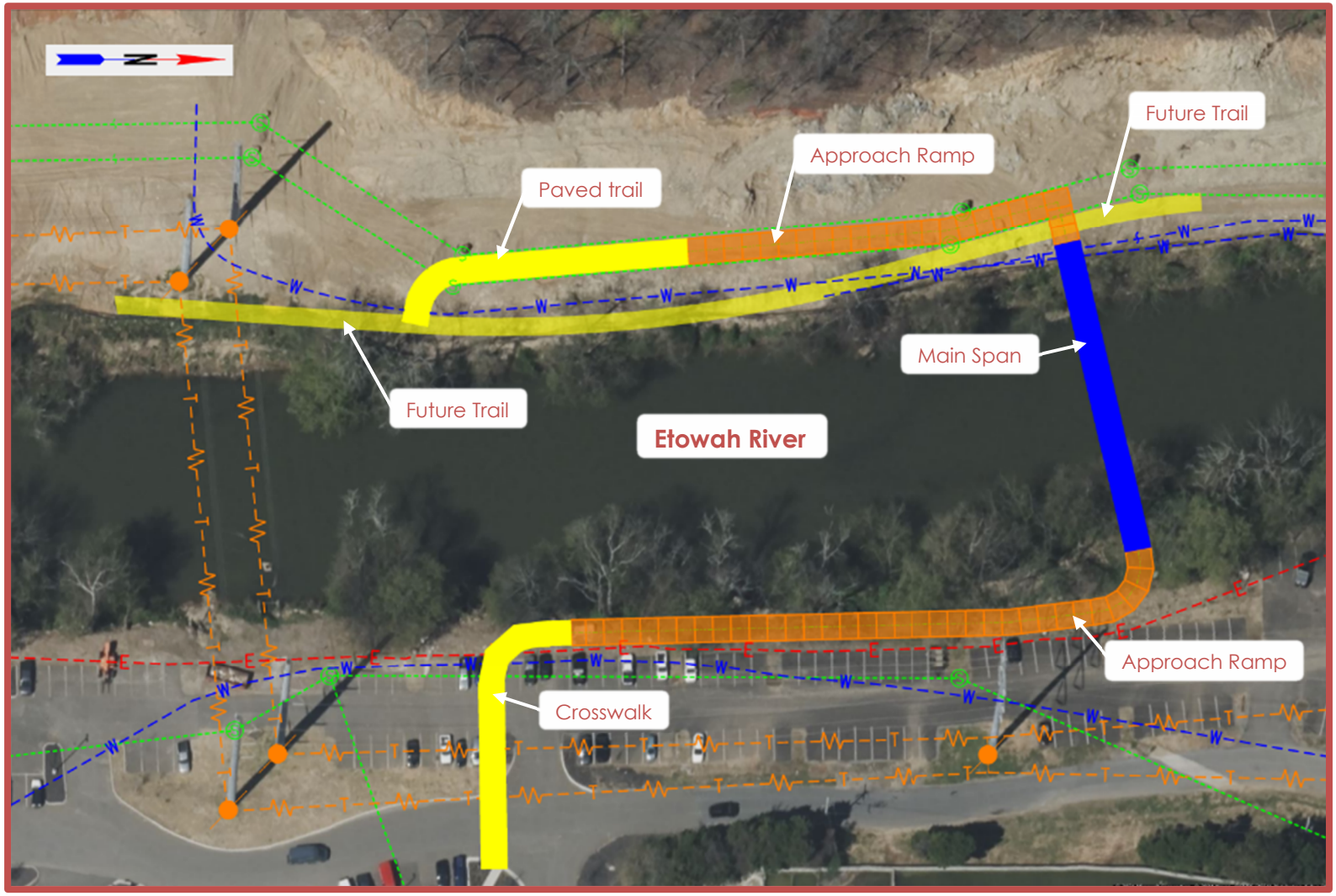
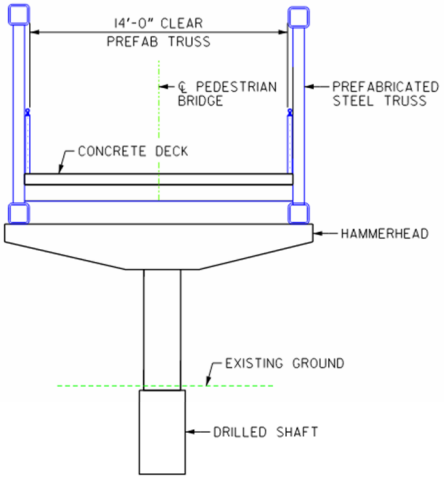
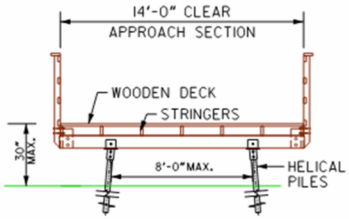


Figure 5. Alternate 3 Proposed Structure Layout

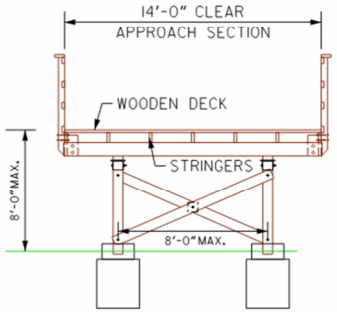
7.3.b) Alternate 3 – Typical Sections & Pros and Cons



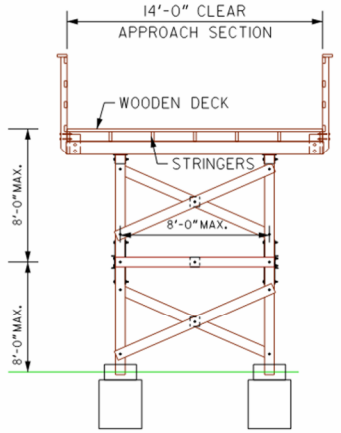
TYPICAL SECTION AT MAIN SPAN BRIDGE



TYPICAL SECTION AT APPROACH RAMPS
30-IN MAX. HEIGHT



TYPICAL SECTION AT APPROACH RAMPS
8-FT MAX. HEIGHT



TYPICAL SECTION AT APPROACH RAMPS
16-FT MAX. HEIGHT

	Pros	Cons
Alternate 3: -East of the River: *Timber deck, timber stringers, timber post on helical piles, concrete hammerhead on drilled shaft* -West of the River: *Timber deck, timber stringers, timber posts on concrete footing, paved trail, concrete hammerhead on drilled shaft*	1. Cost-effective 2. Offers more natural look / aesthetic beauty 3. Lightweight hence easy to construct (applies to approach ramps) 4. Faster construction time 5. Sustainable and environmentally friendly building material (applies to approach ramps)	1. Can only accommodate short spans (applies to approach ramps) 2. High maintenance (applies to approach ramp) 3. Fast aging hence less durability (applies to approach ramps) 4. Potential conflict with the existing sewer lines 5. Short service life (applies to timber members in comparison to concrete and steel)

8. Put-in / Take-Out Overview

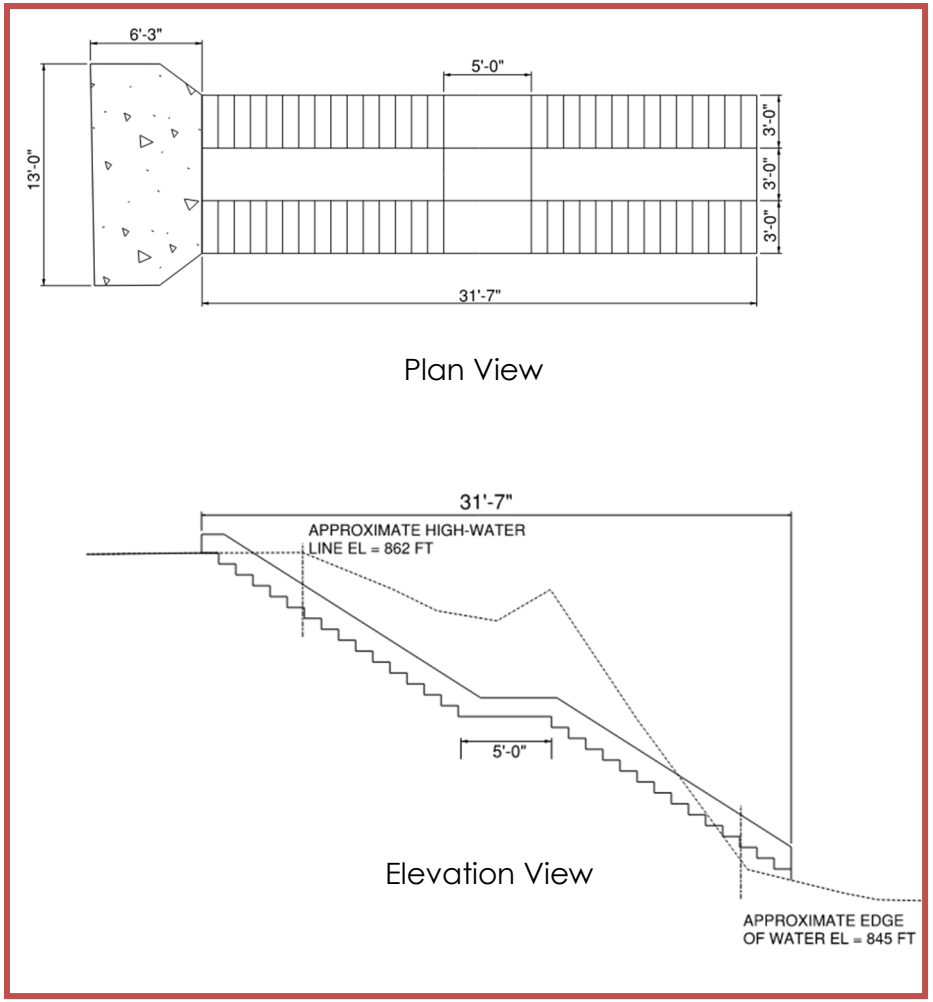
Various locations along both banks of the Etowah River were evaluated to find the most appropriate put-in / take-out location. The current topographic conditions of the site along with the presence of multiple utility lines, and Murph's Surf Shop (private business) were considered. When choosing the location, our intent was to preserve as many parking lot spaces as possible and have minimum disturbance to the surroundings.

Figure 6 suggests the approximate envelope of the proposed location of the put-in/take-out on the east side of the Etowah River near the pedestrian crossing leading to the proposed elevated approach ramp structure. The put-in/take-out is assumed a set of steps.

<u>Proposed Put -in / Take -out Outline:</u>

- Approximate length: 32 ft
- Concrete gore
- Vertical rise: 17 ft (±), will require 5 ft landing
- Width: total width of 9ft: (2) – 3 ft stairways with a 3 ft flat section for kayaks

Example of Put-in / Take-out with Concrete Steps



8.1) Put-in / Take-Out – Proposed Layout

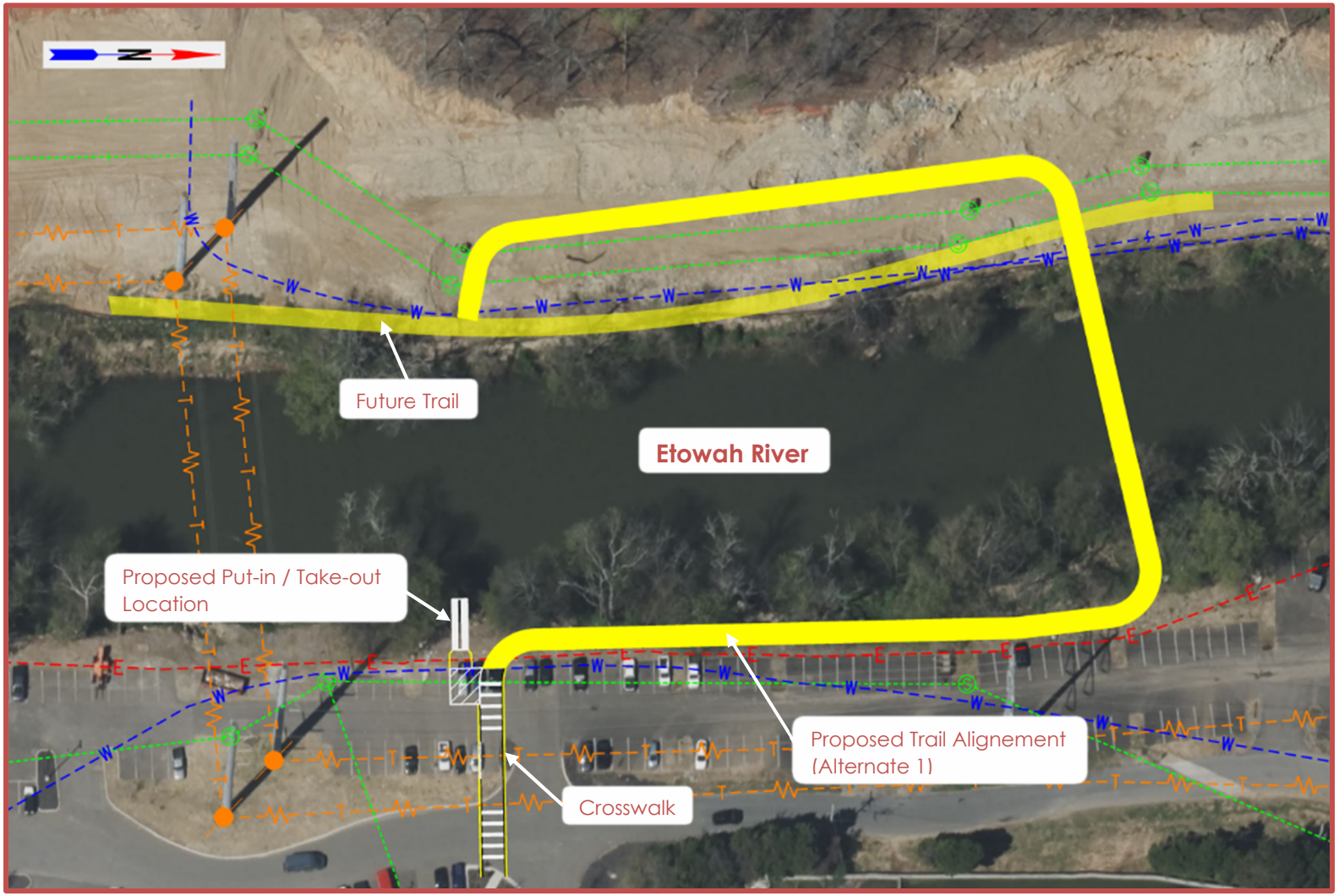


Figure 6. Proposed Location of Put-in / Take-out.

9. Cost Analysis & Comparison

Base costs are calculated based on historic industry pricing taken from representative bid tabs, brought current with appropriate adjustments for inflation for major components of the bridge – deck concrete, deck reinforcement, substructure concrete, substructure reinforcement, beams, piling, and handrail.

The following assumptions are made in this analysis:

1. Costs presented are present-day costs and do not account for inflation during the project period.
2. Foundation costs are based on assumed drilled shafts and helical piles as the foundation type.
3. No contingency costs have been added.

Aesthetic enhancements on concrete, prefabricated truss, and wall structure are included in the unit cost for each.

9.1) Cost Analysis – Put-in / Take-out

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
Put-in/ Take-out	Grading Complete	30 ft x 50 ft	LS	$ -	$ 20,000.00
	Materials and Labor	-	LS	$ -	$ 53,000.00
	Railing	60 ft	LF	$ 150.00	$ 9,000.00
				Total Cost:	**$ 82,000.00**

9.2) Cost Analysis and Alternates Comparison – Pedestrian Trail Crossing

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALTERNATE 1	Prefab Steel Truss (Main Span)	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps (Concrete)	15 ft x 325 ft	SF	$ 250.00	$ 1,218,750.00
	Paved Trail	12 ft x 355 ft	SF	$ 135.00	$ 575,100.00
	Railing (Stainless Steel)	1,365 ft	LF	$ 375.00	$ 511,875.00
	Soil Nail Wall with Perm Facing (incl. foundation)	15ft x 355 ft	SF	$ 165.00	$ 878,625.00
	Approach Abutment / Wall	40 ft x 15 ft	SF	$ 165.00	$ 99,000.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 623,000.00	$ 623,000.00
				Total Cost of Alternate 1:	**$ 5,056,282.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALTERNATE 2	Prefab Steel Truss (Main Span)	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps (Concrete)	15 ft x 498 ft	SF	$ 250.00	$ 1,867,500.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Stainless Steel)	1,526 ft	LF	$ 375.00	$ 572,250.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 2:	**$ 3,965,082.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALTERNATE 3	Prefab Steel Truss (Main Span)	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps (Timber) incl. foundation	15 ft x 498 ft	SF	$ 150.00	$ 1,120,500.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Timber)	1,526 ft	LF	$ 115.00	$ 175,490.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 3:	**$ 2,821,322.00**

9.3) Rating Matrix

Alternate 1, Alternate 2, and Alternate 3 were rated in 5 quantitative variables: design service life, initial cost to build the structure, constructability, aesthetics, and maintenance.

The performance of each alternate was then evaluated and assigned a rate. Ratings from (1-10) were assigned to each variable with 1 being the lowest and 10 being the highest rating. A weight was assigned to each variable depending on importance with 1 being the least important and 3 being most important. The ratings were multiplied by the associated weight to obtain an overall rating for each alternate.

Rating Matrix				
Quantitative Variable (Needs and Desires)	**Weight**	**Rating**		
		Alt. 1	**Alt. 2**	**Alt. 3**
Design Service Life	3	10	10	5
Initial Cost of Alternate	2	6	7	10
Constructability	2	10	8	9
Aesthetics	1	9	7	10
Maintenance Cost	3	10	10	6
Total Score (Max Score = 110)	∑ (Weight x Rating)	**101**	**97**	**81**

10. Summary of Recommended Structure Types

The River Mill District Pedestrian Concept Bridge Type Study assessed various feasible alternates for a new pedestrian bridge structure and approach ramps over the Etowah River, as well as a put-in / take-out addition. This bridge type study identified and evaluated 3 concept alternates and defined the various constraints that controlled the structure type selection such as geometry (typical section, plan and profile), edge railing, bridge appurtenances, and construction requirements. Along with the River Mill topography, some of the main challenges discovered during the survey of the site are the multiple existing utility lines that run adjacent to the project site.

The main goal of this study was to determine and evaluate various alternates, then recommend an alternate that is efficient, cost-effective, and resilient structure. This alternate was to complement the historical importance of the River Mill surroundings while minimizing utility impacts and disturbance to the surroundings area. We also considered the significance of aesthetics as an integral part of the concept study. The report also considered and compared the implications of each bridge and approach alternate and costs to aid in making a final recommendation. Costs are based on the square foot and / or linear foot costs estimated above and account for the various constraints identified.

Our recommendation is Alternate 1 due to 1) its longer design structure life, 2) minimal maintenance of the structures and walls; 3) its ability to be enhanced aesthetically with the use of weathering steel, formliners, and other means, and 4) no impact to the utilities present at the project site. As shown on the Rating Matrix Table, Alternate 1 has the highest score of 101 out of 110. The Alternate 1 alignment to the west of the Etowah River has the lowest length of elevated structures (approach ramps).

Alternate Decking

	Pros	Cons
1. Wood Composite Decking: Reference: Trex Decking *(Applies to Alternates 1,2 and 3)*	1. Environmentally friendly product (composed of 95% recycled material). 2. More durable than pressure-treated timber. 3. Lower maintenance than timber decking, no splintering or splitting. 4. Highly resistant to insect damage, rotting, and decay. 5. Lower initial cost vs. metal decking. 6. 20–30 years lifespan vs. 10 years for conventional wood decking.	1. Higher initial cost vs. pressure-treated timber. 2. Higher absorption and retention of heat vs. pressure-treated timber (dependent on sun exposure and color of decking). Can lead to skin burns. 3. Can fade, sag, and warp due to high UV exposure. 4. Requires the addition of slip tape to conform with ADA requirements.
	Pros	Cons
2. Metal Decking: Reference: Various Steel Manufacturers *(Applies to Alternates 1 and 2, assumes steel beam superstructure)*	1. Lightweight sections. 2. Various finishes available. 3. Longer service life vs. wood composite decking. 4. ADA compliant. 5. 60+ years lifespan	1. Requires at least one additional beam to support superstructure vs. concrete deck and beams. 2. Higher initial cost vs. wood and wood composite decking.

Metal Decking vs. Concrete Decking on the Main Span Truss – The use of concrete on the main truss span for the deck gives the span a maintenance-free, non-slip, and heat resistant surface for the pedestrian vs. metal decking which will eventually require maintenance for the connections to the truss, can become a slick surface when wet or covered with debris, and retains heat resulting in a hot surface. Concrete decking may have a higher initial cost as compared to the metal decking but future maintenance on the metal decking will eventually offset the initial cost difference. However, metal decking would reduce the overall weight of the span resulting in easier construction (lifting and setting the truss).

The following cost comparisons will show the difference between various decking (concrete, metal, composite). Note, the metal decking was deemed not to be a viable option on concrete beams. Therefore, Alternates 1B & 1C, and 2B & 2C were created to incorporate metal or composite (Trex) decking on steel beams in lieu of concrete beams.

Cost Analysis and Comparison of Alternate Decking – Alternate 1:

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 1A – Concrete Deck on Concrete Beam	Prefab Steel Truss (Main Span) – Concrete Deck	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps - Concrete Deck & Beam	15 ft x 325 ft	SF	$ 250.00	$ 1,218,750.00
	Paved Trail	12 ft x 355 ft	SF	$ 135.00	$ 575,100.00
	Railing (Stainless Steel)	1,365 ft	LF	$ 375.00	$ 511,875.00
	Soil Nail Wall with Perm Facing (incl. Foundation)	15ft x 355 ft	SF	$ 165.00	$ 878,625.00
	Approach Abutment / Wall	40 ft x 15 ft	SF	$ 165.00	$ 99,000.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 623,000.00	$ 623,000.00
				Total Cost of Alternate 1A:	**$ 5,056,282.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 1B - Metal Deck on Steel Beam	Prefab Steel Truss (Main Span) – Metal Deck	16 ft x 180 ft	SF	$ 350.00	$ 1,008,000.00
	Approach Ramps – Metal Deck & Steel Beam	15 ft x 325 ft	SF	$ 270.00	$ 1,316,250.00
	Paved Trail	12 ft x 355 ft	SF	$ 135.00	$ 575,100.00
	Railing (Stainless Steel)	1,365 ft	LF	$ 375.00	$ 511,875.00
	Soil Nail Wall with Perm Facing (incl. Foundation)	15ft x 355 ft	SF	$ 165.00	$ 878,625.00
	Approach Abutment / Wall	40 ft x 15 ft	SF	$ 165.00	$ 99,000.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 623,000.00	$ 623,000.00
				Total Cost of Alternate 1B:	**$ 5,052,982.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 1C - Trex Decking on Steel Beam	Prefab Steel Truss (Main Span) – Metal Deck	16 ft x 180 ft	SF	$ 350.00	$ 1,008,000.00
	Approach Ramps – Trex Decking & Steel Beam	15 ft x 325 ft	SF	$ 233.00	$ 1,135,875.00
	Paved Trail	12 ft x 355 ft	SF	$ 135.00	$ 575,100.00
	Railing (Stainless Steel)	1,365 ft	LF	$ 375.00	$ 511,875.00
	Soil Nail Wall with Perm Facing (incl. Foundation)	15ft x 355 ft	SF	$ 165.00	$ 878,625.00
	Approach Abutment / Wall	40 ft x 15 ft	SF	$ 165.00	$ 99,000.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 623,000.00	$ 623,000.00
				Total Cost of Alternate 1C:	**$ 4,872,607.00**

Cost Analysis and Comparison of Alternate Decking – Alternate 2:

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 2A - Concrete Deck on Concrete Beams	Prefab Steel Truss (Main Span) – Concrete Deck	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps – Concrete Deck & Beam	15 ft x 498 ft	SF	$ 250.00	$ 1,867,500.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Stainless Steel)	1,526 ft	LF	$ 375.00	$ 572,250.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 2A:	**$ 3,965,082.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 2B - Metal Deck on Steel Beam	Prefab Steel Truss (Main Span) – Metal Deck	16 ft x 180 ft	SF	$ 350.00	$ 1,008,000.00
	Approach Ramps – Metal Deck & Steel Beam	15 ft x 498 ft	SF	$ 270.00	$ 2,016,900.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Stainless Steel)	1,526 ft	LF	$ 375.00	$ 572,250.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 2B:	**$ 4,013,682.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 2C - Trex Decking on Steel Beam	Prefab Steel Truss (Main Span) – Metal Deck	16 ft x 180 ft	SF	$ 350.00	$ 1,008,000.00
	Approach Ramps – Trex Decking & Steel Beam	15 ft x 498 ft	SF	$ 233.00	$ 1,740,510.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Stainless Steel)	1,526 ft	LF	$ 375.00	$ 572,250.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 2C:	**$ 3,737,292.00**

Cost Analysis and Comparison of Alternate Decking – Alternate 3:

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 3A – All Timber (Approaches)	Prefab Steel Truss (Main Span) – Concrete Deck	16 ft x 180 ft	SF	$ 385.00	$ 1,108,800.00
	Approach Ramps (Timber) incl. Foundation	15 ft x 498 ft	SF	$ 150.00	$ 1,120,500.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Timber)	1,526 ft	LF	$ 115.00	$ 175,490.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 3A:	**$ 2,821,322.00**

	Structure Element	Geometry	Cost per	Unit Cost	Total Cost
ALT 3B – Trex Deckig on Timber Superstr. & Substructure	Prefab Steel Truss (Main Span) – Metal Deck	16 ft x 180 ft	SF	$ 350.00	$ 1,008,000.00
	Approach Ramps - Trex Decking on Timber Sub	15 ft x 498 ft	SF	$ 170.00	$ 1,269,900.00
	Paved Trail	12 ft x 170 ft	SF	$ 135.00	$ 275,400.00
	Railing (Timber)	1,526 ft	LF	$ 115.00	$ 175,490.00
	Crosswalk (along The Mill Parking lot)	14 ft x 226 ft	SF	$ 13.00	$ 41,132.00
	Grading Complete	1	LS	$ 100,000.00	$ 100,000.00
				Total Cost of Alternate 3B:	**$ 2,869,922.00**

7.1.a) Alternate 1 – Proposed Layout

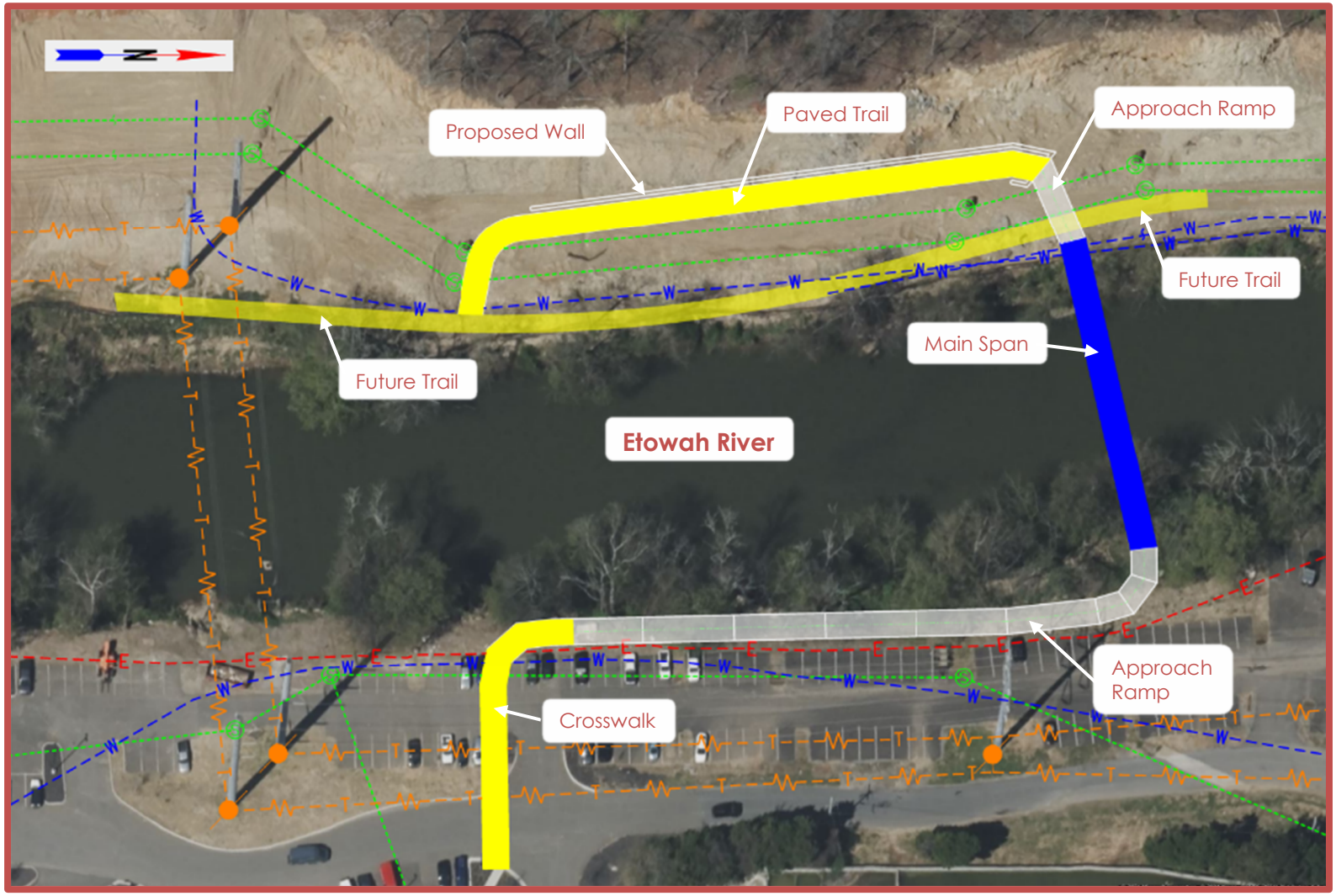


Figure 3. Alternate 1- Preferred Alternate: Proposed Structure Layout