

SECTION IV

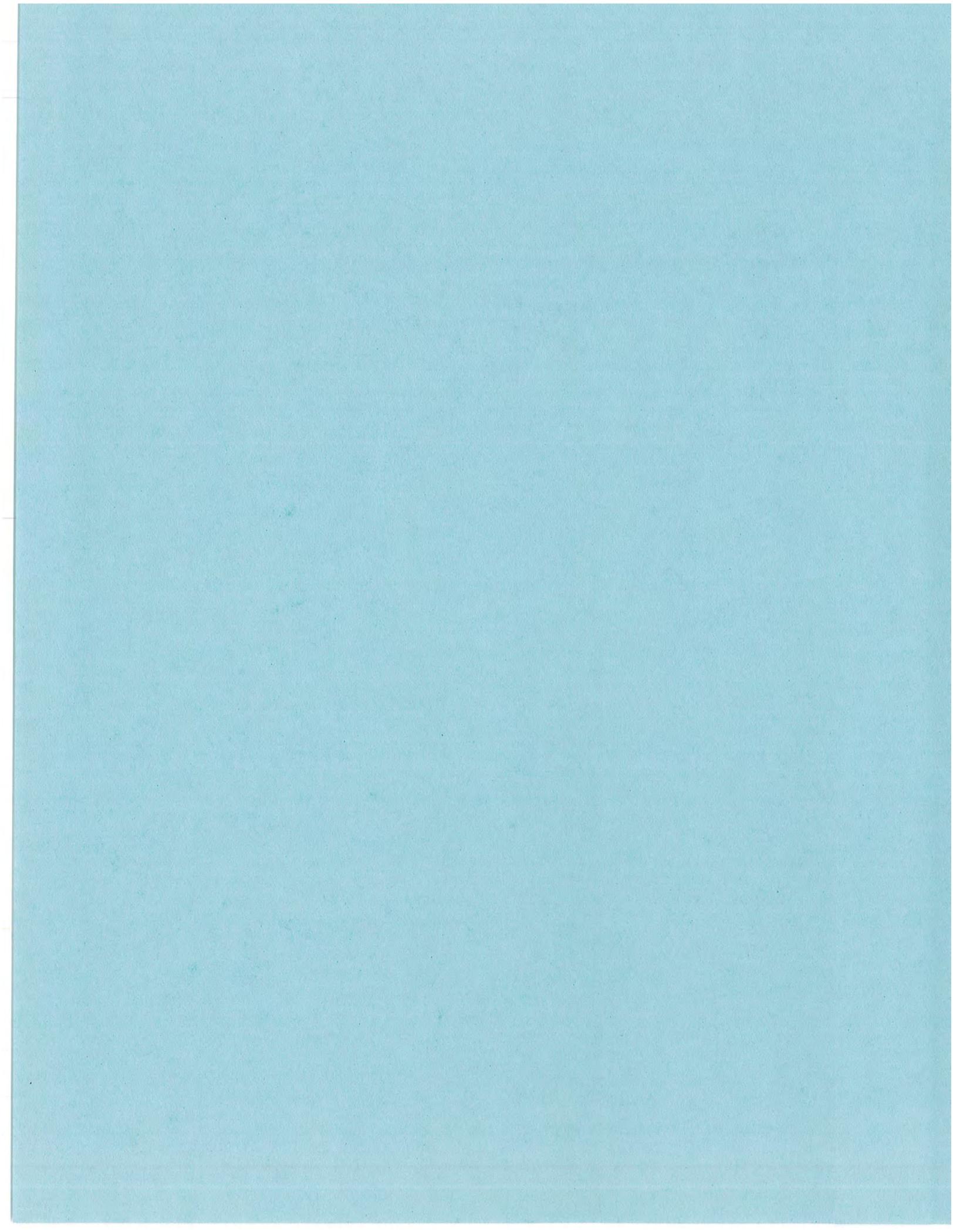
PROPOSED IMPROVEMENTS



BUILDING THE FUTURE

Winston-Salem

BUSINESS 40



IV. PROPOSED IMPROVEMENTS

The proposed improvements for each alternative carried forward are discussed below.

A. FUNCTIONAL CLASSIFICATION AND ROADWAY CROSS-SECTIONS

The classifications of the roadways within the project study area are stated in Section II.C.1 [Functional Classification]. These classifications may need to be reevaluated once an alternative is chosen.

The proposed cross-sections are consistent between the two (2) alternatives, but vary for each roadway in the project limits, as noted in Table 13. The proposed shoulders along US 421/ I-40 Business will consist of: inside shoulders four (4) foot wide with concrete median barrier and outside shoulders of eight (8) foot wide with a four (4) foot expressway gutter without auxiliary lane, or four (4) foot wide with a four (4) foot expressway gutter with auxiliary lane. Typical sections for US 421/ I-40 Business and NC 150 (Peters Creek Parkway) are shown in Figures 17a through 17c.

Table 13. Proposed Cross-sections and Right-of-Way of Roadways

Roadway	Number of Travel Lanes*	Width of Travel Lanes*	Right-of-Way Width
US 421/ I-40 Business	2 EB and 2 WB Through Lanes with select Auxiliary Lanes	EB & WB Lanes = 12 ft Aux Lanes = 12 ft	Varies - 153 ft minimum ³
W. Fourth Street ¹	1 NB and 1 SB Through Lanes	No change to existing widths is proposed	50 ft ⁴
NC 150 (Peters Creek Parkway)	Varies 3 NB and 3 SB Through Lanes, and 1 SB Turn Lane	NB & SB Lanes = 12 ft	Varies - 87 ft minimum ³
Green Street	Pedestrian Bridge	N/A	45 ft ⁴
Broad Street	1 NB and 1 SB Through Lanes, and 1 Center Turn Lane	NB & SB Lanes = 12 ft Center Lane = 12 ft	68 ft ⁴
Brookstown Avenue	1 NB and 1 SB Through Lanes	NB & SB Lanes = 12 ft	40 ft ⁴
Spruce Street ²	1 NB and 1 SB Through Lanes	NB & SB Lanes = 10 ft	Varies - 40 ft minimum ³
Marshall Street	3 SB Lanes	Outside Lanes = 14 ft Center Lane = 12 ft	60 ft ⁴
Cherry Street	3 NB Lanes	Outside Lanes = 14 ft Center Lane = 12 ft	60 ft ⁴
Liberty Street	3 SB Lanes	Outside Lanes = 14 ft Center Lane = 12 ft	60 ft ⁴
Main Street	3 NB Lanes	Outside Lanes = 11 and 14 ft Center Lane = 11 ft	Varies - 54 ft minimum ³
Church Street	1 NB and 1 SB Through Lanes	NB & SB Lanes = 11 ft	Varies - 57 ft minimum ³

* Eastbound (EB), Westbound (WB), Northbound (NB) and Southbound (SB)

1 No improvements are proposed – existing to remain in place

2 Only applicable with Alternative 3

3 Asymmetrical about Centerline

4 Symmetrical about Centerline

B. HORIZONTAL AND VERTICAL ALIGNMENT

The mainline vertical alignment will be improved by decreasing the number of crest and sag curves and allowing better vertical clearance of the cross street bridges, see Sections IV. I. [Structures] of this document. The proposed maximum grade on US 421/I-40 Business is six (6) percent and ten (10) percent on ramps and loops. Ramp and loop improvements include improved (larger) radii and increased length allowing for exiting and entry speeds on ramps and loops to meet current standards. Both alternatives mirror the existing horizontal alignments of the mainline and cross streets.

C. RIGHT-OF-WAY AND ACCESS CONTROL

The right-of-way widths for each roadway in the project limits, are noted in Table 13 above. Within the project study area US 421/I-40 Business is a full control of access facility all other roadways have no control of access.

D. DESIGN SPEED AND POSTED SPEED LIMIT

Based on the preliminary design the design speeds and proposed posted speed limits for the roadways within the project limits are listed in Table 14.

Table 14. Design Speed and Proposed Posted Speed Limits on Roadways

Roadway	Design Speed	Proposed Posted Speed Limit ^{1,2}
US 421/I-40 Business	50 mph	45 mph
W. Fourth Street	N/A since no work is proposed on the roadway	N/A
NC 150 (Peters Creek Parkway)	50 mph	45 mph
Green Street	Not Applicable north of US 421/I-40 Business and Not posted south of US 421/I-40 Business– assume 35 mph	
Broad Street	30 mph	25 mph
Brookstown Avenue	30 mph	25 mph
Spruce Street ³	25 mph	20 mph
Marshall Street	30 mph	25 mph
Cherry Street	40 mph	35 mph
Liberty Street	30 mph	25 mph
Main Street	30 mph	25 mph
Church Street	30 mph	25 mph

1 Recommended based on the Design Speed

2 Regional Traffic Engineer and City of Winston-Salem Traffic Engineering will recommend the posted Speed Limit

3 Only applicable with Alternative 3

E. ANTICIPATED DESIGN EXCEPTIONS

NCDOT prefers not to have design exceptions for the proposed project. If design exceptions are needed during design they will be submitted for approval prior to construction.

F. INTERCHANGES/GRADE SEPARATED CROSSINGS

Proposed interchanges by alternative within the project limits are located at:

Alternative 3 - Liberty/Main (main access to downtown Winston-Salem) Deep Cut, see Figure 15

- **NC 150 (Peters Creek Parkway)** – a partial cloverleaf interchange is proposed. This interchange will consist of one (1) ramp and one (1) loop, each, in the northeast and southeast quadrants. The proposed interchange will provide full access movements with NC 150 (Peters Creek Parkway) which is bridged over US 421/I-40 Business;
- **Broad Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access movements from Broad Street to US 421/I-40 Business (eastbound) and from westbound US 421/I-40 Business to Broad Street;
- **Liberty Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access movements from Liberty Street to US 421/I-40 Business (westbound only) and from eastbound US 421/I-40 Business to Liberty Street;
- **Main Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access movements from Main Street to US 421/I-40 Business (eastbound) and from westbound US 421/I-40 Business to Main Street.

Alternative 4 - Cherry/Marshall (main access to downtown Winston-Salem) Deep Cut, see Figure 16

- **NC 150(Peters Creek Parkway)** – a partial cloverleaf interchange is proposed. This interchange will consist of one (1) ramp and one (1) loop, each, in the northeast and southeast quadrants. The proposed interchange will provide full access movements with NC 150 (Peters Creek Parkway) which is bridged over US 421/I-40 Business;
- **Marshall Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access movements from Marshall Street to US 421/I-40 Business (westbound only) and from eastbound US 421/I-40 Business to Marshall Street;
- **Cherry Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access

movements from Cherry Street to US 421/I-40 Business(eastbound only) and from westbound US 421/I-40 Business to Cherry Street, and;

- **Main Street** – a partial diamond interchange is proposed. This interchange will consist of two (2) ramps in parallel quadrants which will provide partial access movements from Main Street to US 421/I-40 Business (eastbound) and from westbound US 421/I-40 Business to Main Street.

Proposed grade separated crossings by alternative within the project limits are shown in Table 15 below.

Table 15. Proposed Grade Separated Crossings by Alternative

	Alternative 3	Alternative 4
W. Fourth Street crossing of US 421/I-40 Business	Overpassed	Overpassed
Green Street crossing of US 421/I-40 Business	Overpassed (pedestrian bridge only)	Overpassed (pedestrian bridge only)
Broad Street crossing of US 421/I-40 Business	N/A this alternative, an interchange is proposed	Overpassed
US 421/I-40 Business crossing of Brookstown Avenue	Overpassed	Overpassed
Spruce Street crossing of US 421/ I-40 Business	Overpassed	N/A this alternative, no bridge is proposed
Marshall Street crossing of US 421/ I-40 Business	Overpassed	N/A this alternative, an interchange is proposed
Cherry Street crossing of US 421/ I-40 Business	Overpassed	N/A this alternative, an interchange is proposed
Liberty Street crossing of US 421/I-40 Business	N/A this alternative, an interchange is proposed	Overpassed
Church Street crossing of US 421/I-40 Business	Overpassed	Overpassed

Based on the need to maintain the current utilities being carried by the Green Street Bridge, to provide access to a regional recreational facility (BB&T Ballpark) and the status of Green Street (see Section II.C.2.e [Interchanges/Grade Separated Crossings]) a pedestrian/utility bridge is proposed versus a vehicular bridge to replace the existing structure.

G. SERVICE ROADS

There are no proposed service roads in either alternative within the project limits

H. RAILROAD CROSSINGS

There are no railroad crossings in the project study area.

I. STRUCTURES

The eleven (11) existing and three (3) proposed structures within the project study area will be improved by alternative are noted in Table 16a below.

Table 16a. Proposed Bridges by Alternative

Bridge No.	Carries / Crosses	Proposed Improvement	Proposed Width ^{1,2}	Proposed Length ⁴	
				Alternative 3	Alternative 4
269	W. Fourth Street / US 421/I-40 Business	Maintenance	N/A	N/A	N/A
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	Replacement - Vehicular	96 ft (Clear Roadway Width)	124 ft	124 ft
286	Green Street ³ / US 421/I-40 Business	Replacement - Pedestrian	10 ft (Clear Roadway Width)	132 ft	132 ft
178	Broad Street / US 421/I-40 Business	Replacement - Vehicular	48 ft (Clear Roadway Width)	88 ft	92 ft
288	US 421/I-40 Business / Brookstown Avenue	Replacement - Vehicular	26 ft (Horizontal Clearance Under)	52 ft	52 ft
291	Spruce Street / US 421/I-40 Business ⁵	Replacement - Vehicular	24 ft (Clear Roadway Width)	104 ft	N/A ⁵
293	Marshall Street / US 421/I-40 Business	Replacement - Vehicular	44 ft (Clear Roadway Width)	104 ft	88 ft
305	Cherry Street / US 421/I-40 Business	Replacement - Vehicular	30 ft (Clear Roadway Width)	124 ft	86 ft
New	Cherry Street / US 421/I-40 Business Westbound Off Ramp/ Strollway	New Structure - Vehicular	30 ft (Horizontal Clearance Under)	N/A	48 ft
New	Cherry Street / US 421/I-40 Business Eastbound On Ramp / Strollway	New Structure - Vehicular	30 ft (Horizontal Clearance Under)	N/A	58 ft
New	US 421/I-40 Business / Strollway	New Structure - Vehicular	30 ft (Horizontal Clearance Under)	46 ft	46 ft
New	Liberty Street / US 421/I-40 Business Westbound On Ramp/ Strollway	New Structure - Vehicular	30 ft (Horizontal Clearance Under)	46 ft	N/A
New	Liberty Street / US 421/I-40 Business Eastbound Off Ramp / Strollway	New Structure - Vehicular	20 ft (Horizontal Clearance Under)	280 ft	N/A
312	Liberty Street / US 421/I-40 Business	Replacement - Vehicular	44 ft (Horizontal Clearance Under)	88 ft	112 ft
313	Main Street / US 421/I-40 Business	Replacement - Vehicular	29 ft (Clear Roadway Width)	82 ft	98 ft
336	Church Street / US 421/I-40 Business	Replacement - Vehicular	34 ft (Clear Roadway Width)	144 ft	148 ft

1 Proposed widths are subject to change based on negotiations with the City of Winston-Salem and final designs

2 Clear Roadway Width or Minimum Horizontal Clearance under Structure

3 Bridge is Currently Closed

4 Approximate Lengths, Actual lengths will be determined by Structural Design Unit

5 Spruce Street Bridge is removed in Alternative 4

The proposed deep cut on US 421/I-40 Business to improve the vertical clearance of the Peters Creek Parkway will adversely affect the foundations of the interior bents/supports of the existing structure. In addition the proposed widening from four (4) to seven (7) lanes will require replacement of this bridge. The proposed deep cuts along US 421/I-40 Business to improve the vertical clearance of the Green, Broad, Spruce (applicable to Alternative 3 only), Marshall, Cherry, Main and Church Street Bridges will adversely affect the foundations of the interior bents/supports of the existing structures requiring replacement of the bridges.

The proposed vertical clearance for the eleven (11) existing and three (3) proposed structures within the project study area will be improved by alternative are noted in Table 16b below.

Table 16b. Proposed Bridges – Vertical Clearance by Alternative

Bridge No.	Carries / Crosses	Vertical Clearance			
		Minimum Required	Desired	Proposed Alternative 3	Proposed Alternative 4
269	W. Fourth Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
286	Green Street ¹ / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
178	Broad Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
288	US 421/I-40 Business / Brookstown Avenue	15'-0"	15'-6"	15'-6"	15'-6"
291	Spruce Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	N/A ²
293	Marshall Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
305	Cherry Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
New	Cherry Street / US 421/I-40 Business Westbound Off Ramp/ Strollway	8'-0"	10'-0"	N/A	10'-0"
New	Cherry Street / US 421/I-40 Business Eastbound On Ramp / Strollway	8'-0"	10'-0"	N/A	10'-0"
New	US 421/I-40 Business / Strollway	8'-0"	10'-0"	10'-0"	10'-0"
New	Liberty Street / US 421/I-40 Business Westbound On Ramp/ Strollway	8'-0"	10'-0"	10'-0"	N/A
New	Liberty Street / US 421/I-40 Business Eastbound Off Ramp / Strollway	8'-0"	10'-0"	10'-0"	N/A
312	US 421/I-40 Business / Liberty Street	15'-0"	15'-6"	17'-0"	17'-0"
313	Main Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"
336	Church Street / US 421/I-40 Business	17'-0"	17'-6"	17'-0"	17'-0"

1 Bridge is Currently Closed

2 Proposed to be removed

J. BICYCLE AND PEDESTRIAN FACILITIES/GREENWAYS

NCDOT and the City of Winston-Salem have reviewed both alternatives and concurred on accommodations for pedestrians and bicyclists. The pedestrian and bicycle facilities on the

proposed bridges that are synonymous for both Alternatives 3 and 4 are found in Table 18. In Alternative 3 the Spruce Street Overpass of US 421/I-40 Business, Bridge No. 291, is proposed to have ten (10) foot sidewalks on both the west and east sides with no accommodations for bicycles. The proposed new ramps, westbound off and eastbound on, from Cherry Street to US 421/I-40 Business over the Strollway in Alternative 3, are not proposed to have pedestrian and bicycle facilities. The proposed new ramps, westbound on and eastbound off, from Liberty Street to US 421/I-40 Business over the Strollway in Alternative 4, are not proposed to have pedestrian and bicycle facilities. The pedestrian and bicycle facilities on the preliminary design plans do not reflect the proposed accommodations for pedestrians and bicyclists shown in Table 17.

Table 17. Pedestrian and Bicycle Facilities on Proposed Bridges¹ – Alternative 3 and 4

Bridge No.	Carries / Crosses	Sidewalk		Bicycle Accommodations	
		West Side	East Side	West Side	East Side
269	W. Fourth Street / US 421/I-40 Business	8 ft ²	8 ft ²	Wide Lane ²	Wide Lane ²
278	NC 150(Peters Creek Parkway) / US 421/I-40 Business	10 ft	10 ft	Shared Wide Outside Travel Lane (14 ft)	Shared Wide Outside Travel Lane (14 ft)
286	Green Street / US 421/I-40 Business	5 ft ³	5 ft ³	Shared ³	Shared ³
178	Broad Street / US 421/I-40 Business	10 ft	10 ft	Dedicated 4 ft Bike Lane	Dedicated 4 ft Bike Lane
288	US 421/I-40 Business / Brookstown Avenue	0 ft	0 ft	None	None
291	Spruce Street / US 421/I-40 Business ⁴	10 ft	10 ft	None	None
293	Marshall Street / US 421/I-40 Business	10 ft	10 ft	Shared Wide Outside Travel Lane (14 ft)	Shared Wide Outside Travel Lane (14 ft)
305	Cherry Street / US 421/I-40 Business	10 ft	10 ft	Shared Wide Outside Travel Lane (14 ft)	Shared Wide Outside Travel Lane (14 ft)
New	US 421/I-40 Business / Strollway	0 ft	0 ft	None	None
New	Cherry Street / US 421/I-40 Business Westbound Off Ramp/ Strollway ⁵	0 ft	0 ft	None	None
New	Cherry Street / US 421/I-40 Business Eastbound On Ramp / Strollway ⁵	0 ft	0 ft	None	None
New	US 421/I-40 Business / Strollway	0 ft	0 ft	None	None
New	Liberty Street / US 421/I-40 Business Westbound On Ramp/ Strollway ⁴	0 ft	0 ft	None	None

**Table 17. Pedestrian and Bicycle Facilities on Proposed Bridges¹ – Alternative 3 and 4
(Cont.)**

Bridge No.	Carries / Crosses	Sidewalk		Bicycle Accommodations	
		West Side	East Side	West Side	East Side
New	Liberty Street / US 421/I-40 Business Eastbound Off Ramp / Strollway ⁴	0 ft	0 ft	None	None
312	US 421/I-40 Business / Liberty Street	8 ft	8 ft	Shared Wide Outside Travel Lane (14 ft)	Shared Wide Outside Travel Lane (14 ft)
313	Main Street / US 421/I-40 Business	8 ft	8 ft	None	Shared Wide Outside Travel Lane (14 ft)
336	Church Street / US 421/I-40 Business	8 ft	8 ft	Dedicated 4 ft Bike Lane	Dedicated 4 ft Bike Lane

1 Proposed widths are subject to change based on negotiations with the City of Winston-Salem and final designs

2 Existing Pedestrian and Bicycle Facilities no changes are proposed

3 Proposed bridge is a Pedestrian/Utility Bridge

4 Only for Alternative 3

5 Only for Alternative 4

In accordance with the NCDOT Pedestrian policy, NCDOT will fully fund the cost to replace any existing sidewalks, at their existing widths, to be relocated by the project on existing streets. The City of Winston-Salem will participate in the cost of new sidewalks where sidewalks do not exist or where wider replacement sidewalks are requested. A municipal agreement with the City of Winston-Salem will be prepared prior to construction.

K. UTILITIES

The project is expected to have a high level of utility impacts due to a relocation of an electrical transmission line. Relocated utilities include power, telephone, water and sewer. Utilities along the project will be relocated prior to construction.

L. LANDSCAPING

Landscaping is proposed as a part of this project. Upon selection of a preferred alternative NCDOT will coordinate with the City of Winston-Salem in the development of a landscaping plan.

M. PROJECT ENHANCEMENTS

Enhancements options are being developed for the project by the Bridge and Design Working Group (B&D WG), see Section VI.A.2.c [Working Group Meetings]. The B&D WG is continuing the development of bridge design elements (rails, lighting, retaining walls, sidewalks, other treatments), public art for the bridges (on the exterior of the bridges and along the cross street

section of the bridge) and types of pedestrian bridges for Green Street, see Sections V. O. [Project Enhancements] of this document for further details.

Upon completion of the B&D WG sessions NCDOT and the City of Winston-Salem will review the proposed enhancements for the project and determine the feasibility of implementing the enhancements and the cost share for the proposed enhancements. The City of Winston-Salem participation in the cost of the enhancements will be per a municipal agreement prior to construction.

N. NOISE BARRIERS

Noise abatement measures are recommended for further detailed analysis during the final design adjacent to seven (7) areas along the project, see Sections V. P. [Traffic Noise Analysis] of this document for further details.

O. INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Substantial improvements in the ITS system along US 52 and US 421/I-40 Business have been undertaken within the last decade in advance of the ongoing Traffic Signal Upgrade projects in Winston-Salem. Investments in upgrading the existing ITS along US 421/I-40 Business corridor are proposed. Additions to the traveler information system will include additional fiber optic communications, three (3) additional closed circuit television (CCTV) and three (3) additional dynamic message signs (DMS).

P. WORK ZONE, TRAFFIC CONTROL AND CONSTRUCTION PHASING

A tentative Construction Phasing for the project has been developed based on recommendations from the ACTT Workshop and public input on the project. The tentative Construction Phasing includes the following elements:

- Reconstruct the Peters Creek Parkway interchange prior to any mainline improvements to US 421/I-40 Business;
- Construct the Peters Creek Parkway bridge in two phases, and maintain traffic on the existing bridge during the first phase;
- Alternate the closure/removal/replacement of the existing cross street bridges (Broad, Spruce, Marshall, Cherry, Liberty, Main and Church Streets and Brookstown Avenue) so that access across US 421/I-40 Business will not be considerably restricted during construction, and;
- Full closure of the US 421/I-40 Business of no more than two (2) years for pavement removal/replacement and grading.

Detour routes (vehicular, bicycle and pedestrian) for use during the construction of the project will be developed by NCDOT in coordination with the City of Winston-Salem Department of

Transportation. Final Work Zone, Traffic Control and Construction Phasing will be developed based on final plans.

Q. LIGHTING

The Peters Creek Parkway interchange will be lit with high mast lighting. NCDOT and the City of Winston-Salem are reviewing the US 421/I-40 Business corridor and all bridges to determine appropriate lighting requirements. Once appropriate lighting is determined for the facilities within the project area the City of Winston-Salem will assume maintenance responsibilities per a municipal agreement prior to construction.

R. OFF-SITE IMPROVEMENTS

Traffic patterns shifts will occur as a result of the project. Some of these shifts are temporary during construction and others will become permanent changes resulting from the construction of the project. To mitigate the impacts of the shifting traffic, off-site improvements may be required. Both temporary and long term off-site improvements are discussed below.

1. Temporary (During Construction) Off-Site Intersection Improvements

The project was analyzed for areas where temporary improvements may be necessary during construction in the year 2021, worst case construction scenario, with the closure of US 421/I-40 Business and the removal of Broad, Marshall and Cherry Street bridges or the removal of Broad, Liberty and Main Street bridges. Of the eighty-eight (88) major intersections analyzed, forty-nine (49) required no improvements, eighteen (18) required only signal timing revisions, eight (8) intersections were not recommended for temporary improvements and thirteen (13) intersections were recommended for temporary improvements.

The thirteen (13) intersections with recommended improvements were determined to be constructible with only minor impacts/changes but would yield significant improvement in the intersection operations. The thirteen intersection locations, are illustrated in Figure 18, with the proposed temporary improvements listed in Table 18 below.

Table 18. Temporary Off-Site Intersections Improvements

No.	Location	Proposed Improvement
1	Peters Creek Parkway at I-40 Business Eastbound Ramp (New)	Use the on-ramp pavement to provide two left turn lanes and two right turn lanes on the off-ramp (loop)
2	Peters Creek Parkway at I-40 Business Westbound Ramp (New)	Convert the left most southbound through lane to a separate left turn lane (providing a second left turn lane)
3	Peters Creek Parkway/Second Street at First Street	Provide a second left turn lane eastbound and a third left turn lane westbound
4	Broad Street at Second Street	Convert the left most eastbound through lane to a shared left/through lane
5	Broad Street at Fifth Street	Provide a separate left turn lane westbound

Table 18. Temporary Off-Site Intersections Improvements (Cont.)

No.	Location	Proposed Improvement
6	Broad Street at Sixth Street	Provide a separate left turn lane westbound
7	Marshall Street at Academy Street	Provide a separate left turn lane southbound
8	Third Street at Liberty Street	Provide a separate left turn lane westbound
9	Martin Luther King Jr. Drive at Marshall Street & Cherry Street	Provide a second left turn lane southbound
10	First Street at Northwest Boulevard	Provide a separate right turn lane westbound
11	First Street at Hawthorne Road	Provide a separate right turn lane northbound
12	Northwest Boulevard at Broad Street/Thurmond Road	Provide a separate left turn lane eastbound
13	Peters Creek Parkway at Silas Creek Parkway	Provide a second left turn lane southbound, convert the right most eastbound left turn lane to a through lane and convert the right most eastbound through lane to a second right turn lane

2. Temporary (During Construction) Off-Site Roadway Improvements

The project was analyzed for areas where temporary improvements may be necessary during construction in the year 2021, worst case construction scenario, with the closure of US 421/I-40 Business and the removal of Broad, Marshall and Cherry Street bridges or the removal of Broad, Liberty and Main Street bridges. The analysis included the roadway network and major intersections to determine the impacts on traffic. The Traffic and Community Working Group (T&C WG) is reviewing the results of the analysis and will be making suggestions as to road network improvements and possible detour options. Additional coordination with the public, the City of Winston-Salem and NCDOT staff is needed to determine offsite roadway improvements and proposed detour routes during construction.

3. Long Term (2021 Project Opening) Off-Site Intersection Improvements

The future Levels of Service (LOS) - 2021 No-Build for the road network within the project study area is discussed in Section II.C.4 above. The future LOS - 2021 Build Conditions for Alternatives 3 and 4 showed no change, i.e. remained the same as No-Build, in 117 and 114, respectively, of the 164 intersections analyzed. Each of the proposed alternatives will have varying effects on the roadway network in and around the project study area; both provide the net positive improvement to 37 intersection and minor degradation 10 and 13 intersections, respectively, in the network.

At the project opening, 2021, the Marshall Street and Cherry Street at Martin Luther King, Jr. Drive intersections indicate the need for improvements for both alternatives. Intersection improvements for these intersections are currently under development.

4. Long Term (2040 Design Year) Off-Site Intersection Improvements

Shifts in travel patterns were anticipated as a result of deleting and reconfiguring interchanges with each alternative. To better understand the shifts in travel patterns the project was analyzed in the build year 2040 for both alternatives. The analyses included the roadway network and major intersections to determine the impacts on traffic.

Of the forty-six (46) major intersections analyzed in Alternative 3, six (6) were identified for improvement. Of the six (6) intersections three (3) is synonymous to both alternatives and three (3) only apply to Alternative 3. The three (3) intersections locations with recommended improvements for Alternative 3 are shown in Figure 19 with the proposed improvements listed in Table 19 below.

Table 19. Long Term Off-Site Intersections Improvements – Alternative 3

No.	Location	Proposed Improvement
1	Broad Street at I-40 Business Westbound Off Ramp	The signal should be retained at this location.
2	Liberty Street at I-40 Business Eastbound Off Ramp	Revise the eastbound approach to one through and one shared through/right lane.
3	Main Street at I-40 Business Eastbound On Ramp	Provide one left turn, one shared left/through, and one through lane.

Of the forty-two (42) major intersections analyzed in Alternative 4, three (3) were identified for improvement. Of the remaining three (3) intersections all are synonymous to both alternatives. Two (2) of the three (3) intersections locations with recommended improvements for Alternatives 3 and 4 are listed in Table 20 below.

Table 20. Long Term Off-Site Intersections Improvements – Alternative 4

No.	Location	Proposed Improvement
1	Peters Creek Parkway at Academy Street	Provide a westbound exclusive right turn lane.
2	Peters Creek Parkway and Second Street at First Street	Provide a northbound and southbound exclusive right turn lane.

The third intersection location is comprised of two (2) intersections; Marshall Street at Martin Luther King, Jr. Drive and Cherry Street at Martin Luther King, Jr. Drive. Due to the short distance between the two (2) intersections they work as one (1) intersection. Intersection improvements for this location are currently under development. The three (3) intersections synonymous to both alternatives are shown in Figure 20.

Shifts in bicycle and pedestrian patterns may occur as a result of the project. Some of these shifts are temporary during construction and others will become permanent changes resulting from the construction of the project. Additional coordination with the public, the City of

Winston-Salem and NCDOT staff is needed to determine if offsite bicycle and pedestrian improvements will be required.

S. FUTURE TRAFFIC VOLUMES

Based on the Traffic Projections all roadways in and around the project study area will experience an increase in traffic volumes in the 2021 and 2040 No-Build Condition, as noted in Section II.C.4.b [Future Traffic Volumes] above. The 2021 and 2040 Build Conditions for Alternatives 3 and 4 were analyzed to provide an assessment of the proposed improvements to the network. Each of the proposed alternatives will have varying effects on the roadway network in and around the project study area; some roadways will experience an increase in forecasted traffic volume, some roadways will experience a decrease in forecasted traffic volume while other will experience no change in forecasted traffic volume. Copies of the unabridged version of the 2021 Opening Year Traffic Operations Analysis with First and Second Street in One-Way Operation Memo, dated February, 2014, and the Project Level Traffic Forecast Report, dated June, 2013, can be viewed at the Project Development & Environmental Analysis Unit, Century Center Building A, 1000 Birch Ridge Drive, Raleigh N.C.

The forecasted traffic volumes for the 2040 No-Build Condition, 2040 Build Conditions Alternative 3 and 2040 Build Conditions Alternative 4 are shown in Table 21 below. In Table 21 each alternative with an increase in traffic volume over the 2040 No-Build Condition is highlighted in orange, decrease in traffic volumes over the 2040 No-Build Condition is highlighted in green and no change in traffic volumes over the 2040 No-Build Condition has no color.

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
Peters Creek Pkwy	south of Academy St	31,600	31,600	31,600
Peters Creek Pkwy	north of Academy St	31,600	33,700	35,800
Peters Creek Pkwy	south of I-40 Business	28,500	30,600	32,700
Peters Creek Pkwy	north of I-40 Business	13,500	19,200	24,900
Peters Creek Pkwy	north of First St	10,900	14,300	17,700
Broad St	south of Wachovia Ave	10,200	8,500	6,900
Broad St	south of I-40 Business	11,500	9,400	7,300
Broad St	north of I-40 Business	18,700	13,000	7,300
Broad St	north of First St	20,100	16,700	13,300
Broad St	south of Second St	18,900	15,500	12,100
Broad St	north of Second St	21,000	21,000	21,000

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts (Cont.)

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
Marshall St	south of Brookstown Ave	2,500	1,600	2,500
Marshall St	south of High St	3,000	2,100	3,800
Marshall St	south of I-40 Business	1,800	1,900	6,100
Marshall St	between I-40 Business Ramps	6,100	-	6,100
Marshall St	south of First St	10,600	1,900	14,600
Marshall St	south of Second St	10,400	3,300	13,300
Marshall St	north of Second St	9,900	4,900	11,600
Marshall St	north of Fourth St	9,900	5,700	11,100
Marshall St	north of Fifth St	9,800	6,300	10,300
Marshall St/Cherry St	south of Martin Luther King, Jr. Dr.	20,300	15,300	21,300
Marshall St/Cherry St	north of Martin Luther King, Jr. Dr.	22,100	22,100	22,100
Cherry St	south of High St	600	900	600
Cherry St	south of I-40 Business	4,700	1,400	12,600
Cherry St	south of First St	8,200	1,400	8,300
Cherry St	south of Second St	8,600	2,600	11,800
Cherry St	south of Third St	9,200	4,200	11,300
Cherry St	south of Fourth St	11,900	7,300	10,900
Cherry St	south of Fifth St	9,900	7,900	13,600
Cherry St	north of Fifth St	9,100	8,600	10,800
Trade St	south of Fifth St	4,800	4,800	9,600
Trade St	north of Fifth St	4,600	4,600	4,800
Trade St	south of Martin Luther King, Jr. Dr.	3,500	3,500	4,600
Trade St	north of Martin Luther King, Jr. Dr.	4,500	4,500	3,500
Liberty St	south of Cemetery St	5,000	5,900	4,500
Liberty St	south of I-40 Business	6,900	11,700	4,200
Liberty St	between I-40 Business Ramps	6,100	10,000	6,100
Liberty St	north of I-40 Business	10,500	18,900	-
Liberty St	north of First St	11,200	18,000	6,100
Liberty St	north of Second St	12,100	16,900	10,000
Liberty St	south of Third St	9,400	14,200	7,300
Liberty St	north of Third St	7,700	12,900	6,000
Liberty St	north of Fourth St	8,700	12,200	7,500
Liberty St	north of Fifth St	5,100	7,200	4,600

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts (Cont.)

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
Liberty St	south of Martin Luther King, Jr. Dr.	7,100	12,100	6,100
Main St	south of Cemetery St	7,200	7,200	7,200
Main St	south of I-40 Business	11,200	15,100	11,200
Main St	between I-40 Business Ramps	10,500	14,100	6,900
Main St	north of I-40 Business	15,500	22,200	11,900
Main St	north of First St	14,800	20,700	12,100
Main St	north of Second St	13,700	18,500	12,000
Main St	north of Third St	9,500	14,300	7,800
Main St	north of Fourth St	6,600	9,700	5,700
Main St	north of Fifth St	4,500	6,800	4,000
Patterson Ave	south of Martin Luther King, Jr. Dr.	2,800	2,800	2,800
Patterson Ave	north of Martin Luther King, Jr. Dr.	7,600	7,600	7,600
Linden St	south of Martin Luther King, Jr. Dr.	3,600	3,600	3,600
US 52	south of I-40 Business	82,500	82,500	82,500
US 52	north of I-40 Business	107,000	107,000	107,000
US 52	south of Martin Luther King, Jr. Dr.	107,000	107,000	107,000
US 52	north of Martin Luther King, Jr. Dr.	103,800	103,800	103,800
Martin Luther King, Jr. Dr.	south of Lowery St	20,400	20,400	20,400
Martin Luther King, Jr. Dr.	south of I-40 Business	20,400	20,400	20,400
Martin Luther King, Jr. Dr.	south of First St	21,800	22,600	22,200
Martin Luther King, Jr. Dr.	north of First St	19,400	20,200	19,800
Academy St	west of Peters Creek Pkwy	11,400	11,400	11,400
Academy St	east of Peters Creek Pkwy	8,000	10,100	12,200
Wachovia St	west of Broad St	1,100	900	700
Wachovia St	east of Broad St	1,400	1,200	900
Brookstown Ave	west of Marshall St	1,300	1,300	1,300
Brookstown Ave	east of Marshall St	1,800	1,800	2,600
Brookstown Ave	west of Cherry St	2,800	2,800	3,600
Brookstown Ave	east of Cherry St	2,600	2,500	3,400

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts (Cont.)

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
High St	west of I-40 Business EB Off Ramp	800	-	800
High St	west of Marshall St	5,300	900	9,700
High St	west of Cherry St	5,300	1,700	13,200
Cemetery St	east of Liberty St	3,700	7,600	3,700
Cemetery St	east of Main St	3,100	3,100	3,100
Lowery St	west of Martin Luther King, Jr. Dr.	400	400	400
I-40 Business	west of Peters Creek Pkwy	90,200	90,200	90,200
I-40 Business	west of Broad St	96,400	88,600	96,400
I-40 Business	east of Broad St	96,400	96,400	96,400
I-40 Business EB Off Ramp	north of High St	4,500	-	8,900
I-40 Business WB On Ramp	at Marshall St	4,500	-	8,500
I-40 Business EB	between Marshall St ramps	43,700	-	39,300
I-40 Business WB	between Marshall St ramps	43,700	-	39,700
I-40 Business EB On Ramp	from Marshall St	4,300	-	-
I-40 Business EB On Ramp	from Cherry St	-	-	4,300
I-40 Business WB Off Ramp	at Cherry St	3,500	-	3,500
I-40 Business EB	west of Liberty St	48,000	48,100	43,600
I-40 Business WB	west of Liberty St	47,200	48,300	43,200
I-40 Business WB On Ramp	at Liberty St	4,400	8,900	-
I-40 Business EB Off Ramp	at Liberty St/Main St	4,400	8,900	-
I-40 Business EB Off Ramp	at Liberty St	800	1,700	-
I-40 Business EB Off Ramp	at Main St	3,600	7,200	-
I-40 Business EB	between Main St ramps	43,600	39,200	43,600
I-40 Business WB	between Main St ramps	42,800	39,400	43,200
I-40 Business EB On Ramp	at Liberty St/Main St	4,300	8,200	4,300
I-40 Business WB Off Ramp	at Main St	5,000	8,100	5,000
I-40 Business	west of US 52	95,700	94,900	96,100
I-40 Business	east of US 52	101,000	100,200	101,400

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts (Cont.)

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
I-40 Business	east of Martin Luther King, Jr. Dr.	96,600	96,600	96,600
First St	west of Peters Creek Pkwy	6,200	6,200	6,200
First St	west of Broad St	7,200	9,500	11,800
First St	east of Broad St	5,600	5,600	5,600
First St	west of Marshall St	6,500	6,500	6,500
First St	west of Cherry St	7,100	6,700	7,000
First St	west of Liberty St	6,900	6,700	6,700
First St	west of Main St	7,800	7,800	7,700
First St	east of Main St	5,300	5,300	5,300
First St	west of Martin Luther King, Jr. Dr.	1,300	1,300	1,300
First St	east of Martin Luther King, Jr. Dr.	4,900	4,900	4,900
Second St	west of Broad St	10,900	14,300	17,700
Second St	east of Broad St	8,400	8,400	8,400
Second St	west of Marshall St	9,700	9,700	9,700
Second St	west of Cherry St	10,800	9,900	10,800
Second St	east of Cherry St	10,200	10,100	10,000
Second St	west of Liberty St	10,200	10,100	10,000
Second St	west of Main St	11,500	11,800	11,300
Second St	east of Main St	7,800	7,800	7,800
Third St	east of Cherry St	3,300	3,500	3,300
Third St	west of Liberty St	3,300	3,500	3,300
Third St	west of Main St	5,000	5,600	5,400
Third St	east of Main St	5,000	5,600	5,400
Fourth St	west of Marshall St	12,500	12,500	12,500
Fourth St	west of Cherry St	12,100	12,300	11,800
Fourth St	west of Trade St	10,900	12,100	10,600
Fourth St	west of Liberty St	8,900	10,100	8,600
Fourth St	west of Main St	8,100	8,600	8,100
Fourth St	east of Main St	7,200	7,200	7,200
Fifth St	west of Marshall St	10,000	10,000	10,000
Fifth St	west of Cherry St	10,100	10,400	10,200
Fifth St	west of Trade St	10,900	10,700	10,800
Fifth St	west of Liberty St	10,300	10,100	10,200
Fifth St	west of Main St	10,500	10,700	10,300
Fifth St	east of Main St	9,000	9,000	9,000

Table 21. 2040 Build Conditions Alternative 3 and 4 Traffic Forecasts (Cont.)

Major Roadway	Location	2040 No-Build Conditions Traffic Forecasts*	2040 Build Conditions Alternative 3 Traffic Forecasts*	2040 Build Conditions Alternative 4 Traffic Forecasts*
Martin Luther King, Jr. Dr.	west of Marshall St	15,600	15,600	15,600
Martin Luther King, Jr. Dr.	east of Cherry St	22,200	24,800	22,400
Martin Luther King, Jr. Dr.	west of Liberty St	25,600	28,200	25,800
Martin Luther King, Jr. Dr.	west of Patterson Ave	28,300	28,300	28,300
Martin Luther King, Jr. Dr.	west of Linden St	31,100	31,100	31,100
Martin Luther King, Jr. Dr.	west of US 52	29,100	29,100	29,100
Martin Luther King, Jr. Dr.	east of US 52	19,500	19,500	19,500
	No Change from 2040 No-Build Forecasted Traffic			
	Decrease from 2040 No-Build Forecasted Traffic			
	Increase from 2040 No-Build Forecasted Traffic			

* Traffic forecast volumes are Annual Average Daily Traffic (AADT)

The Alternative 3 projected traffic volumes for the 2040 Build Conditions - AADT volumes with design hourly volume, directional splits and truck percentages are shown in Figure 21 and the Alternative 4 projected traffic volumes for the 2040 Build Conditions - AADT volumes with design hourly volume, directional splits and truck percentages are shown in Figure 22.

T. FUTURE LEVELS OF SERVICE

The future Levels of Service (LOS) - 2040 No-Build for the road network within the project study area is discussed in Section II.C.4 above and is shown in Figure 8. The future LOS - 2040 Build Conditions for Alternatives 3 and 4 are discussed below:

1. 2040 Build Levels of Service Alternative 3

Within the project study area in 2040 for Alternative 3 US 421/I-40 Business operates at a LOS “F” from the Peters Creek Parkway interchange westward and from the Broad Street interchange eastward and LOS of “E” between the Peters Creek Parkway and Broad Street interchanges. Broad Street operates at a LOS “D” within the interchange. Liberty Street operates at a LOS “F” between the First and Second Streets and LOS “D” between the First Street and the westbound on-ramp. Main Street operates at a LOS “E”. Second Street operates at a LOS “E” between Brookstown Avenue and Broad Street and LOS “D” between

the Liberty and Main Streets. All other roadways operate at a LOS of “A-C” as shown in Figure 23. The six (6) levels of service for a roadway are depicted in Figure 7.

2. 2040 Build Levels of Service Alternative 4

Within the project study area in 2040 for Alternative 4 US 421/I-40 Business operates at a LOS “F”. Peters Creek Parkway operates at a LOS “D” between the interchange and First Street. Marshall Street operates at a LOS “D” between the First and Second Streets. Second Street operates at a LOS “D” between First Street and Brookstown Avenue and LOS “F” between the Brookstown Avenue and Broad Street. High Street operates at a LOS “D” between the Marshall and Cherry Streets. All other roadways operate at a LOS of “A-C” as shown in Figure 24.

U. RELOCATIONS OF RESIDENCES AND BUSINESSES

The proposed project will require the relocation of homes and businesses. All relocations will be carried out in accordance with Federal and State laws and regulations. NCDOT’s Relocation Assistance Program will be utilized to assist in finding replacement housing for residents relocated by the project. Alternative 3 is anticipated to relocate thirty (30) residences, ten (10) of which are minority, and one (1) business. Alternative 4 is anticipated to relocate thirty (32) residences, ten (10) of which are minority, and one (1) business. Appendix A includes information on NCDOT’s relocation assistance program, as well as the relocation reports for each alternative.

V. COST ESTIMATES

Table 22 provides a comparison of the preliminary cost for each of the Detailed Study Alternatives based on preliminary engineering designs.

Table 22. Preliminary Cost Estimates

	Alternative 3	Alternative 4
Construction	\$59,300,000.00	\$53,100,000.00
Utilities Relocation	\$ 2,144,000.00	\$ 1,929,000.00
Right-of-Way	\$12,600,000.00	\$11,850,000.00
Total Cost	\$74,044,000.00	\$66,879,000.00

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