FRANKLINTON RAIL CROSSING DESIGN ALTERNATIVES STUDY

Prepared by
Parsons Brinckerhoff
434 Fayetteville Street
Suite 1500
Raleigh, NC 27601

for the

North Carolina Capital Area MPO (CAMPO)
The Professional Building, Suite 800
127 West Hargett Street
Raleigh, NC 27601

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1.0 Introduction

Franklinton, North Carolina is located approximately 30 miles north of downtown Raleigh along the US 1 highway corridor. Approximately one mile east of US 1 is an existing railroad corridor that has been identified as a critical link in the Southeast High Speed Rail (SEHSR) system planned to connect Richmond, Virginia to Raleigh, North Carolina.

As part of the Southeast High Speed Rail (SEHSR) Environmental Impact Statement (EIS) analysis, it has been identified that up to eight at-grade rail crossings near and through Franklinton will be closed. To mitigate the impact of these closings, the North Carolina Department of Transportation (NCDOT) is in the process of more detailed evaluation on multiple grade separations. Based on the previously developed public hearing maps, three grade separated roadway crossings have been proposed (including the existing NC 56 Green Street overpass). Specific to this report, no alternative has been advanced that would provide a connection serving access between downtown Franklinton and Mason Street to the east.

This study was initiated by the North Carolina Capital Area Metropolitan Planning Organization (CAMPO) to examine and identify grade separated roadway options that may be feasible to better serve downtown Franklinton. Four horizontal alignments were identified as possible alternatives for providing a grade separation which would link downtown Franklinton with Mason Street east of the tracks. A preliminary design was developed for each alternative examining both a roadway overpass of the existing railroad tracks as well as an underpass. For each design, slope stakes were determined and conceptual planning level cost estimates were developed.

The purpose of this analysis was to identify potential alternatives that could be examined and compared with other options being examined as part of the SEHSR EIS analysis. It has been completed on an accelerated schedule and is intended to provide a conceptual overview and comparison of alternatives. It is understood that more detailed analysis will need to be conducted at a future stage. Nevertheless, the analysis conducted to date has been done to a level of detail sufficient to provide an initial screening of potentially viable alternatives.

2.0 Study Process & Meetings

The study process for this project is on an accelerated duration of less than one month. As such, it is intended as a conceptual analysis and does not examine all issues associated with a proposed crossing. As part of this process, three meetings were held with staff from the Town of Franklinton, CAMPO, and NCDOT Rail.

In developing the alternatives, a meeting was held with CAMPO and the Town of Franklinton on June 16, 2011. The objectives of the Town were discussed at this meeting. A field visit was held where various alternatives as well as historic buildings and other features were identified. It was determined that the goal of this study was to identify a design alternative that would provide a grade separated connection over (or under) the proposed SEHSR tracks that would maintain a connection between downtown Franklinton and Mason Street.

A coordination meeting was held on June 22, 2011 between CAMPO and NCDOT Rail staff and consultants to discuss the current status of the SEHSR EIS development as well as to review options investigated by NCDOT. NCDOT presented multiple alternatives for both roadway and pedestrian access. The NCDOT team indicated that they were open to considering additional alternatives as part of the SEHSR examinations assuming that alternatives could be identified that would meet NCDOT and federal design guidelines.

The preliminary findings were discussed with CAMPO and Town of Franklinton staff during a meeting on June 27, 2011. At this meeting, seven options on four different horizontal alignment alternatives were discussed. This document summarizes in greater detail the project findings and identifies two alternatives for more detailed study.

Note that no public meetings were held as part of this screening analysis. A formal public involvement process would be required as part of future studies if specific alternatives were to be examined in greater detail.

3.0 Issues Examined

The focus of this examination was to identify an alternative that could meet NCDOT and federal engineering guidelines and geometric requirements for consideration as part of the SEHSR EIS. Four horizontal alignments were identified as possible alternatives. Preliminary designs were developed including horizontal and vertical alignments, edges of pavement, slope stakes, and planning level cost estimates. A subjective comparison of the alternatives was conducted that examined design features as well as the primary impacts of each alignment.

3.1 Design Issues

The primary goal of this analysis is to identify one or more alternatives that would be considered viable for evaluation for future roadway connections in Franklinton as part of the EIS evaluation of the SEHSR.

3.1.1 Design Guidelines

Since a strict set of design criteria were not available from NCDOT, the following information was used for application to the conceptual alternative designs. While these criteria could change in more detailed design, it was assumed that they would provide solid assumptions for the investigation of alternatives for this project.

- Connector roads would need to meet both NCDOT and federal requirements in order to be eligible for consideration of funding related to the SEHSR.
- It is generally assumed that local roadways would be classified as a collector roadway as defined in the American Association of State Highway Transportation Officials (AASHTO*) 2004 Policy on Geometric Design of Highways and Streets* (i.e., the *2004 Green Book*).
- For testing purposes, a typical section with a 30-foot base pavement width is being used for cross streets. This typical section is consistent with the NCDOT typical section for a collector per NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* (July 2003).
- A 12 percent maximum grade was identified as the maximum allowable grade for identifying feasible alternatives based on the AASHTO *2004 Green Book* (See Section 3.1.2).
- The evaluation of grades did need to take into account the potential for a second parallel track or extension of sidings along the railroad (even if these were not detailed on the SEHSR public hearing maps).

- Railroad clearance needs to be a minimum of 24'-3" in order to provide for potential electrification of future light rail.
- Structure depths were assumed to be six feet for a highway bridge (i.e. an overpass) and eight feet for a railroad bridge. These depths would be refined in future design steps.
- A 25 mph design speed would be appropriate tying into the downtown Franklinton street grid.

3.1.2 Maximum Vertical Grades

The critical factor affecting the viability of an alternative was determined to be the maximum grades on the proposed alignment. Due to vertical clearances required for a railroad overpass or underpass, combined with relatively short distances between the railroad tracks and tie-in points to the local roads, the required grades exceeded 10 percent in all cases and more than 15 percent in some cases. Note that these findings were generally consistent with expectations based on previous analysis that indicated grades may preclude a grade separation in the downtown area of Franklinton.

Prior to the development of grades, a review of the *2004 Green Book* was conducted. As indicated in Exhibit 6-8 of the Green Book, a maximum grade of up to 12 percent is allowed on an urban collector in rolling terrain with a 25 mph design speed. This could reach as high as 15 percent if the roadway were classified as a local street. Based upon this review and consultation with CAMPO, it was determined that the preferred design concepts would be limited to 12 percent (if possible).

3.2 Planning and Impact Issues

The primary focus of this analysis was to identify geometrically viable design alternatives. As such, other planning and impact issues were not examined in detail recognizing that these would need to be itemized and examined in greater detail if a specific alternative were advanced to further study as part of the SEHSR or other studies. Nevertheless, in the evaluation of alternatives certain factors were noted that are called out as part of the alternative comparison. Some of these issues included:

- **Impacts to Buildings/ Nearby Land Use** – In general, there is a strong desire to avoid buildings. In some cases, however, alignments and construction will likely require impacts to buildings or parcels. In general, the analysis identifies potential impacts and, in some cases, assumes the construction of retaining walls to protect specific properties.
- **Historic Structures** – A formal review of historic structures has not been conducted. For certain alternatives, however, specific structures are identified

that may have historic significance. This is provided for information only and will require verification at a later stage. In addition, the selection of alternatives was not directly influenced by consideration of a possible historic district within Franklinton.

- **Traffic Volumes and Operations** – A formal study of traffic patterns has not been conducted. Based upon examination of available NCDOT Annual Average Daily Traffic (AADT) counts, however, traffic volumes in downtown Franklinton are assumed to be relatively low and could be accommodated with a two-lane typical section. In terms of roadway classification, it is currently assumed that a new alternative would be an urban collector facility.
- **Roadway Network and Circulation** – Ideally, a proposed alternative would utilize the existing Mason Street corridor and preserve the existing network patterns. Since this is likely not practical (as shown by previous reviews), provision for a crossing at Vine Street would also be desirable, but is not required. The key circulation concern of the town is providing an alternative crossing somewhere north of the existing Green Street underpass, but located within roughly one-quarter mile of the downtown high school. In terms of a connection on the east side of the tracks, access to Mason Street is required. A connection into Tanyard Street could also potentially provide an alternate route to connect roadways east of the railroad tracks.
- **Complete Streets and Provision for Bicycles/Pedestrians** – The proposed alternatives assume provision for both bicycle and pedestrian facilities on the proposed roadway section. It is understood that final provision would be subject to a more formal review of bicycle and pedestrian plans for the Town of Franklinton and NCDOT. Regardless, the analysis assumes these facilities are included in order to provide a conservative review of impacts and costs. It is possible that provision for bicycle and pedestrian facilities as part of a street alternative may eliminate the need for alternative pedestrian-only access related to the SEHSR.

3.3 Factors Examined in Comparison Analysis

As stated previously, four alternatives were identified and then examined both as an overpass and underpass at the railroad (resulting in the comparison of 7 variations). For the comparison of alternatives, a colored matrix examining multiple design features and issues is provided as Table 2. A series of colors are utilized ranging from light green for more positive features to pink for more negative features or impacts. Red is used to identify potential fatal flaws. This comparison examines four general categories:

- **Grade Requirements** – Identifies the critical grades on both sides of the railroad tracks. The calculation of grades assumed that the proposed roadway would tie into Main Street without elevation changes on the downtown side of the tracks, cross over/under the railroad tracks, and then tie into Mason Street with minimal grade changes on the east side of the tracks. As a result, the grades reflected what was required on each alignment instead of assuming a certain maximum grade prior to the design.

  After a grade was established it was compared with the desired maximum grade of 12 percent. In general, a grade of 12 percent or less was viewed as acceptable and a grade of more than 12 percent was considered a potential fatal flaw (although, as noted previously, consideration of a specific alternative as a local roadway instead of an urban collector could allow for a 15 percent grade).

- **Construction Issues** – Three specific design details were examined under this criteria including cost, drainage requirements, and the need for walls. Planning level construction cost estimates are summarized for each alternative in Table 1. Note that these alternatives are preliminary and subject to change. In addition, the estimated costs do not include right-of-way estimates. For drainage, the primary factor considered was whether positive drainage could be obtained or a pump would be required. The provision of walls is a major cost consideration depending upon the height and potential visible impacts of a wall.

Table 1. Planning Level Cost Estimates

Summary Sheet (see Appendix B)	Alternative	Planning Level Construction Cost Estimate
B-1	Alternative 1 with Overpass	$3.3 million
B-2	Alternative 1 with Underpass	$8.9 million
B-3	Alternative 2 with Overpass (grades identified as feasible)	$4.1 million
B-4	Alternative 2 with Underpass	$9.2 million
B-5	Alternative 3 with Overpass	$3.9 million
B-6	Alternative 4 with Overpass (grades identified as feasible)	$4.8 million
B-7	Alternative 4 with Underpass	$9.6 million

Notes:

- All costs are preliminary and subject to change with design refinements and more detailed analysis.
- Costs shown do not reflect right of way (ROW) acquisition and related costs.

Table 2 - Comparison of Alternate Alignments

	Alternative 1 Overpass	Alternative 1 Underpass	Alternative 2 Overpass	Alternative 2 Underpass	Alternative 3 Overpass Only	Alternative 4 Overpass	Alternative 4 Underpass
Grade Requirements							
Max Grade to West (toward downtown)	12.0%	16.5%	12.0%	14.1%	14.0%	12.0%	15.5%
Max Grade to East (toward Tanyard Street)	14.6%	10.5%	10.4%	6.6%	14.7%	12.0%	6.0%
Construction Issues							
Construction Cost	$3.3 million	$8.9 million	$4.1 million	$9.2 Million	$3.9 million	$4.8 million	$9.6 million
Drainage	Positive Drainage	Sag created under tracks/ Requires pump	Positive Drainage	Undercuts existing box culvert at RR tracks/ Requires pump	Positive Drainage	Positive Drainage	Sag created under tracks/ Requires pump
Walls Required to Avoid Buildings	10 ft wall required adjacent to historical house & downtown business on Vine Street	5 ft wall required adjacent to historical house & downtown business on Vine Street	10 ft wall required adjacent to 2 houses on Main Street	5 ft wall required adjacent to 2 houses on Main Street	30 ft wall required adjacent to downtown buildings on Front Street	10 ft wall required adjacent to historical house & downtown business on Vine Street	5 ft wall required adjacent to historical house & downtown business on Vine Street
Building Impacts							
West of RR Tracks (downtown side)	Requires relocation of driveway & carport for historic building	Requires relocation of driveway & carport for historic building	None	None	None	Requires relocation of driveway & carport for historic building	Requires relocation of driveway & carport for historic building
East of RR Tracks (toward Tanyard Street)	None	None	1 Building taken (house)	None	1 Building taken (house)	1 Building taken (house)	2 Buildings taken (1 house & historic depot)
Circulation & Roadway Network							
Downtown Circulation	Ties into Vine Street	Ties into Vine Street	Ties into Main Street 400 feet north of Vine Street	Ties into Main Street 400 feet north of Vine Street	Indirectly ties into Mason Street	Ties into Vine Street	Ties into Vine Street
Tie into Mason Street east of tracks	Creates 4 way stop with Tanyard	Creates 4 way stop with Tanyard	Creates 4 way stop with Tanyard	Creates 4 way stop with Tanyard	Creates 4 way stop with Tanyard	Direct tie into Mason	Direct tie into Mason
Other Circulation Issues	None	None	None	None	Right angle turn at stop condition on bridge	Grade issues tying old Mason and Tanyard	Grade issues tying old Mason and Tanyard

Legend:
Minimal impact/ higher benefit
Low impact/ high benefit
Medium impact/ moderate benefit
High impact/ low benefit
Potential fatal flaw

Notes:

Construction costs are preliminary and subject to change with design refinements and more detailed analysis.

Costs shown do not reflect right of way acquistion and related costs.

- **Building Impacts –** In general, the proposed alignments must tie into the existing downtown network west of the railroad tracks and then pass through more rural residential type parcels east of the track. The impacts to building range from full takes to access issues at driveways related to walls and construction. Note that in some cases, it is likely that final design can be refined to minimize or eliminate building impacts. For planning purposes, however, it was more conservative to overestimate impacts.

- **Circulation & Roadway Impacts** – The primary operational and circulation goal is to find an alternative grade separated access over the railroad tracks and maintain a connection to Mason Street east of downtown. Nevertheless, the various alternatives vary in how well they service the downtown Franklinton roadway network as shown Table 2.

4.0 Overview of Alternatives

Four basic alternatives were considered with three of the alternatives examining both an overpass and underpass alignments at the railroad tracks for a total of seven options. The plan and profile design for each of these options are shown in Appendix A. In addition, Appendix B provides the assumptions and quantities used in the planning level estimate at this stage.

As noted in Section 3.3, a comparison analysis is illustrated in Table 2. As noted, the analysis utilizes a series of colors ranging from light green for more positive features to pink for more negative features or impacts. Red is used to identify potential fatal flaws.

For each alternative a description of the improvement, a summary of critical findings, and a conclusion is provided. In addition, differences in providing an overpass or an underpass for each alternative are examined.

4.1 Alternative 1

Description: An extension of Vine Street to the east crossing the railroad tracks. This alignment ties directly into Tanyard Street creating a four leg intersection with East Mason Street. Both an overpass and underpass were tested.

Critical findings:

- Neither the overpass (14.6 percent) nor underpass (16.5 percent) alignment can be constructed without exceeding a 12 percent grade. This is a potential fatal flaw regardless of other findings.
- With an overpass, Alternative 1 is estimated to have $3.3 million in construction costs. This increases to $8.9 million with an underpass due to additional costs associated with providing a railroad bridge along an active rail line.
- The provision of an underpass would create a sag under the tracks and require a pump for drainage.
- The Vine Street approach will require walls to prevent impacts to buildings including a downtown business and a potential historic house.
- Access to the driveway and carport for the potentially historic house will need to be relocated.

Conclusion: Alternative 1 (as an overpass or underpass) is not recommended for future study.

4.2 Alternative 2

Description: This alternative proposes a new roadway connecting into North Main Street at an undeveloped residential lot located approximately 400 feet north of Vine Street. The alignment crosses the railroad and turns south to connect directly into Tanyard Street. Both an overpass and underpass were tested.

Critical findings:

- An overpass can be constructed using a 12 percent grade between Main Street and the railroad and a 10.4 percent grade to the east. Based on a 12 percent design threshold, this option is viable based on grades. In contrast, an underpass alignment requires a 14.1 percent grade to the west and cannot be constructed without exceeding a 12 percent maximum grade. This is a potential fatal flaw with an underpass regardless of other findings.
- With an overpass, Alternative 2 is estimated to have $4.1 million in construction costs. This increases to $9.2 million with an underpass due to additional costs associated with providing a railroad bridge along an active rail line.
- The provision of an underpass would create a sag under the tracks and require a pump for drainage. More critically, however, an underpass in this location would also undercut a box culvert under the railroad tracks exacerbating the drainage issues.
- The Main Street approach will require walls to minimize construction impacts and to provide adequate distance for a sidewalk and landscaping adjacent to the two houses on either side of the proposed road.
- One house (a mobile home) on the east side of the railroad tracks will be impacted requiring relocation.
- The new connection into Main Street will require a short diversion for downtown traffic from both Mason Street and Vine Street to cross the railroad tracks.
- The new connection comes into the east side of Main Street across from a historic structure located on the west side of Main Street. No physical impacts to this property are proposed.

Conclusion: *Alternative 2 (as an overpass) is a viable alternative and is recommended for consideration as part of future studies by CAMPO or the SEHSR study.* The Alternative 2 alignment with a railroad underpass is not recommended, however.

4.3 Alternative 3

Description: This alignment connects directly into Mason Street on the downtown side of the tracks. It provides a parallel 350 foot upgrade to the tracks along the existing Front Street, requires a 90 degree turn across the railroad tracks, and then connects directly into Tanyard Road. This concept requires an extensive retaining wall along Front Street to prevent impacts to the downtown businesses along Front Street. Due to multiple issues (primarily related to sight distance and safety), an overpass of the railroad tracks was the only option considered.

Critical findings:

- The proposed overpass alternative alignment requires a 14.0 percent and 14.7 percent grade on each side of the tracks, exceeding a 12 percent grade. This is a potential fatal flaw regardless of other findings.
- With an overpass, Alternative 3 is estimated to have $3.9 million in construction costs.
- The roadway section along Front Street will require a 30-foot high wall along the back side of multiple downtown businesses. This is not desired by the town and would provide a visible impact in addition to introducing increased costs.
- One house on the east side of the railroad tracks will be impacted requiring relocation.
- The new connection via Front Street will require all vehicles using the overpass to execute two right angle turns – one at Main Street and one at the top of the bridge where Front Street turns to cross over the bridge. In addition to providing indirect access to downtown, the potential for crashes at these locations is higher than with a straight alignment.

Conclusion: Alternative 3 (as an overpass) is not a viable alternative due to grades. In addition, it has negative impacts to downtown that are not desired. Therefore, the alignment is not recommended for further study.

4.4 Alternative 4

Description: Similar to Alternative 1, this alignment extends Vine Street to the east and crosses the railroad tracks. The alignment then curves to the left directly onto Mason Street. Tanyard Street is realigned slightly to connect with Mason Street at the revised grade point. Both an overpass and underpass were tested.

Critical findings:

- An overpass can be constructed using a 12.0 percent grade to connect with Main Street and a 12.0 percent grade to the east. Based on a 12 percent design

threshold, this makes the overpass option viable based on grades. In contrast, an underpass alignment (up to 15.5 percent grade) cannot be constructed without exceeding a 12 percent maximum grade. This is a potential fatal flaw with an underpass regardless of other findings.

- With an overpass, Alternative 4 is estimated to have $4.8 million in construction costs. This increases to $9.6 million with an underpass due to additional costs associated with providing a railroad bridge along an active rail line.
- The provision of an underpass would create a sag under the tracks and require a pump for drainage.
- The Vine Street approach west of the railroad tracks will require walls to minimize construction impacts to buildings including a downtown business and a potential historic house. In addition, the walls can provide adequate distance for a sidewalk and landscaping adjacent to the buildings on either side of the proposed road.
- Access to the driveway and carport for the potentially historic house on Vine Street will need to be relocated.
- East of the railroad tracks, one house (a mobile home) will be impacted requiring relocation with an overpass. With an underpass, the mobile home and recently relocated Franklinton depot (a historical structure) will both be impacted and require relocation.
- The existing connection of Tanyard Road at East Mason Street will need to be revised to account for a change in elevation on East Mason Street. As a result, Tanyard will require a new alignment and a 10 foot retaining wall will be required near the intersection. The revised alignment on East mason Street will also require reconstruction of an existing culvert at a stream crossing under the roadway.

Conclusion: *Alternative 4 (as an overpass) is a viable alternative and is recommended for consideration as part of future studies by CAMPO or the SEHSR study.* The Alternative 2 alignment with a railroad underpass is not recommended, however.

5.0 Recommended Alternatives and Design Considerations

Based on the review of alternatives, the critical overall finding was that the maximum desired grade of 12 percent was exceeded with five of the seven options tested (as shown in the red highlighting in Table 2). Since this was assumed to be indicative of a potential fatal flaw, the primary conclusion is that only two alternatives would likely be viable for additional study as part of the SEHSR EIS. The two alternatives (and the estimated planning level construction cost) are:

- Alternative 2 with an overpass ($4.1 million plus ROW)
- Alternative 4 with an overpass ($4.8 million plus ROW)

Discussions with the Town of Franklinton and CAMPO staff indicate that of these two options, Alternative 2 is the preferred solution. At the same time, it was agreed that both alternatives be forwarded to NCDOT for possible future consideration as part of the SEHSR EIS analysis.

As noted, the primary focus of this analysis was identifying viable geometric alternatives for future study. In the course of completing these investigations, certain design issues were noted that could be considered in more detail as part of future studies in order to mitigate impacts of the two recommended alternatives or to improve the overall design.

In addition, the current study has relied exclusively on coordination with CAMPO staff, Town of Franklinton officials, and NCDOT staff. Any future studies should include agency coordination and public involvement with outreach to the general public and those individuals directly impacted by the alternatives.

5.1 Alternative 2 with an Overpass - Preferred

- Estimated construction costs for this alternative are $4.1 million. These costs should be re-examined using the base cost assumption being utilized for the SEHSR review. In addition, right of way costs should be examined in future studies.
- The alignment and grade assumed the inclusion of an additional track and extension of a nearby railroad siding despite these not being shown on the public hearing map. If the extra track work is not required (in particular the extension of the siding), the critical grade between Main Street and the railroad tracks

could potentially be reduced from 12 percent to 10 percent based on preliminary analysis. In addition, a shorter bridge may reduce structure depth.

- North of the Alternative 2 overpass, NCDOT Rail indicated the possible introduction of a new track alignment to the northeast. In addition, CAMPO identified this as a possible location of either a rails-to-trails type pedestrian/bicycle project or a future extension of rail transit to Franklinton and points north. More detailed evaluation and consideration of these issues is recommended.
- The proposed alignment utilizes an undeveloped lot on Main Street in a residential section of town. This undeveloped lot is currently available for purchase and may be an opportunity for right of way protection.
- East of the railroad tracks, the roadway impacts larger rural parcels. In addition to determining ROW requirements, more detailed investigations should take into account unofficial development plans that have been informally proposed to town staff in this general area.
- Retaining walls and landscaping will likely be required for the two residential lots adjacent to undeveloped lot noted in the previous bullet. This should be coordinated in future phases of design and planning to examine issues due to landscaping, sidewalks, and property impacts. Note that it is not anticipated that these two houses are historical resources, but this will need investigation.
- East of the railroad tracks, one mobile home would need to be relocated. Based on the current design, it is unlikely that this will be avoided with minor design refinements.
- The connection of the new overpass at Main Street should be examined for traffic requirements and possible signalization.
- The proposed section includes a 30 foot roadway pavement and the provision of 10 foot berms allowing for 5 to 6-foot sidewalks. The specific provisions for bicycles and pedestrians will need to be examined in greater detail.

5.2 Alternative 4 with an Overpass - Feasible

- Estimated construction costs for this alternative are $4.8 million. These costs should be re-examined using the base cost assumption being utilized for the SEHSR review. In addition, right of way costs should be examined in future studies.
- Opportunities for flattening grades are reduced with Alternative 4 because the existing track includes a sidetrack in this location. Regardless, the future track

layout should be checked to verify if there could be opportunities to reduce grades on the Alternative 4 roadway overpass.

- East of the railroad tracks, the roadway impacts larger rural parcels. In addition to determining existing ROW requirements, more detailed investigations should take into account unofficial development plans that have been informally proposed to town staff in this general area.
- Retaining walls and landscaping on Vine Street will need to be coordinated with the downtown business and residential homeowner along Vine Street. This will include issues due to landscaping, sidewalks, the potential removal of on-street parking, and relocation of an existing carport. Note that as part of future studies, the two buildings should be reviewed to determine if either is officially a historic resource or may be eligible.
- East of the railroad tracks, one mobile home would have to be relocated. Based on the current design, it is very unlikely that this will be avoided with minor design refinements.
- East of the railroad tracks, the slope stake line for the fill is estimated to reach within 15 to 20 feet of the recently relocated Franklinton Depot. It is anticipated that this could be completed without requiring relocation of the historic Depot, but future design refinements should try to minimize any resulting impacts.
- The Town of Franklinton has had discussions with an unnamed developer regarding the provision of possible multi-family housing east of the railroad tracks. The Alternative 4 alignment apparently bisects this property. In any event, potential impacts and/or mitigation should be considered as more information becomes available.
- Front Street provides access to railroad ROW that is currently used for parking related to the high school as well as vehicular access to some isolated houses fronting Main Street. Access to these lots would be eliminated with the Alternative 4 alignment and may require more detailed examination if this option is pursued.
- The connection of the new overpass at the intersection of Vine Street at Main Street should be examined for traffic requirements and possible signal refinements.
- The proposed connection of Tanyard Street and Mason Street has been designed to minimize impacts. More detailed review could result in alternative connection solutions.
- The proposed section includes a 30-foot roadway pavement and the provision of 10 foot berms allowing for 5 to 6-foot sidewalks. The specific provisions for bicycles and pedestrians will need to be examined in greater detail.

Appendix A
Conceptual Design of Alternatives

Index of Sheets:

8/17/99

PROJECT REFERENCE NO.	ALTERNATIVE
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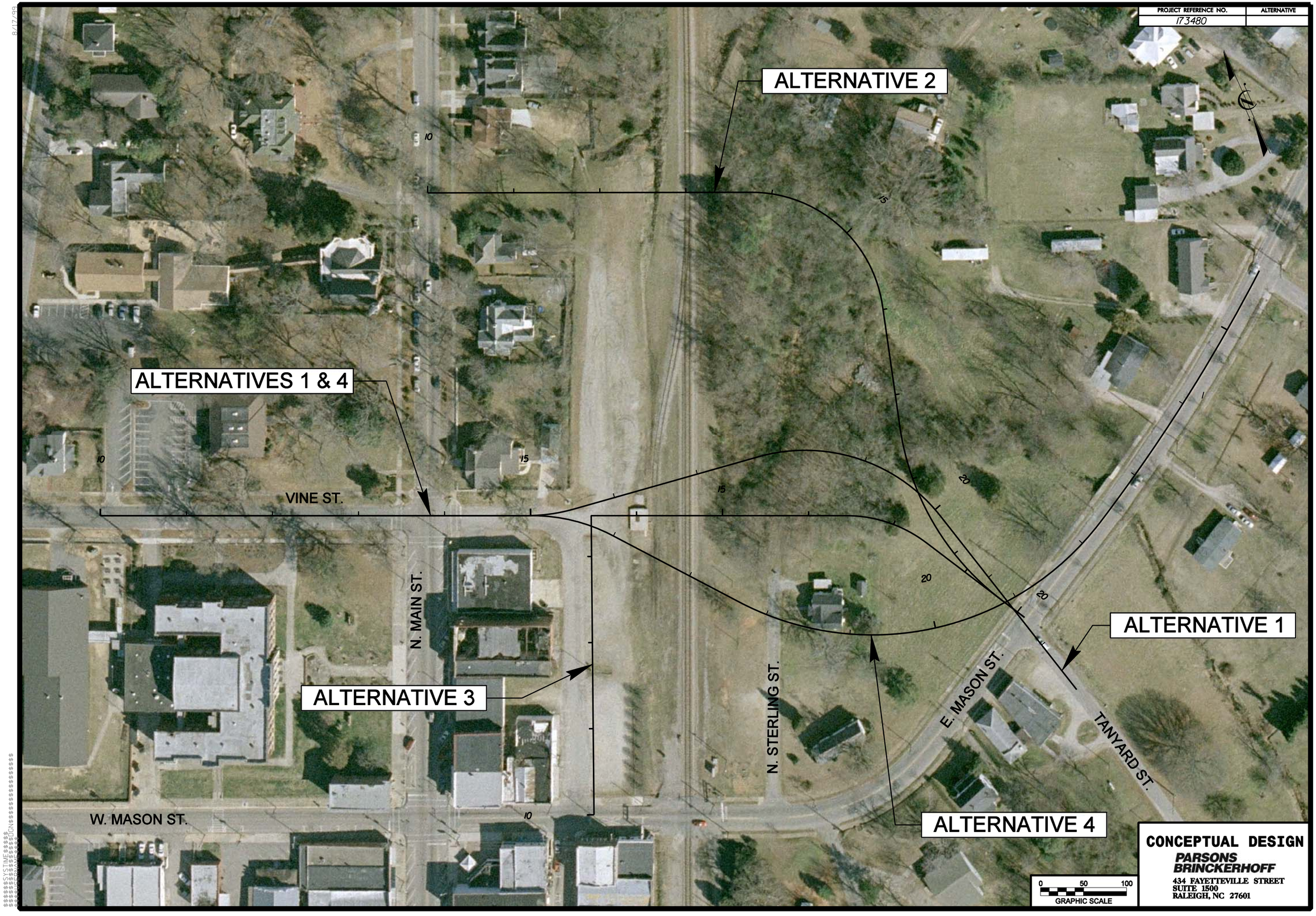


CONCEPTUAL DESIGN

PARSONS BRINCKERHOFF
434 FAYETTEVILLE STREET
SUITE 1500
RALEIGH, NC 27601

8/17/99

PROJECT REFERENCE NO.	ALTERNATIVE
173480	1

PI Sta 15+23.24
△ = 15° 48' 59.4" (LT)
D = 28° 38' 52.4"
L = 55.21'
T = 27.78'
R = 200.00'
e = NC
Ds = 25mph

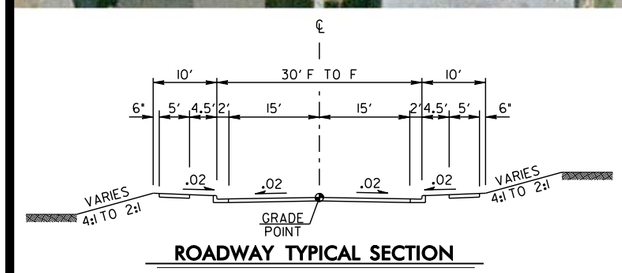
PI Sta 19+07.66
△ = 67° 40' 08.9" (RT)
D = 28° 38' 52.4"
L = 236.21'
T = 134.06'
R = 200.00'
e = NC
Ds = 25mph

N. HILLSBOROUGH ST.
VINE ST.
N. MAIN ST.
N. STERLING ST.
E. MASON ST.
TANYARD ST.

POT Sta. 10+00.00
S 65° 46' 01.7" E
PC Sta. 14+95.46
PT Sta. 15+50.67
S 81° 35' 01.1" E
PC Sta. 17+73.60
PT Sta. 20+09.81
S 13° 54' 52.2" E
POT Sta. 22+66.03

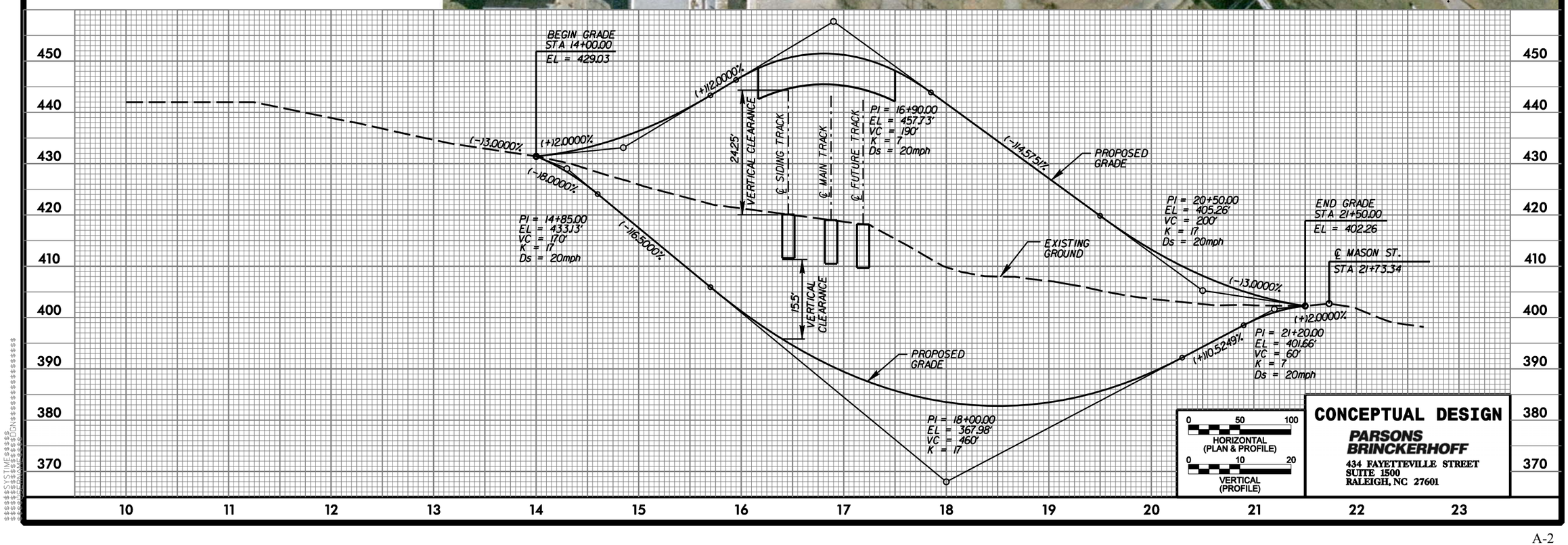
END BRIDGE STA. 17+50.00
BEGIN BRIDGE STA. 16+16.60

PROP SS ABOVE
PROP SS UNDER
PROP RETAINING WALL
30' R
45' R



ROADWAY TYPICAL SECTION

ALTERNATIVE 1



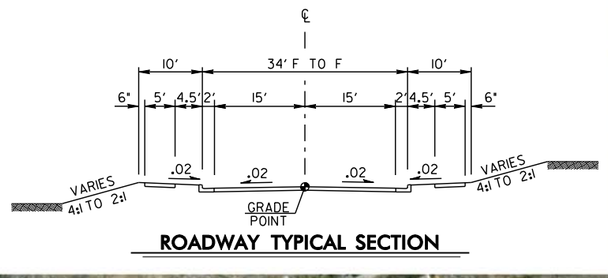
0 50 100
HORIZONTAL (PLAN & PROFILE)
0 10 20
VERTICAL (PROFILE)

CONCEPTUAL DESIGN

PARSONS BRINCKERHOFF
434 FAYETTEVILLE STREET
SUITE 1500
RALEIGH, NC 27601

8/17/99

PROJECT REFERENCE NO.	ALTERNATIVE
173480	2

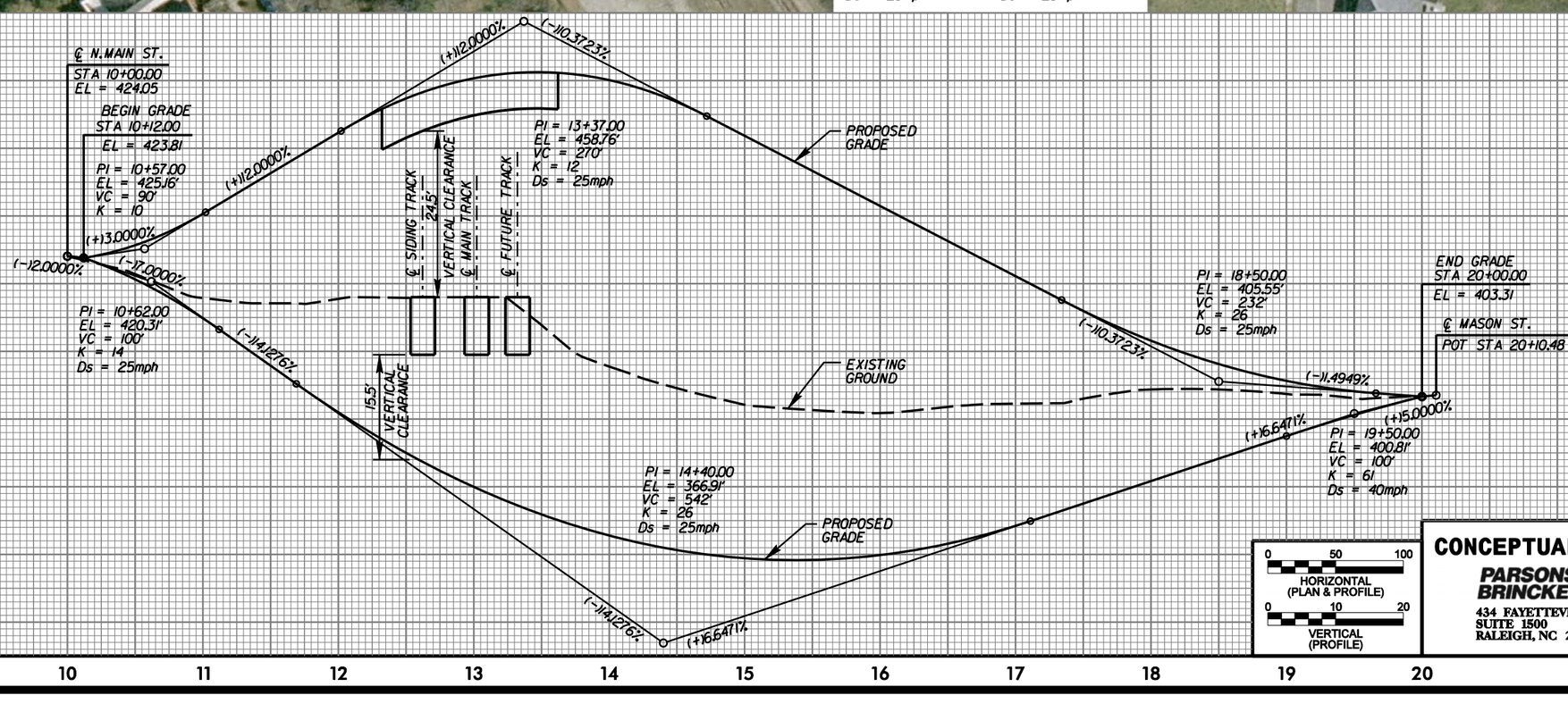


ROADWAY TYPICAL SECTION

PROP SS ABOVE
END BRIDGE STA. 13+62.18
PROP SS UNDER
PT Sta. 15+95.96
PROP SS UNDER
PROP SS ABOVE
PC Sta. 17+38.27
S 16° 01' 54.2" W
E. MASON ST.
BEGIN BRIDGE STA. 12+32.18
END RETAINING WALL
BEGIN RETAINING WALL
30' R
POT Sta. 10+00.00
S 65° 52' 04.8" E
PROP RETAINING WALL
PC Sta. 13+75.82
PROP SS UNDER
PROP SS ABOVE
END RETAINING WALL
30' R
BEGIN RETAINING WALL
PT Sta. 19+77.07
POT Sta. 20+10.48
45' R
S 28° 32' 09.3" E
PROP SS UNDER
45' R
PROP SS ABOVE
N. MAIN ST.
TANYARD ST.

PI Sta 15+09.46	PI Sta 18+64.08
Δ = 81° 53' 59.0" (RT)	Δ = 44° 34' 03.5" (LT)
D = 37° 12' 18.2"	D = 18° 39' 47.2"
L = 220.13'	L = 238.80'
T = 133.63'	T = 125.81'
R = 154.00'	R = 307.00'
e = 4%	e = 3.4%
Ds = 25mph	Ds = 25mph

ALTERNATIVE 2



0 50 100
HORIZONTAL (PLAN & PROFILE)

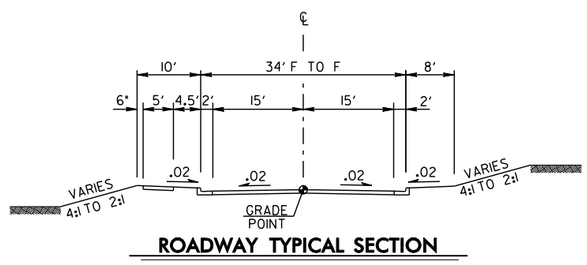
0 10 20
VERTICAL (PROFILE)

CONCEPTUAL DESIGN

PARSONS BRINCKERHOFF
434 FAYETTEVILLE STREET
SUITE 1500
RALEIGH, NC 27601

8/17/99

PROJECT REFERENCE NO.	ALTERNATIVE
173480	3



ROADWAY TYPICAL SECTION

PI Sta 16+95.33
Δ = 37° 13' 52.4" (RT)
D = 37° 12' 18.2"
L = 100.07'
T = 51.87'
R = 154.00'
e = 4%
Ds = 25mph

BEGIN BRIDGE
STA. 13+93.96

END BRIDGE
STA. 15+19.48

10' R

PI Sta. 13+47.40

S 65° 46' 01.7" E

S 28° 32' 09.3" E

45' R

POT Sta. 18+87.02

E. MASON ST.

30' R

PC Sta. 16+43.46

PROP RETAINING WALL

PT Sta. 17+43.53

45' R

N. MAIN ST.

N 23° 42' 35.0" E

PROP RETAINING WALL

N. STERLING ST.

30' R

30' R

POT Sta. 10+00.00

W. MASON ST.

TANYARD ST.

ALTERNATIVE 3

460
450
440
430
420
410
400
390

PI = 12+66.00
EL = 452.22'
VC = 120'
K = 10

PI = 14+67.40
EL = 456.25'
VC = 200'
K = 12
Ds = 25mph

℄ MASON ST.
STA 10+00.00

BEGIN GRADE
STA 10+08.00
EL = 422.15

PI = 10+63.00
EL = 423.80'
VC = 110'
K = 10

(+)14.0000%

(+)12.0000%

(+)12.0000%

(-)14.6620%

END GRADE
STA 13+36.00
EL = 452.01

℄ NEW ROAD
STA 13+47.40
EL = 453.85'

(+)14.0000%

(+)3.0000%

℄ SIDING

℄ MAIN TRACK

℄ FUTURE TRACK

24.9' VERTICAL CLEARANCE

PROPOSED GRADE

EXISTING GROUND

PI = 18+16.00
EL = 405.13'
VC = 118'
K = 10

(-)14.6620%

(-)13.0000%

END GRADE
STA 18+76.00
EL = 403.33

℄ MASON ST.
POT STA 18+87.02

10 11 12 13 14 15 16 17 18 19

0 50 100
HORIZONTAL (PLAN & PROFILE)

0 10 20
VERTICAL (PROFILE)

CONCEPTUAL DESIGN

PARSONS BRINCKERHOFF
434 FAYETTEVILLE STREET
SUITE 1500
RALEIGH, NC 27601

8/17/99

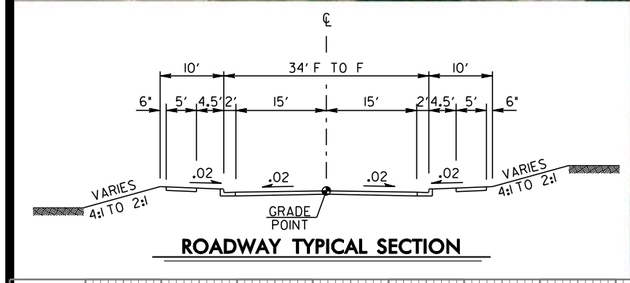
PROJECT REFERENCE NO.	ALTERNATIVE
17.3480	4

PI Sta 15+51.10
Δ = 27° 40' 11.9" (RT)
D = 28° 38' 52.4"
L = 96.59'
T = 49.25'
R = 200.00'
e = NC
Ds = 25mph

PI Sta 20+46.83
Δ = 80° 24' 01.8" (LT)
D = 17° 12' 21.4"
L = 467.28'
T = 281.41'
R = 333.00'
e = NC
Ds = 30mph

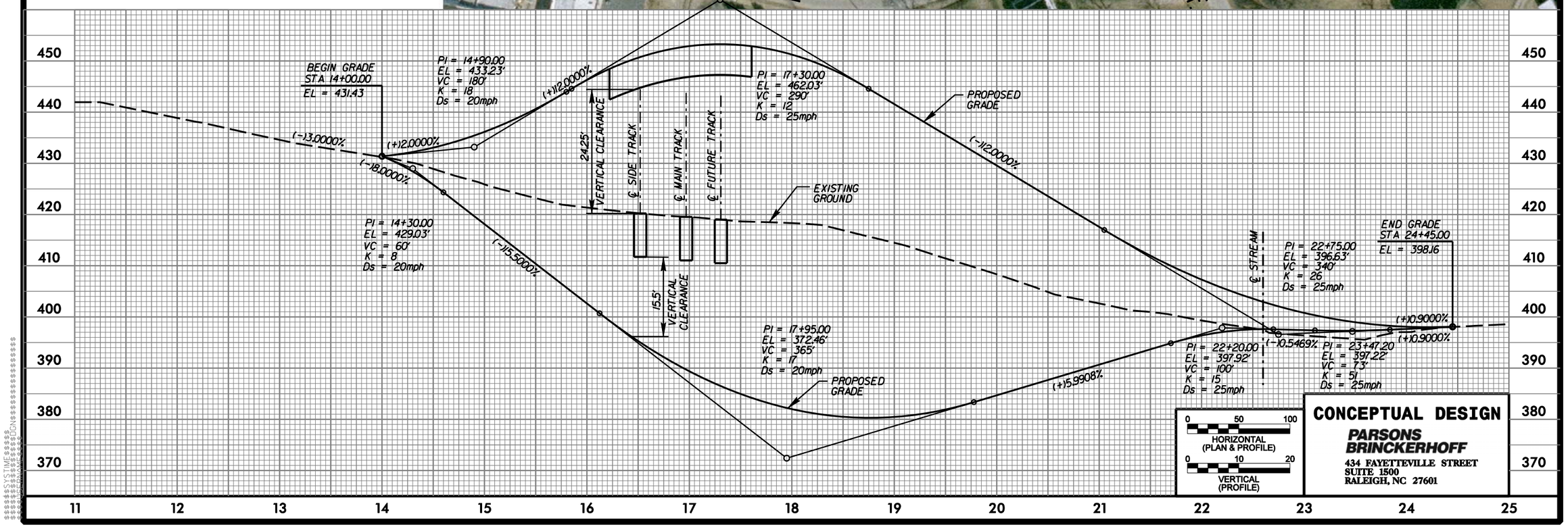
PI Sta 24+05.95
Δ = 9° 54' 05.7" (LT)
D = 2° 51' 53.2"
L = 345.63'
T = 173.25'
R = 2,000.00'
e = NC
Ds = 35mph

VINE ST.
S 65° 46' 01.7" E
POT Sta. 10+00.00
BEGIN RETAINING WALL
PT Sta. 15+98.43
END RETAINING WALL
PROPOSED RETAINING WALLS
BEGIN RETAINING WALL
PC Sta. 15+01.84
N. MAIN ST.
END RETAINING WALL
BEGIN BRIDGE STA. 16+18.00
END BRIDGE STA. 17+65.00
S 35° 05' 49.8" E
PC Sta. 17+65.42
PROP SS ABOVE
PROP SS UNDER
PCC Sta. 22+32.71
PT Sta. 25+78.34
PROP SS ABOVE
PROP SS UNDER
N. STERLING ST.
BEGIN RETAINING WALL
E. MASON ST.
TANYARD ST.
END RETAINING WALL



ROADWAY TYPICAL SECTION

ALTERNATIVE 4



0 50 100
HORIZONTAL (PLAN & PROFILE)
0 10 20
VERTICAL (PROFILE)

CONCEPTUAL DESIGN

PARSONS BRINCKERHOFF
434 FAYETTEVILLE STREET
SUITE 1500
RALEIGH, NC 27601

Appendix B
Planning Level Construction Cost Estimates of Alternatives

Index and Summary of Cost Estimates:

Summary Sheet	Alternative	Planning Level Construction Cost Estimate
B-1	Alternative 1 with Overpass	$3.3 million
B-2	Alternative 1 with Underpass	$8.9 million
B-3	Alternative 2 with Overpass (grades identified as feasible)	$4.1 million
B-4	Alternative 2 with Underpass	$9.2 million
B-5	Alternative 3 with Overpass	$3.9 million
B-6	Alternative 4 with Overpass (grades identified as feasible)	$4.8 million
B-7	Alternative 4 with Underpass	$9.6 million

Notes:

- All costs are preliminary and subject to change with design refinements and more detailed analysis.
- Costs shown do not reflect right of way acquisition and related costs.

North Carolina Department of Transportation
Preliminary Estimate

Alternative 1 Overpass **Func** County: **Franklin**
Route
From Sta. 13+25.00 to Sta. 22+50.00 **CONSTR. COST**
Typical Section **$3,322,000**

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.0	Acre	$ 20,000.00	$ 20,000.00
			Earthwork Borrow	57,200	CY	$ 7.00	$ 400,400.00
			Drainage New Location	0.18	Miles	$ 350,000.00	$ 63,000.00
			Fine Grading	2,250	SY	$ 2.00	$ 4,500.00
			New Pavement	2,250	SY	$ 40.00	$ 90,000.00
			Subgrade Stabilization	2,250	SY	$ 6.00	$ 13,500.00
			2'-6" Concrete Curb and Gutter	1350	LF	$ 13.00	$ 17,550.00
			4" Concrete Sidewalk	373	SY	$ 26.00	$ 9,706.67
			Traffic Control	0.2	Miles	$ 30,000.00	$ 5,400.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 3,600.00
			Structures				
			New Structure 45 x 134	6,030.00	SF	$ 150.00	$ 904,500.00
			Retaining Wall	10,200.00	SF	$ 80.00	$ 816,000.00
			Misc. & Mob (15% Strs&Util)				$ 258,075.00
			Misc. & Mob (45% Functional)				$ 282,445.50

Lgth 0.18 Miles **Contract Cost** …… $ 2,888,677.17
E. & C. 15% …… $ 433,301.58
Construction Cost …… **$ 3,322,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 1 Underpass **Func** County: **Franklin**
Route
From Sta. 13+25.00 to Sta. 22+50.00
Typical Section

CONSTR. COST
$8,920,000

Prepared By: Davin Wallace Date #######
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.0	Acre	$ 20,000.00	$ 20,000.00
			Earthwork Unclassified	44,750	CY	$ 8.00	$ 358,000.00
			Drainage New Location	0.18	Miles	$ 350,000.00	$ 63,000.00
			Fine Grading	2,917	SY	$ 2.00	$ 5,833.33
			New Pavement	2,917	SY	$ 40.00	$ 116,666.67
			Subgrade Stabilization	2,917	SY	$ 6.00	$ 17,500.00
			2'-6" Concrete Curb and Gutter	1600	LF	$ 13.00	$ 20,800.00
			4" Concrete Sidewalk	373	SY	$ 26.00	$ 9,706.67
			Traffic Control	0.2	Miles	$30,000.00	$ 5,400.00
			Thermo and Markers	0.2	Miles	$20,000.00	$ 3,600.00
			Track Detour	1.0	LS	$400,000.00	$ 400,000.00
			Structures				
			New Rail Bridge 3Tracks X 175'L	525.00	TF	$ 10,000.00	$ 5,250,000.00
			Retaining Wall	2,600.00	SF	$ 80.00	$ 208,000.00
			Misc. & Mob (15% Strs&Util)				$ 818,700.00
			Misc. & Mob (45% Functional)				$ 459,228.00

Lgth 0.18 Miles

Contract Cost ……..	$ 7,756,434.67
E. & C. 15% ……..	$ 1,163,465.20
Construction Cost ……..	**$ 8,920,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 2 Overpass **Func** County: **Franklin**
Route
From Sta. 10+00.00 TO Sta. 20+00.00
Typical Section

CONSTR. COST
$4,123,000

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.5	Acre	$ 20,000.00	$ 29,889.81
			Earthwork Borrow	113,100	CY	$ 7.00	$ 791,700.00
			Drainage New Location	0.19	Miles	$ 350,000.00	$ 66,500.00
			Fine Grading	3,022	SY	$ 2.00	$ 6,044.44
			New Pavement	3,022	SY	$ 40.00	$ 120,888.89
			Subgrade Stabilization	3,022	SY	$ 6.00	$ 18,133.33
			2'-6" Concrete Curb and Gutter	1,800	LF	$ 13.00	$ 23,400.00
			4" Concrete Sidewalk	961	SY	$ 26.00	$ 24,988.89
			Traffic Control	0.2	Miles	$ 30,000.00	$ 5,700.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 3,800.00
			Structures				
			New Structure 45 x 130	5,850.00	SF	$ 150.00	$ 877,500.00
			Retaining Wall	10,800.00	SF	$ 80.00	$ 864,000.00
			Misc. & Mob (15% Strs&Util)				$ 261,225.00
			Misc. & Mob (45% Functional)				$ 490,970.41

Lgth 0.19 Miles

Contract Cost ……	$ 3,584,740.78
E. & C. 15% ……	$ 537,711.12
Construction Cost ……	**$ 4,123,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 2 Underpass **Func** County: **Franklin**
Route
From Sta. 10+00.00 TO Sta. 20+00.00
Typical Section

CONSTR. COST
$9,158,000

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.5	Acre	$ 20,000.00	$ 30,000.00
			Earthwork Unclassified	53,750	CY	$ 8.00	$ 430,000.00
			Drainage New Location	0.19	Miles	$ 350,000.00	$ 66,500.00
			Fine Grading	3,667	SY	$ 2.00	$ 7,333.33
			New Pavement	3,667	SY	$ 40.00	$ 146,666.67
			Subgrade Stabilization	3,667	SY	$ 6.00	$ 22,000.00
			2'-6" Concrete Curb and Gutter	33,000	LF	$ 13.00	$ 429,000.00
			4" Concrete Sidewalk	961	SY	$ 26.00	$ 24,988.89
			Traffic Control	0.2	Miles	$ 30,000.00	$ 5,700.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 3,800.00
			Track Detour	1.0	LS	$ 400,000.00	$ 400,000.00
			Structures				
			New Rail Bridge 3Tracks X 165'L	495.00	TF	$ 10,000.00	$ 4,950,000.00
			Misc. & Mob (15% Strs&Util)				$ 742,500.00
			Misc. & Mob (45% Functional)				$ 704,695.00

Lgth 0.19 Miles

Contract Cost ……	$ 7,963,183.89
E. & C. 15% ……	$ 1,194,477.58
Construction Cost ……	**$ 9,158,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 3 **Func** County: **Franklin**
Route
From Sta. 10+00.00 TO Sta. 18+87.02
Typical Section

CONSTR. COST
$3,893,000

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.0	Acre	$ 20,000.00	$ 20,000.00
			Earthwork Borrow	54,700	CY	$ 7.00	$ 382,900.00
			Drainage New Location	0.17	Miles	$ 350,000.00	$ 59,500.00
			Fine Grading	2,667	SY	$ 2.00	$ 5,333.33
			New Pavement	2,667	SY	$ 40.00	$ 106,666.67
			Subgrade Stabilization	2,667	SY	$ 6.00	$ 16,000.00
			2'-6" Concrete Curb and Gutter	1,550	LF	$ 13.00	$ 20,150.00
			4" Concrete Sidewalk	461	SY	$ 26.00	$ 11,988.89
			Traffic Control	0.2	Miles	$ 30,000.00	$ 5,100.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 3,400.00
			Structures				
			New Structure 45 x 125	5,625.00	SF	$ 150.00	$ 843,750.00
			Retaining Wall	16,300.00	SF	$ 80.00	$ 1,304,000.00
			Misc. & Mob (15% Strs&Util)				$ 322,162.50
			Misc. & Mob (45% Functional)				$ 283,967.50

Lgth 0.17 Miles **Contract Cost** …… $ 3,384,918.89
E. & C. 15% …… $ 507,737.83
Construction Cost …… **$ 3,893,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 4 Overpass **Func** County: **Franklin**
Route
From Sta. 14+00.00 TO Sta. 25+50
Typical Section

CONSTR. COST
$4,805,000

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.0	Acre	$ 20,000.00	$ 20,000.00
			Earthwork Borrow	79,350	CY	$ 7.00	$ 555,450.00
			Drainage New Location	0.22	Miles	$ 350,000.00	$ 77,000.00
			Fine Grading	4,078	SY	$ 2.00	$ 8,155.56
			New Pavement	4,078	SY	$ 40.00	$ 163,111.11
			Subgrade Stabilization	4,078	SY	$ 6.00	$ 24,466.67
			2'-6" Concrete Curb and Gutter	5,050	LF	$ 13.00	$ 65,650.00
			4" Concrete Sidewalk	778	SY	$ 26.00	$ 20,222.22
			Traffic Control	0.2	Miles	$ 30,000.00	$ 6,600.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 4,400.00
			Track Detour	1.0	LS	$ 400,000.00	$ 400,000.00
			Structures				
			New Structure 45 x 147	6,615.00	SF	$ 150.00	$ 992,250.00
			Retaining Walls	11,500.00	SF	$ 80.00	$ 920,000.00
			Culverts				
			Single Barrel	1	EA	$ 25,000.00	$ 25,000.00
			Misc. & Mob (15% Strs&Util)				$ 290,587.50
			Misc. & Mob (45% Functional)				$ 605,275.00

Lgth 0.22 Miles

Contract Cost …… $ 4,178,168.06
E. & C. 15% …… $ 626,725.21
Construction Cost …… **$ 4,805,000.00**

North Carolina Department of Transportation
Preliminary Estimate

Alternative 4 Underpass **Func** County: **Franklin**
Route
From Sta. 14+00.00 TO Sta. 25+50
Typical Section

CONSTR. COST
$9,636,000

Prepared By: Davin Wallace Date 7/6/2011
Requested By: Date

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Clearing and Grubbing	1.0	Acre	$ 20,000.00	$ 20,000.00
			Earthwork Unclassified	64,125	CY	$ 8.00	$ 513,000.00
			Drainage New Location	0.22	Miles	$ 350,000.00	$ 77,000.00
			Fine Grading	4,667	SY	$ 2.00	$ 9,333.33
			New Pavement	4,667	SY	$ 40.00	$ 186,666.67
			Subgrade Stabilization	4,667	SY	$ 6.00	$ 28,000.00
			2'-6" Concrete Curb and Gutter	5,350	LF	$ 13.00	$ 69,550.00
			4" Concrete Sidewalk	778	SY	$ 26.00	$ 20,222.22
			Traffic Control	0.2	Miles	$ 30,000.00	$ 6,600.00
			Thermo and Markers	0.2	Miles	$ 20,000.00	$ 4,400.00
			Structures				
			New Rail Bridge 3Tracks X 195'L	585.00	TF	$ 10,000.00	$ 5,850,000.00
			Retaining Walls	2,900.00	SF	$ 80.00	$ 232,000.00
			Culverts				
			Single Barrel	1	EA	$ 25,000.00	$ 25,000.00
			Misc. & Mob (15% Strs&Util)				$ 916,050.00
			Misc. & Mob (45% Functional)				$ 420,647.50

Lgth 0.22 Miles

Contract Cost …… $ 8,378,469.72
E. & C. 15% …… $ 1,256,770.46
Construction Cost …… **$ 9,636,000.00**