



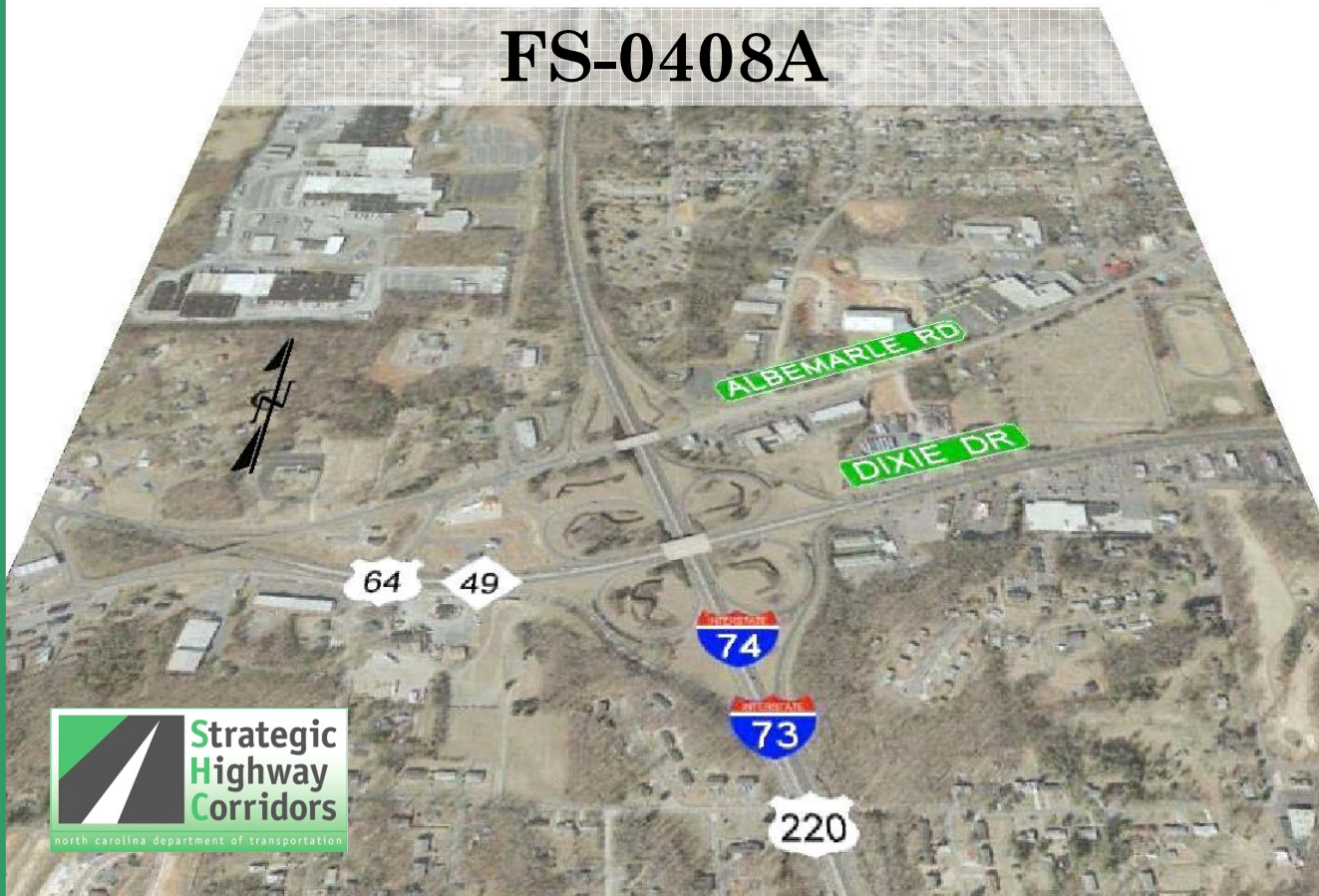
FEASIBILITY STUDY US 220 / Future I-73 / I-74



From South of NC 134 / US 220 Business
To South of SR 2269 (Vision Drive)

Asheboro, Randolph County
Division 8

FS-0408A



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FEASIBILITY STUDY US 220 / Future I-73 / I-74



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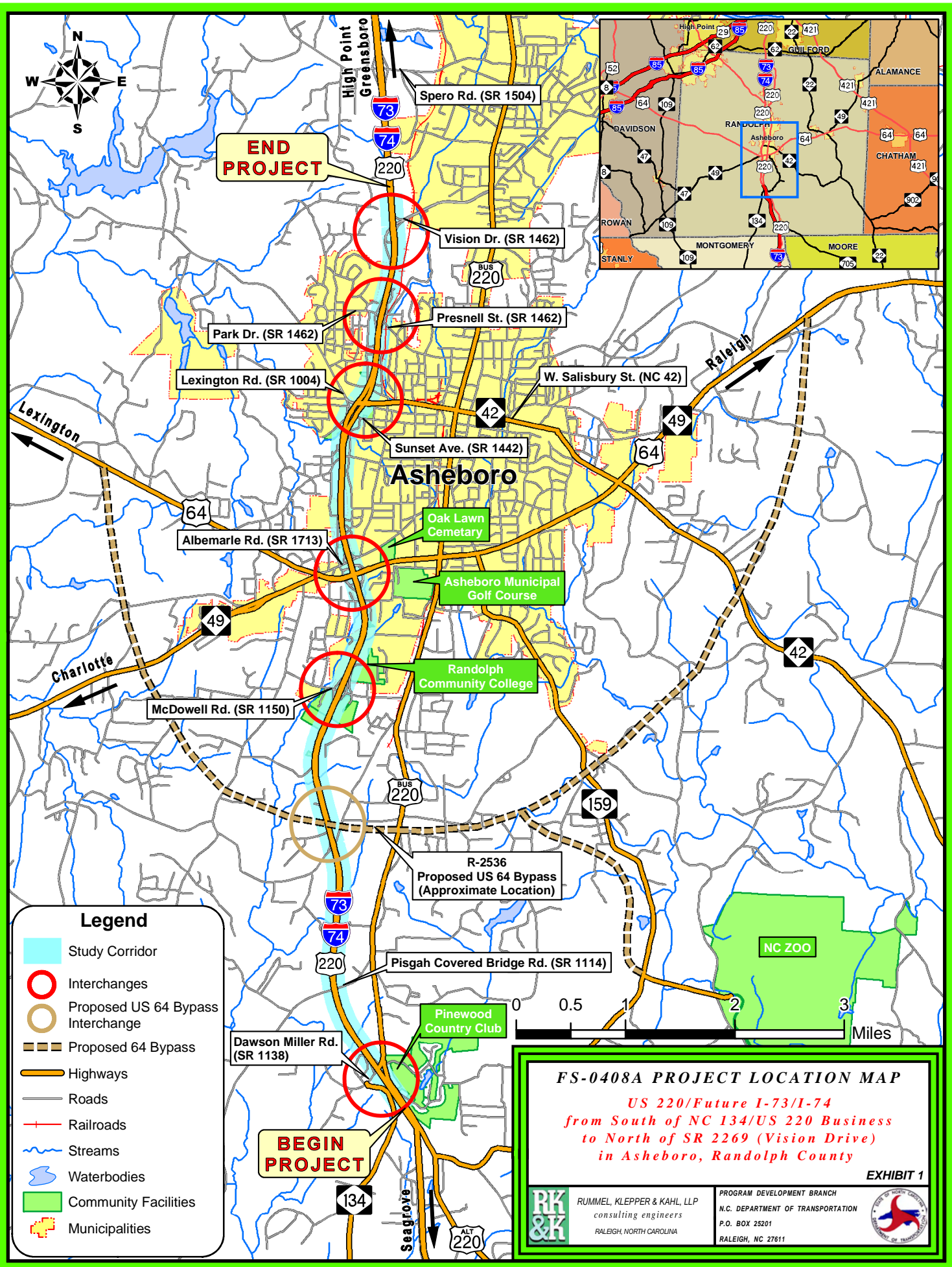
I. Introduction

Future Interstate 73 and 74 corridors are described by federal law as traveling along the existing US 220 corridor through Asheboro, Randolph County. North Carolina DOT Strategic Highway Corridor (SHC) Vision Plans confirm this corridor routing. This feasibility study addresses improvements including interchange upgrades along the US 220 corridor through the city of Asheboro in Randolph County to accommodate future Interstates 73 and 74, a distance of approximately 10 miles.

This study is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. The purpose of this study is to describe the proposed project, including costs, and to identify issues that may warrant more detailed study in the planning and design phases.

II. Background

This study is concerned specifically with the capacity, geometry, and safety of the corridor beginning just south of SR 1138 (Dawson-Miller Road)/US 220 Business and continuing for approximately 10 miles to north of SR 2269 (Vision Drive). This report evaluates seven interchanges within the study area, including the proposed US 64 Bypass interchange. The study corridor can be seen on the **Project Location Map, Exhibit 1**, on the following page. The study area is currently posted with future interstate shields. US 220 south of the study area is posted with Interstate 73 and 74 shields.



END PROJECT

BEGIN PROJECT

FS-0408A PROJECT LOCATION MAP

*US 220/Future I-73/I-74
from South of NC 134/US 220 Business
to North of SR 2269 (Vision Drive)
in Asheboro, Randolph County*

EXHIBIT 1

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	CONSULTING ENGINEERS		
	TRANSPORTATION		
	PROJECT DEVELOPMENT		

Legend

- Study Corridor
- Interchanges
- Proposed US 64 Bypass
- Interchange
- Proposed 64 Bypass
- Highways
- Roads
- Railroads
- Streams
- Waterbodies
- Community Facilities
- Municipalities

▪ **Federal Considerations**

Improvements studied in this report are generated by the need to accommodate future Interstates 73 and 74 along the US 220 corridor through Asheboro. The National Highway System's "High Priority Corridor 5" (also referred to as the "I-73/74 North-South Corridor") is defined by federal law as traveling from Georgetown, South Carolina to Detroit, Michigan and Sault Ste. Marie, Michigan. This High Priority Corridor is described in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and in its subsequent amendment, the Transportation Equity Act for the 21st Century (TEA-21) of 1996. Although specific routing outside of North Carolina is uncertain, both future interstate corridors are to follow US 220 through Asheboro. See **Appendix A** for maps of the "Congressional High Priority Corridors" and the "Future Interstates" taken from the Federal Highway Administration website (<http://www.fhwa.dot.gov/hep10/nhs/hipricorridors/>).

▪ **State Considerations**

This future interstate corridor is also identified as a Strategic Highway Corridor (SHC) by NCDOT. **Exhibit 2**, a map of the SHC Vision Plan for Randolph County, is located on the following page. The corridor is "critical to statewide mobility and connectivity and promote[s] a vision of modern, efficient transportation supportive of economic opportunities and environmental excellence" (SHC Policy Statement, <http://www.ncdot.org/doh/preconstruct/tpb/SHC/overview/>). SHC objectives also include providing a safe, efficient, high-speed interstate corridor through Asheboro, Randolph County. According to the SHC Vision Plan, the Asheboro corridor is identified as needing upgrades in order to satisfy the objectives of a SHC. Corridor improvements studied in this report seek to satisfy SHC objectives.

▪ **Local Issues**

The population of Randolph County has increased from approximately 130,454 to 138,367 between 2000 and 2005, a 6% increase, according to the US Census Bureau (www.census.gov). In 2005, the unemployment rate was 8.5% and the percent of families living below poverty level was 12.8%. Manufacturing is the major industry in Randolph County, accounting for approximately 38% of all jobs in the county in 2005. Retail trade, wholesale trade, and health care related services are secondary leading industries in Randolph County. Tourism attractions include the NC Aviation Museum, the NC Zoo, the historic Pisgah Covered Bridge, the Richard Petty Museum, and Seagrove Pottery. The new interstate along the US 220 corridor will foster local economic growth throughout the county as well as provide for regional transportation needs.

There are several NCDOT projects and studies adjacent to this study area: Transportation Improvement Program (TIP) projects I-4407, I-4921, R-2536, R-2535, R-2220, U-5005, and the US 64-NC 49 Corridor Study. TIP projects R-2606, R-609, and U-3600 are also nearby but do not

directly connect to this project. The adjacent TIP projects and their relationship to the future interstate corridor are shown in **Exhibit 2** along with the SHC Vision Plan for Randolph County.

TIP project I-4407, which is a Strategic Highway Corridor project, proposes upgrading 8 miles of existing US 220 with minor improvements required for meeting safety standards for interstates. The project begins south of SR 1138 (Dawson-Miller Road)/NC 134/US 220 Business and continues to north of SR 1462 (Presnell Street), overlapping a significant portion of this study. I-4407 project improvements include upgraded acceleration/deceleration lanes, paved shoulders, guardrail, cable guiderail and concrete barrier improvements. Improvements made by the I-4407 project are not included in the costs of this study. I-4407 improvements are reflected in existing pavement and median widths shown on the Widening Typical Sections of **Exhibit 3**. I-4407 is currently scheduled for right-of-way and construction in future years 2008 and 2010, respectively.

TIP project I-4921, also a Strategic Highway Corridor project, proposes upgrading 23 miles of US 220 to interstate standards. The project begins at SR 1462 (Presnell Street), the northern terminus of the I-4407 project, and continues north to I-85 in Greensboro. TIP project I-4921 is currently unfunded. I-4921 overlaps the northern end of this study. Improvements to and costs for the SR 1462 (Presnell Street) and SR 2269 (Vision Drive) interchanges have been updated and included in this study.

The third TIP project, R-2536, is the proposed US 64 Asheboro Southern Bypass and is also a Strategic Highway Corridor project. Improvements include a four-lane freeway on new location from US 64 west to US 64 east. The R-2536 project structures are to accommodate a future 6-lane I-73/I-74 section as a result of coordination with the Piedmont Triad RPO and this feasibility study. No improvements to the proposed US 64 Bypass interchange are recommended in this study outside of US 220 widening. Section B of R-2536 is currently scheduled for right-of-way and construction in future years 2010 and 2012, respectively. The remaining sections of R-2536 are currently unfunded. More information on this project can be found on NCDOT website <http://www.ncdot.org/projects/asheboro/>. Coordination with R-2536 is needed to ensure these projects tie together without conflict.

TIP project R-2535, NC 49 widening to a four-lane divided facility, runs from SR 1174 west of Farmer to SR 1193 (Old Highway 49) west of US 64 in Asheboro. The R-2535 project is also a Strategic Highway Corridor project and is currently unfunded.

TIP project R-2220, US 64 widening to a four-lane divided highway, runs from east of I-85 Business in Lexington to US 220 in Asheboro. R-2220 is also a Strategic Highway Corridor project. R-2220 sections D and E connect to this study's improvements at US 64 Dixie Drive and NC 49. R-2220D includes the section of US 64 that approaches NC 49 west of US 220. R-2220E includes the interchange of US 64 with NC 49, just 0.4 miles west of US 220. Although the R-2220 project is currently unfunded, a prior functional design (as found in the 1991 Environmental Assessment) was used

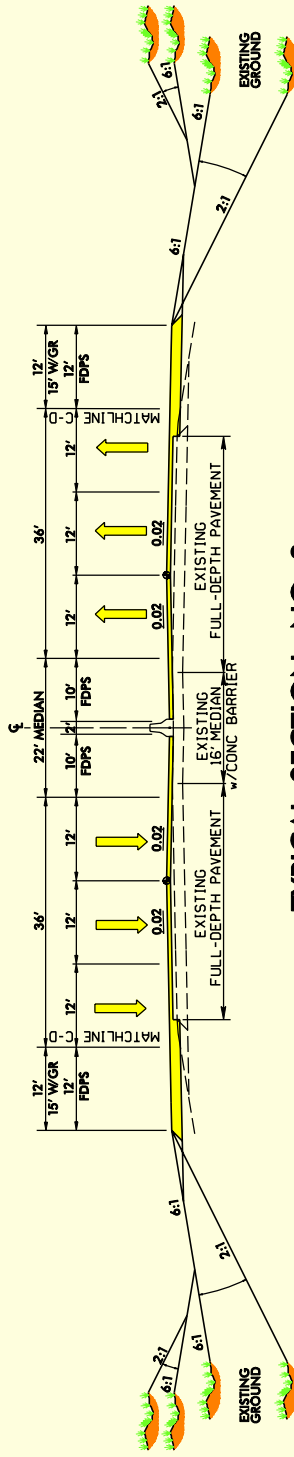
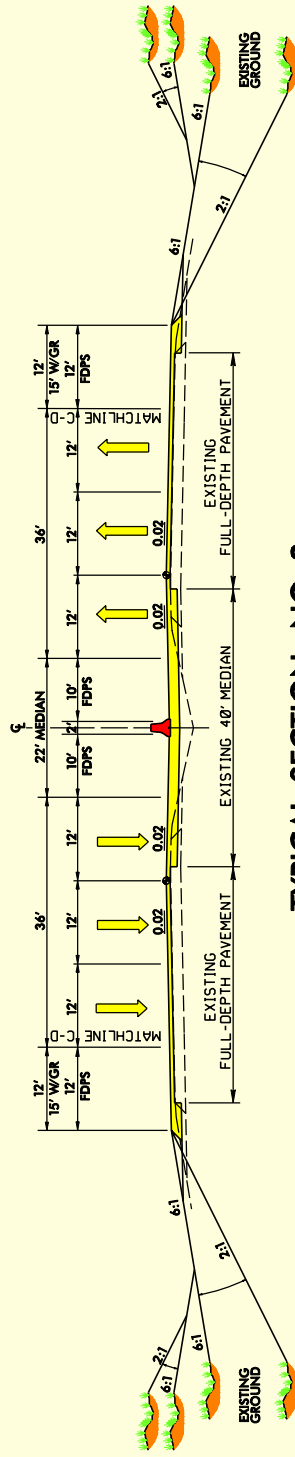
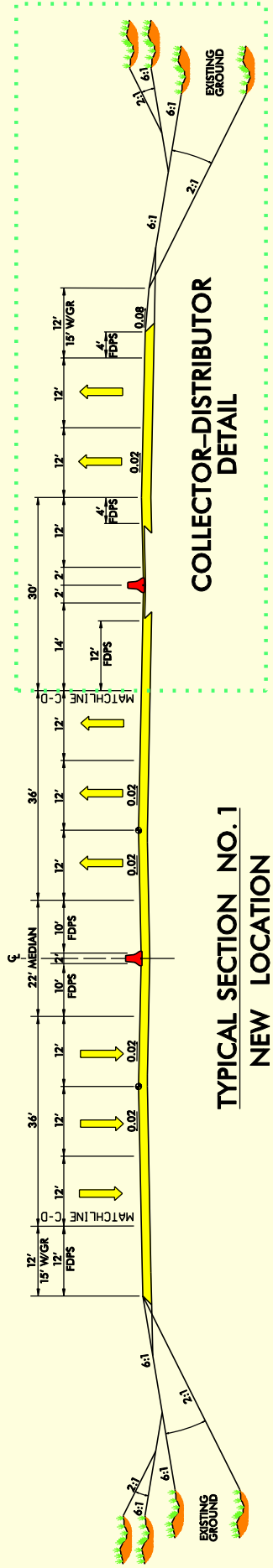


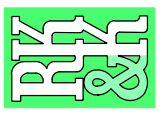
EXHIBIT 3

FS-0408A - TYPICAL SECTIONS
 US 220 / FUTURE I-73 / I-74
 FROM SOUTH OF NC 134 / US 220 BUSINESS
 TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY



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as a baseline for improvements considered in this study. Coordination with R-2220 is needed to ensure these projects tie together without conflict.

U-5005 addresses widening US 220 Business from US 220 (Future I-73/I-74) to SR 1453 (Walker Avenue) in Asheboro. The U-5005 project upgrades the roadway to a four-lane divided section with a 23' raised grass median, upgrades intersections, and addresses other safety issues along US 220 Business. U-5005 project Y-line improvements include widening a section of SR 1150 (McDowell Road) to a four-lane divided section with a 23' raised grass median. The U-5005 improvements connect to improvements recommended in this study on US 220 Business and SR 1150 (McDowell Road). The U-5005 project is currently unfunded.

Finally, the US 64-NC 49 Corridor Study, a comprehensive study to develop a plan for the future of these two roads from Charlotte and Statesville to Raleigh, includes portions of US 64 and NC 49 that approach US 220 in Asheboro. "Phase I" of the US 64-NC 49 Corridor Study, consisting of a broad assessment and evaluation to meet the objectives and needs of a Strategic Highway Corridor, was completed in May 2005. Additional information can be found on the NCDOT Transportation Planning Branch website: <http://www.ncdot.org/doh/preconstruct/tpb/SHC/studies/US64-NC49/>.

There is an adjacent Norfolk Southern Railroad line that parallels US 220 from NC 42 (West Salisbury Street) northward to SR 2269 (Vision Drive). This study will affect two existing structures over the railroad at SR 1462 (Presnell Street) and SR 2269 (Vision Drive).

US 220 is currently a four-lane highway classified as a freeway/principal arterial through Randolph County. [Road classifications throughout this report are taken from the NCDOT Transportation Planning Branch (TPB) Rural Functional Classification Maps and the Piedmont Triad Council of Governments (PTCOG) Thoroughfare Plan.] South of the study area US 220 is a four-lane freeway with a 70' median, 300' right-of-way, and a 65 mph posted speed limit. From SR 1138/US 220 Business northward, US 220 has a 40' median, 250' to 275' of right-of-way, and a posted speed limit of 55 mph. The 55 mph speed limit continues through the Asheboro city limits. The median narrows to a 16' concrete barrier median from US 64 to SR 1462, with the exception of the split mainline through the SR 1442/NC 42 interchange. There are short sections of narrow 200' right-of-way through the city limits with development right along the right-of-way. North of SR 1462 the median width returns to 40'. From SR 1504 northward, US 220 opens back up to a 70' median, 300' right-of-way, and a 65 mph posted speed limit. US 220 vertical and horizontal alignments through the study area meet 70-mph design-speed criteria upon preliminary examination. The bridge structures along this portion of US 220, however, were built in 1962 and are deficient in horizontal and vertical clearances.

III. Traffic & Safety

Traffic forecasts for the Annual Average Daily Traffic (AADT) used in this study were provided by the NCDOT Transportation Planning Branch. Forecasts were based on historical trends for US 220 and typical growth for interstate highways. Future year forecasts include the existence of an interchange for US 64 Bypass over US 220. Base year (BY) 2006 and design year (DY) 2035 forecasts have been interpolated and extrapolated, respectively, from year 2004, 2005, and 2030 AADTs. Refer to the traffic diagrams located in **Appendix B**. The base year AADT on US 220 ranges from 22,200 at the southern end of the project to 49,400 vehicles per day (vpd) at the northern end. The estimated design year AADT ranges from 65,900 to 107,200 vpd. The percentage of truck traffic on US 220 at the northern end is 24% (10% Duals and 14% TTST's) for both base year and design year traffic.

Table 1 shows US 220 levels of service based on capacity analyses of current conditions:

Table 1 – Freeway Segments Levels of Service – No Build Alternative				
Freeway Segment	From/To	Base Year 2006	Design Year 2035	Failing Year
1	From Begin Study to SR 1138/US 220	B	F	2026
2	From SR 1138/US 220 Business to SR1150	B	F	2021
3	From SR1150 to US 64	C	F	2018
4	From US 64 to NC 42	C	F	2012
5	From NC 42 to SR 1462	D	F	2008
6	From SR 1462 to SR 2269	D	F	2007
7	From SR 2269 to End Study	D	F	2010

The freeway segments within the Asheboro city limits are estimated to fail first. Funding and scheduling for improvements could be prioritized accordingly.

Accident Analysis

During the three-year period from May 1, 2003 through April 30, 2006 there were 174 accidents reported on the 10-mile portion of US 220 within the study limits. This resulted in an accident rate of 62.45 accidents per 100 million vehicle miles (Acc/100MVM), which is lower than the statewide average of 155.81 Acc/100MVM for Urban US Routes (from the year 2000 to 2002). There were 3 fatalities and 67 non-fatal injuries reported within the study limits during this period. Forty-seven percent of the reported accidents were collisions with fixed objects; 15% were sideswipe/same direction accidents; and 13% were rear end/slow/stop accidents. The proposed improvements of the studied alternatives should reduce the potential for these types of traffic accidents.

IV. Project Description

The 10-mile study area has been divided into six sections, A through F, to facilitate the examination of the US 220 corridor. Corridor mapping can be found on **Maps 1, 2, and 3** at the end of the document.

Section A – SR 1138/NC 134/US 220 Business Interchange

Section A of the study includes a 3.75-mile section of US 220, the interchange with SR 1138 (Dawson-Miller Road)/US 220 Business, a grade separation with SR 1114 (Pisgah Covered Bridge Road), and the proposed interchange with R-2536 (US 64 Bypass). The first interchange, the SR 1138 (Dawson-Miller Road)/US 220 Business interchange, is in a rural area but has numerous roads intersecting at this location. The existing interchange is a conventional diamond with no space for future loops. There is less than 500' between the ramp terminal intersections. NC 134, a major collector/major thoroughfare, tees into SR 1138 (Dawson-Miller Road), a local road, just 600' west of the southbound ramps. US 220A also intersects US 220 Business just 200' east of the northbound ramps. Current design guidelines require a 1,000' spacing from ramp terminals to subsequent crossroads along the "Y-line" for proper safety and operations. A small residential neighborhood is located northwest of the interchange on Cole Mountain Road. Pinewood Country Club is located southeast of the interchange along US 220A. This interchange is located approximately 0.8 miles south of the SR 1114 grade separation and 2.0 miles south of the proposed US 64 Bypass interchange.

The proposed US 64 Bypass interchange was not included in the No Build traffic analysis. A traffic analysis was performed on the SR 1138/US 220 Business interchange. Existing SR 1138/US 220 Business is a two-lane highway with a posted speed of 55 mph. Section A highway and intersection LOS can be found in **Table 2**. There are no exclusive turn lanes from SR 1138/US 220 Business onto the US 220 ramps. Analysis indicates the need for exclusive left-turn lanes in the design year. In fact, the left-turning traffic from SR 1138 to northbound US 220 needs a loop in the design year. These factors and the close proximity of the subsequent Y-lines (NC 134 and US 220A) contribute to the failing intersections in 2035. The failing intersection levels of service, which indicate the need for a multilane section on US 220 Business through the interchange, are the controlling factors at this location. Mapping of the existing roadways in Section A can be found on **Map 1**.

Table 2 – Section A Levels of Service – No Build Alternative			
Description	Type	Base Year 2006	Design Year 2035
SR 1138/US 220 Business	Two-Lane Highway	C	D
Western Ramp Terminal	Unsignalized Intersection*	C	F
Eastern Ramp Terminal	Unsignalized Intersection*	C	F

* Meets traffic signal warrants in the base year.

Section B – SR 1150 Interchange

The remainder of the study corridor north of Section A lies within the Asheboro city limits. The land use in Sections B through F is a mixture of residential, commercial, and light industrial establishments.

Section B of the study includes a 0.75-mile section of US 220 and the SR 1150 (McDowell Road) interchange. SR 1150 intersects US 220 1.5 miles north of the proposed US 64 Bypass. SR 1150 is a two-lane minor thoroughfare and has a posted speed of 45 mph. SR 1150 is a short, 1.1-mile long road connecting two major thoroughfares (US 220 Business and SR 1144 Mack Road) to US 220. The existing interchange is a conventional diamond with less than 600' between the ramp terminals and no space for future loops. There are developed parcels located very close to the interchange ramps in three quadrants; including the Randolph County office building, the Randolph Electric Membership Corporation office, and a K&W Cafeteria. Randolph Community College and several industries are located northeast of the interchange. Division personnel note that the southbound exit ramp backs up in peak hours. There are several side roads intersecting SR 1150 within close proximity to the ramp terminals. Current design guidelines require a 1,000' spacing from ramp terminals to subsequent crossroads along the "Y-line". There is approximately 1.1 mile from SR 1150 (McDowell Road) to US 64 (Dixie Drive).

Section B highway and intersection LOS can be found in **Table 3**. There are currently no exclusive turn lanes from SR 1150 onto the US 220 ramps. Analysis indicates the need for exclusive left-turn lanes on SR 1150 and for dual left-turn lanes on the southbound exit ramp in the design year.

Table 3 – Section B Levels of Service – No Build Alternative			
Description	Type	Base Year 2006	Design Year 2035
SR 1150	Two-Lane Highway	C	D
Western Ramp Terminal	Unsignalized Intersection*	F	F
Eastern Ramp Terminal	Unsignalized Intersection*	D	F

* Meets traffic signal warrants in the base year.

The failing intersection levels of service are the controlling factors at this location. Intersection analysis indicates the need for a multilane section on SR 1150. Mapping of the existing roadways in Section B can best be seen on **Map 2 Option 2**.

Section C – US 64/SR 1713 and US 64/NC 49 Interchanges

Section C of the study includes a 1.6-mile section of US 220 and the US 64 (Dixie Drive) and SR 1713 (Albemarle Road) interchanges. There is a cluster of three partial interchanges at this location. The US 220 interchange with US 64 is a full cloverleaf interchange minus one ramp in the northwest

quadrant. Approximately 700' to the north there is a half-diamond interchange on SR 1713 (Albemarle Road). There is a third partial interchange on US 64 with NC 49 just 2,000' west of US 220. The interchange is on a tight skew and includes a pair of two-way ramps and two free-flow ramps. See **Map 2 Options 1 and 2**.

These conditions are notably less than desirable. Significant development has occurred in close proximity to the interchanges on all sides as well as in between US 64, NC 49, and SR 1713. Cloverleaf interchanges, when compared with other types, are not as well suited to urban areas because of their large footprint. There is an undesirable direct connection to the northwest loop from SR 1713 (Albemarle Road) at its SR 1446 (Lewallen Road) intersection. Although the US 220/US 64 cloverleaf ramps are free-flowing connections, there are no collector-distributor roads on US 220. The ramp terminals at US 220/SR 1713 are stop-controlled and currently operate at a LOS A and are estimated to operate at a LOS B in the design year No Build scenario.

This study must also carefully consider the US 64/NC 49 junction, as it significantly affects the operation of the two US 220 interchanges. The US 64/NC 49 junction is just 2,000' west of US 220 and the configuration is undesirable. The stop-controlled intersections at the NC 49/US 64 two-way ramps currently operate at a LOS C and are estimated to operate at a LOS F in the design year No Build scenario. The traffic forecasts on NC 49 and US 64 indicate failing levels of service as two-lane facilities. Therefore, this study considered some form of the interchange modifications under the R-2220 and R-2535 four-lane widening projects to be in place in the future. The configurations of these three clustered interchanges are closely dependant upon one another. Design coordination between these interchanges to ensure proper functionality is crucial.

The existing US 64 cloverleaf does not have collector-distributors on US 220. While the design year level of service for these weaving movements are considered marginally adequate, there are significant safety and operational concerns with weaving sections within cloverleaf interchanges. As weaving volumes increase, the quality of service on the main facility deteriorates quickly (2004 AASHTO, pp. 788-789). The weaving section is also an accident-prone area as indicated by the cluster of accidents reported in the three-year accident analysis. Collector-distributor roads address these concerns by removing the slow weaving traffic from the high-speed mainline traffic with positive separation. Collector-distributor roads are needed at this location to improve the LOS and operational safety of the facility. The close proximity and configuration of the interchanges in Section C are the controlling factors in accommodating future interstate traffic.

Section D – SR 1442/SR1004/NC 42 Interchange

Section D of the study includes a 1.3-mile section of US 220. The interchange in this section is an unconventional split diamond interchange at the junction of SR 1442 (Sunset Avenue), SR 1004 (Lexington Road), and NC 42 (West Salisbury Street). Mapping of this existing interchange in Section D can best be seen on **Map 3 Option 1**. The interchange is approximately 1.5 miles north of the US 64/SR 1713 interchange. SR 1004 (Lexington Road) approaches from the west and splits into SR 1442 (Sunset Avenue)

and NC 42 (West Salisbury Street) at the western edge of the US 220 interchange. SR 1004 (Lexington Road) and NC 42 (West Salisbury Street) are both listed as major thoroughfares on the PTCOG Thoroughfare Plan. Along US 220, the north- and southbound lanes split apart and all four ramps enter and exit US 220 from the median (i.e. left-hand entrances and exits). There are four existing structures carrying SR 1442 and NC 42 over the split lanes of US 220. There is a 600' two-way connector between the ramp terminals on SR 1442 and NC 42. Left-hand exits and entrances are undesirable. The horizontal clearances under the bridges do not have room for any US 220 widening improvements. Any improvements to US 220 through this interchange will require substantial reconstruction.

Table 4 shows Section D arterial and intersection levels of service based on current conditions:

Table 4 – Section D Levels of Service – No Build Alternative			
Description	Type	Base Year 2006	Design Year 2035
NC 42	Arterial	C	F
SR 1004/SR 1442/NC 42	Unsignalized Intersection*	C	F
SR 1442/Southern Ramp	Signalized Intersection	B	B
NC 42/Northern Ramp	Signalized Intersection	B	E
NC 42/SR 1451	Signalized Intersection	B	F
NC 42/SR 1707	Signalized Intersection	C	F
NC 42/US 220 Business	Signalized Intersection	D	F

* Meets traffic signal warrants in the design year.

As seen above, there are three existing signalized intersections on NC 42 between US 220 and US 220 Business: SR 1451 (Park Street), SR 1707 (Church Street), and US 220 Business. The failing LOS at these signalized intersections indicates the need for widening improvements along NC 42. However, this portion of NC 42 is located in an urban setting with existing buildings just beyond the sidewalks. A one-mile NCDOT Division project was recently completed which rebuilt the NC 42 pavement structure to a three-lane curb-and-gutter section from US 220 to US 220 Business. Additional improvements east of the US 220 interchange are not feasible.

Section E – SR 1462 Interchange

Section E of the study includes a 0.9-mile section of US 220 and the SR 1462 (Park Drive/Presnell Street) interchange. Mapping of Section E can be found on **Map 3 Options 1 and 2**. SR 1462 is approximately 0.8 mile north of NC 42. Existing SR 1462 (Presnell Street), to the east, is a two-lane major thoroughfare with a posted speed of 35 mph. US 220 Business is less than a mile east of the US 220 interchange. To the west, SR 1462 (Park Drive) ends ½ mile within a residential community. The US 220 interchange is closely bounded by a Norfolk Southern Railroad line to the east; SR 1462 bridges over it

approximately 200' from the ramp terminal. The interchange is a conventional type diamond with less than 600' between the ramp terminals and no space for future loops.

Section E roadway and intersection LOS based on current conditions can be found in **Table 5**. There are no existing exclusive turn lanes on SR 1462. Failing intersection and Y-line LOS are controlling factors at this location. Weaving movements between SR 1462 and SR 2269 (Vision Drive) are also factors in determining the need for improvements. They are discussed in Section F below.

Table 5 – Section E Levels of Service – No Build Alternative			
Description	Type	Base Year 2006	Design Year 2035
SR 1462	Two-Lane Highway	D	E
Western Ramp Terminal	Unsignalized Intersection*	B	F
Eastern Ramp Terminal	Unsignalized Intersection*	B	F

* Meets traffic signal warrants in the design year.

Section F – SR 2269 Interchange

The study area did not initially include the SR 2269 (Vision Drive) interchange, but because of its proximity to the SR 1462 interchange and the weaving movements in between, it has been included. SR 1462 is less than 0.9 mile from SR 2269. Section F of the study includes a 1.8-mile section of US 220 through the SR 2269 (Vision Drive) interchange up to SR 1504 (Spero Road) (See **Map 3**). The existing interchange is a three-leg interchange. SR 2269 travels approximately one mile east-northeast from US 220 to US 220 Business. SR 2269 is a four-lane divided roadway with a 16' raised concrete island and is classified as a major thoroughfare. SR 2269 bridges over the Norfolk Southern Railroad approximately 1,000' east of US 220. The US 220 interchange ramps are free-flowing movements; including two ramps, a loop, and a flyover. The loop has a 150' radius, less than the minimum desirable 230' radius for a 30-mph interstate loop. There is also a southbound weaving movement between SR 2269 and SR 1462. It is estimated to operate at LOS B in the BY and to fall to LOS D in the DY. Although this is not a failing level of service it does warrant concern for safe operation with future interstate traffic. With failing levels of service on the US 220 mainline under existing conditions, the quality of service will deteriorate quickly with increasing weaving movements.

V. Studied Improvements

Studied improvements in this report have been separated into six sections, Sections A through F, as shown on **Maps 1, 2, and 3** at the end of the document. Improvements considered were established by traffic analysis, geometric deficiencies, and design standards, as well as input garnered from NCDOT personnel. The following describes the studied improvements for each of the project elements:

Mainline

Improvements to the mainline are needed in order to meet interstate standards and accommodate future traffic demands. TIP project I-4407 will upgrade the existing four-lane freeway's paved shoulders, guardrail, and acceleration/deceleration lanes to current interstate standards. Although the vertical and horizontal alignments of existing US 220 meet 70-mph design-speed criteria, bridge structures located along the corridor are deficient in horizontal and vertical clearances. Traffic forecasts for future year 2035 also show the need for additional through lanes on the mainline. Widening improvements for future traffic demands along this corridor will require significant reconstruction of several of the existing interchanges.

Traffic analyses in this report are based on the Highway Capacity Manual and on NCDOT Analysis Guidelines. Synchro and HCS software were used to analyze traffic operations components. The Levels of Service (LOS) shown below reflect results of Base Year (BY) and Design Year (DY) traffic analyses. Build Alternative Traffic Volumes can be found in **Appendix B**. These analyses are preliminary and should be examined in greater detail in the subsequent stages of this project.

Table 6 below shows the Build Alternative freeway segments levels of service:

Table 6 – Build Alternative Freeway Segments				
Design Year 2035 Levels of Service (LOS)				
Freeway Segment	From/To	Six-Lane	Eight-Lane	Six-Lane with C-Ds*
1	From Begin Study to SR 1138/US 220 Business	C	-	-
2	From SR 1138/US 220 Business to SR1150	D	-	-
3	From SR1150 to US 64	D	-	-
4	From US 64 to NC 42	D	-	-
5	From NC 42 to SR 1462	F	D	D
6	From SR 1462 to SR 2269	F	E	D
7	From SR 2269 to End Study	F	D	D

* C-Ds = Collector-Distributors

Based on capacity analyses of the existing conditions, or No Build Alternative, four-lane US 220 will operate at failing levels of service prior to DY 2035. **Table 6** above presents the resulting levels of service with six-lane, eight-lane, and six-lane with collector-distributors freeway segments. With the short distances between the NC 42, SR 1462, and SR 2269 interchanges and the resulting weaving movements, it is the recommendation of this study to include collector-distributor roads (C-Ds) through segments 5 and 6 with the mainline improvements. The inclusion of C-Ds through these segments should improve operational safety and achieve an acceptable LOS with a six-lane section.

The proposed mainline typical section for this project, as a result of the traffic analysis described above, is a six-lane section with a narrow 22' wide median. **Exhibit 3** shows the proposed typical sections. The narrow 22' wide median includes 10' wide full-depth paved shoulders and a double-faced concrete barrier. Proposed travel lanes are 12' wide. Outside shoulders are 12' wide full-depth paved shoulders. The NCDOT Paved Shoulder Policy recommends considering a 12' wide outside paved shoulder for interstate facilities with heavy truck traffic (NCDOT Design Manual, p. 1-40). Collector-distributor roads are to be included with the mainline from NC 42 to SR 2269 (through segments 5 and 6). Collector-distributor roads have 12' wide travel lanes and 4' wide full-depth paved shoulders. Please refer to "Typical Section No. 1", **Exhibit 3**. Interchange ramps vary from 16' to 24' wide and have 4' wide full-depth paved shoulders. The majority of the mainline widening can be accomplished within existing right-of-way. Varying widths of proposed right-of-way are needed for the portions to be constructed on new location or with collector-distributors, as shown on the study **Maps**.

At the southern end of the project, the highway transitions from the existing four-lane section with a 70' wide median to a six-lane section with a narrow 22' wide median approximately ½ mile south of SR 1138. See **Map 1**. Tapering the six-lane section with collector-distributor roads back to the existing four-lane freeway with a 70' wide median extends construction about a mile north of SR 2269 to SR 1504 Spero Road. See **Map 3**.

Section A – NC 134/US 220 Business Interchange

As mentioned previously, anticipated traffic demands reveal the need for additional through lanes on future I-73/74. **Build Alternative Section A** improvements include widening 3.75 miles of future I-73/74 to a six-lane section with a narrow median. In Section A, existing US 220 is a four lane divided roadway with a 40' median. With the installation of the narrow 22' median, there will be an additional 5 feet of new full-depth pavement needed on the outside. Mainline improvements can be constructed within existing right-of-way. See "Typical Section No. 2", **Exhibit 3**.

The interchange at SR 1138/NC 134/US 220 Business, the grade separation at SR 1114 (Pisgah Covered Bridge Road), and the interchange with proposed US 64 Bypass are also included in **Build Alternative Section A**. This study recommends relocating the SR 1138/NC 134/US 220 Business interchange north of the existing location and realigning NC 134 to create a direct connection to US 220 Business. Relocation of the interchange includes providing standard ramp terminal spacing and allowance for future loops. Traffic analysis reveals the need for a loop in the southeastern quadrant in DY 2035. Relocating the interchange northward will not only facilitate construction of the new, larger interchange, but will avoid impacting the Pinewood Country Club and Golf Course to the southeast.

The NC 134/SR 1138 and US 220A/US 220 Business intersections must be relocated in order to provide improved spacing from the ramp terminals. New access is needed from Cole Mountain Road to SR 1138 as well because of the displacement of part of the neighborhood. NC 134/US 220 Business needs to be widened through the interchange to a four-lane divided section with a 23' raised grass median in order to provide acceptable intersection levels of service in the DY. This required US 220 Business widening also connects to the four-lane improvements addressed by the adjacent U-5005 project.

The SR 1114 structure over US 220 must be replaced to accommodate the six-lane interstate. This study recommends replacing it in its current location. A short off-site detour along SR 1138 and US 220 Business can be utilized to construct the new SR 1114 bridge over the interstate. No improvements are recommended to the proposed US 64 Bypass interchange outside of US 220 widening.

TIP project R-2536 US 64 Bypass is currently in planning and this study should not affect its interchange design. Coordination between the Piedmont Triad RPO and R-2536 project staff has resulted in proposed structures accommodating the future six-lane I-73/74 section. Additional information on the adjacent R-2536 project can be found on page 5, **Section II** of the document.

A traffic analysis was performed on the **Build Alternative Section A** interchange at NC 134/US 220 Business. Both of the ramp terminal intersections meet traffic signal warrants in the p.m. peak hour of the BY. [Although new traffic signals are recommended throughout this study, the actual determination of when a traffic signal is warranted will be made by the Regional Traffic Engineer.] Section A improvements include proposed traffic signals at both ramp terminals. See **Table 7** below:

Table 7 – Section A Levels of Service – Build Alternative			
Description	Type	Base Year 2006	Design Year 2035
NC 134/US 220 Business	Multi-Lane Highway	A	B
Western Ramp Terminal	Signalized Intersection	A	C
Eastern Ramp Terminal	Signalized Intersection	A	A

NCDOT Traffic Survey maps from the NCDOT GIS data distribution website indicate that approximately 70% of the traffic forecast on SR 1138 at the interchange actually comes from NC 134 (4,600 out of 6,200 ADT in 2005). This supports a realignment of NC 134 to US 220 Business to improve traffic operations. Traffic Survey maps also indicate that a significant amount of traffic (4,800 ADT in 2005) travel on US 220A. The US 220A intersection with US 220 Business should be examined more closely in future planning and design stages of the project. The intersection may warrant signalization in the future.

Build Alternative Section A improvements include widening 3.75 miles of future I-73/74 to a six-lane section, relocating and reconstructing the NC 134/US 220 Business diamond interchange, and replacing the SR 1114 (Pisgah Covered Bridge Road) grade separation. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders, and a 22' wide median with a concrete barrier. Please refer to “Typical Section No. 2”, **Exhibit 3**. Mainline widening can be accomplished within existing right-of-way. Additional right-of-way is needed to relocate NC 134 and to reconstruct the US 220 Business interchange. Proposed NC 134/US 220 Business is a four-lane divided section with a 23' raised grass median. Proposed NC 134 south of the interchange is a two-lane roadway. Proposed interchange right-of-way along NC 134/US 220 Business varies from 130' to 150' wide. Proposed right-of-way is approximately 100' outside of ramps.

It is anticipated that **Build Alternative Section A** will require the relocation of 10 residences and no businesses. The total cost, including construction and right-of-way, is estimated to be \$ 48,800,000.

Construction.....	\$ 43,400,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 5,400,000</u>
Total Cost.....	\$ 48,800,000

Section B – SR 1150 Interchange

Two build alternatives are considered in Section B. The first option, **Alternative B1**, reconstructs the tight diamond interchange at SR 1150 (McDowell Road) to a larger, standard diamond interchange configuration with space for future loops. The second option, **Alternative B2**, maintains the tight diamond interchange configuration with widening improvements in order to minimize impacts to existing development. Both options recommend widening McDowell Road to a four-lane divided section with a 23' raised grass median and extending the control-of-access along McDowell Road.

Many of the improvements are common to both options: Both interchange options recommend installing traffic signals at the ramp terminals. Several changes must be made along McDowell Road in order to provide the desired 1,000' of control-of-access. First, east of the interchange, the traffic signal at New Century Drive/Industrial Park Avenue is relocated to Armadillo Drive/DOT Drive. Right-in/Right-out access will be provided between New Century Drive and DOT Drive. (Option 1 cuts off New Century Drive with a cul-de-sac and Option 2 provides right-in/right-out access onto SR 1150.) Industrial Park Avenue is rerouted around Randolph Community College to Armadillo Drive/DOT Drive. A new access road is provided from DOT Drive to New Century Drive.

Access is controlled along McDowell Road to the west for 1,000'. Right-in/right-out access is provided at SR 1157 (Lambert Drive). A U-turn bulb and a new service road are provided at Myrtle Street. The service road provides access to the Randolph Electric Membership Corp parcel. McDowell Road interchange improvements include an existing crossing of the Little River and associated wetlands just beyond the western ramp terminal. Stage construction is recommended in both options in order to widen and replace the existing McDowell Road structure over future I-73/74 while maintaining the existing travel patterns.

The main difference between the two Section B options can be seen in their footprints. **Alternative B1**, with expanded ramp terminals and a loop in the southwest quadrant, displaces the Randolph County office building, the Randolph Electric Membership Corp., a significant portion of the K&W Cafeteria parking lot, and a Sanitary Sewer Lift Station. **Alternative B2**, on the other hand, does not displace these facilities and utilizes a dual left-turning movement from southbound I-73/74 to SR 1150 instead of a loop-ramp.

Section B highway and intersection levels of service can be found in **Table 8**:

Table 8 – Section B Levels of Service – Build Alternatives			
Description	Type	Base Year 2006	Design Year 2035
SR 1150	Multi-Lane Highway	A	A
B1 Western Ramp Terminal	Signalized Intersection	A	B
B1 Eastern Ramp Terminal	Signalized Intersection	A	C
B2 Western Ramp Terminal	Signalized Intersection	A	C
B2 Eastern Ramp Terminal	Signalized Intersection	A	C

A single-point urban interchange (SPUI) was considered at this location. However, with traffic volumes that are not well-balanced among the turning movements, a tight diamond interchange (TDI) will operate better than a SPUI. There is a distinctly heavy volume of traffic traveling from I-73/74 southbound to SR 1150 eastbound and vice versa. For these reasons a TDI was considered instead of a SPUI for **Alternative B2**. Traffic diagrams can be found in **Appendix B**.

Alternative B1 improvements include widening 0.75 mile of future I-73/74 to a six-lane section, reconstructing the SR 1150 diamond interchange, and providing standard ramp terminal spacing and control-of-access. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders, and a 22' wide median with a concrete barrier. Please refer to "Typical Section No. 2", **Exhibit 3**. Mainline widening can be accomplished within existing right-of-way. Additional right-of-way is needed to reconstruct the SR 1150 interchange. Proposed SR 1150 is a four-lane divided section with a 23' raised grass median. Proposed access roads and relocated local roads are two-lane roadways. Proposed right-of-way along SR 1150 is 130' wide.

Proposed interchange right-of-way is approximately 90' outside of ramps. Proposed right-of-way is 100' along service roads and relocated local roads.

It is anticipated that **Build Alternative B1** will require the relocation of 1 residence and 2 businesses. The total cost, including construction and right-of-way, is estimated to be \$ 38,600,000.

Construction.....	\$ 20,800,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 17,800,000</u>
Total Cost.....	\$ 38,600,000

Alternative B2 improvements differ only in interchange configuration from **Alternative B1**. **Alternative B2** improvements require a smaller footprint and eastern ramp modifications which can be accomplished within existing right-of-way. All other aspects of right-of-way and sections are the same.

It is anticipated that **Build Alternative B2** will require the relocation of 1 residence and no businesses. The total cost, including construction and right-of-way, is estimated to be \$ 21,800,000.

Construction.....	\$ 17,200,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 4,600,000</u>
Total Cost.....	\$ 21,800,000

Section C – US 64 and SR 1713 Interchanges

Section C of the study includes widening 1.6-miles of future I-73/74 to a six-lane section and the US 64 (Dixie Drive) and SR 1713 (Albemarle Road) interchanges. Two build alternatives are considered in Section C. **Alternative C1**, the first option, reconstructs the existing cloverleaf interchange at US 64 (Dixie Drive) to a smaller, single-point urban interchange (SPUI) configuration. **Alternative C1** maintains the half-diamond ramps at SR 1713 (Albemarle Road) as well. The second option, **Alternative C2**, maintains the cloverleaf-type interchange configuration with the addition of collector-distributor roads on future I-73/74 in order to improve operational safety. **Alternative C2** includes removing the SR 1713 (Albemarle Road) half-diamond interchange ramps. Both options recommend widening US 64 (Dixie Drive) to a six-lane section with a median concrete island and increasing the length of control-of-access along US 64 (Dixie Drive). See **Map 2 Options 1 and 2**.

Because of the proximity of the interchanges at this location, the US 64/NC 49 interchange was included in the investigation and analysis of Section C improvements. Weaving movements between closely spaced interchanges are of foremost concern in traffic operations analyses. Weaving LOS shown below in **Table 9** include R-2220 interchange improvements in place as shown in the 1991 Environmental Assessment (EA) document. As seen below, **Build Alternative C1** improvements are estimated to operate at LOS C in the DY. Other project improvements (from future TIP projects R-2220 and R-2535) in conjunction with **Alternative C1** are estimated to operate at LOS D or better in the DY. Additional information regarding the R-2220 and R-2535 adjacent projects can be found on page 5 in **Section II** of the document.

Table 9 – Section C Levels of Service – Build Alternative C1		
Description	Type	Design Year
US 64 between NC 49 and I-73/74	Multi-Lane Highway (6-lane divided)	C
US 64 east of I-73/74	Multi-Lane Highway (6-lane divided)	C
SR 1713 east of NC 49	Multi-Lane Highway (4-lane undivided)	C
US 64/NC 49 eastbound weave	Weave	C
US 64/NC 49 westbound weave	Weave	C
US 64 SPUI intersection	Signalized Intersection	C
SR 1713 western ramp terminal	Signalized Intersection	C
SR 1713 eastern ramp terminal	Signalized Intersection	C
Other Projects:		
R-2535 NC 49 west of FS-0408A	Multi-Lane Highway	D
R-2220 ramp terminals	Signalized Intersections	C

Alternative C2 proposes improving the existing cloverleaf interchange, removing the SR 1713 half-diamond ramps, and installing collector-distributors on future I-73/74. **Alternative C2** improvements, with the removal of the SR 1713 half-diamond interchange, concentrate traffic on US 64 and require an eight-lane section on US 64 between NC 49 and future I-73/74. The R-2220E improvements from the 1991 EA do not work with the **Alternative C2** cloverleaf interchange. Weaving movements between R-2220E and **Alternative C2** fail in the DY. R-2220E ramp terminal intersections fail in the DY with the removal of the SR 1713 ramps. In order for an NC 49 interchange to properly function with a cloverleaf interchange at future Interstate 73/74, it must be relocated further west of the future interstate. A free-flowing three-leg interchange on new location is an improvement that would work with this study's **Alternative C2** improvements. With the installation of a US 64/NC 49 three-leg interchange as shown on **Map 2 Option 2**, weaving, merging, and diverging movements are estimated to operate at an acceptable LOS in the DY. **Build Alternative C2** levels of service are summarized below in **Table 10**:

Table 10 – Section C Levels of Service – Build Alternative C2		
Description	Type	Design Year 2035
US 64 between NC 49 and I-73/74	Multi-Lane Highway (8-lane divided)	D
US 64 east of I-73/74	Multi-Lane Highway (6-lane divided)	D
SR 1713 east of NC 49	Multi-Lane Highway (4-lane undivided)	C
US 64/NC 49 eastbound weave	Merge/Diverge *	C *
US 64/NC 49 westbound weave	Weave	D
Interior cloverleaf weaves on I-73/74	Weave	E
Interior cloverleaf weaves on US 64	Weave	D

* These type movements with lengths over 2,500' are not considered weaving movements per the Highway Capacity Manual. The individual merging and diverging movements in the eastbound direction are estimated to operate at LOS C or better in the DY.

Alternative C1 improvements include widening 1.6-miles of future I-73/74 to a six-lane section, reconstructing the US 64 and SR 1713 interchanges, and providing standard control-of-access. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders, and a 22' wide median with a concrete barrier. Please refer to "Typical Section No. 3", **Exhibit 3**. South of US 64, mainline widening can be accomplished within existing right-of-way. Additional right-of-way is needed along the mainline north of US 64 (approximately 300' wide total), along the SR 1713 ramps, and along US 64 west to construct the improvements. East of I-73/74, widening US 64 to a six-lane section with a median concrete island can be accomplished with construction easements. Proposed interchange right-of-way is approximately 100' outside of SR 1713 ramps.

It is anticipated that **Build Alternative C1** will require the relocation of 27 residences and no businesses. The total cost, including construction and right-of-way, is estimated to be \$ 44,300,000.

Construction.....	\$ 30,300,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 14,000,000</u>
Total Cost.....	\$ 44,300,000

Alternative C2 improvements differ in interchange configuration from **Alternative C1**. **Alternative C2** improvements, as stated previously, include installing collector-distributor roads at the cloverleaf interchange and removing the SR 1713 half-diamond ramps. Refer to the "Collector-Distributor Detail" on **Exhibit 3**. All other aspects of typical sections and right-of-way are the same.

It is anticipated that **Build Alternative C2** will require the relocation of 28 residences and 11 businesses. The total cost, including construction and right-of-way, is estimated to be \$ 56,400,000.

Construction.....	\$ 35,700,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 20,700,000</u>
Total Cost.....	\$ 56,400,000

Section D – NC 42/SR 1004 Interchange

Two build alternatives are considered in Section D at the NC 42 (West Salisbury Street)/SR 1004 (Lexington Road)/SR 1442 (Sunset Avenue) interchange. Section D improvements will require substantial reconstruction of the interchange. The first option, **Alternative D1**, reconstructs the existing split inverted diamond interchange to a standard diamond interchange configuration with space for future loops. **Alternative D1** relocates the mainline 300' west of the existing southbound lanes. The second option, **Alternative D2**, reconstructs the existing interchange to a single-point urban interchange (SPUI) configuration with the NC 42 (West Salisbury Street) traffic signal on the bridge. **Alternative D2** widens the mainline about the southbound travel lanes.

Both options include collector-distributor roads which continue through subsequent sections E and F. Both options recommend widening and control-of-access improvements along NC 42/SR 1004. Both options also recommend severing SR 1442 (Sunset Avenue) from the interchange. See **Map 3 Options 1 and 2**. Operational and safety benefits support removing SR 1442 from the interchange. The existing downtown road network provides sufficient connectivity for SR 1442.

Although traffic forecasts and LOS indicate the need for widening NC 42 to a four-lane section, it would not be reasonable to recommend this due to dense urban development right along NC 42 eastward to US 220 Business. A current DOT Division project is reconstructing NC 42 to a three-lane curb-and-gutter section. A four-lane section is recommended within the immediate interchange area. Both alternatives tie to the three-lane section on NC 42 just beyond the eastern ramp terminal. These improvements gain approximately 600' of control-of-access to the east on NC 42 and 1,000' of control-of-access to the west on SR 1004. Both Section D options also include replacement of the SR 3255 (Old Farmer Road) grade separation structure over the mainline.

Alternative D1 reconstructs the interchange to a standard diamond with room for future loops. Traffic forecasts do not indicate the need for loops in the DY. **Alternative D2** reconstructs the interchange to a SPUI. Both options include collector-distributor roads connecting the NC 42 interchange with the subsequent SR 1462 and SR 2269 interchanges. Section D build alternatives levels of service can be found in **Table 11**:

Table 11 – Section D Levels of Service – Build Alternatives		
Description	Type	Design Year 2035
NC 42/SR 1004	Arterial	E
SR 1004/service road *	Signalized Intersection	C
D1 NC 42 western ramp terminal	Signalized Intersection	D
D1 NC 42 eastern ramp terminal	Signalized Intersection	C
D2 NC 42 SPUI	Signalized Intersection	C
Northbound C-D *	Weave	A
Southbound C-D *	Weave	A

* Both Options.

Alternative D1 improvements include constructing 1.3 miles of future I-73/74 on new location 300' west of the existing highway. Improvements include constructing the six-lane mainline section with collector-distributors, replacing the SR 3255 grade separation, reconstructing the NC 42/SR 1004 interchange, and providing standard control-of-access. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders,

and a 22' wide median with a concrete barrier. The proposed section also includes collector-distributor roads which are continuous through Sections D, E, and F. Please refer to “Typical Section No. 1” and to the "Collector-Distributor Detail", **Exhibit 3**. Part of the mainline improvements can be accomplished within existing right-of-way and part on proposed 360' wide right-of-way. Proposed right-of-way is approximately 130' along SR 1004 and tapers to existing on NC 42. Proposed interchange right-of-way varies from 90' to 120' outside of the ramps with the exception of the northeastern ramp. It can be constructed within existing right-of-way. Proposed right-of-way varies from 60' to 100' along service roads.

It is anticipated that **Build Alternative D1** will require the relocation of 126 residences and 7 businesses. The total cost, including construction and right-of-way, is estimated to be \$ 75,400,000.

Construction.....	\$ 37,500,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 37,900,000</u>
Total Cost.....	\$ 75,400,000

Alternative D2 sections and right-of-way are the same as **Alternative D1** with the exception of the following: proposed right-of-way is approximately 200' along SR 1004 and tapers from 200' to existing on NC 42. Proposed interchange right-of-way is approximately 90' outside of the western ramps. Work on the eastern ramps can be accomplished within existing right-of-way.

It is anticipated that **Build Alternative D2** will require the relocation of 94 residences and 15 businesses. The total cost, including construction and right-of-way, is estimated to be \$ 81,100,000.

Construction.....	\$ 41,900,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 39,200,000</u>
Total Cost.....	\$ 81,100,000

Section E – SR 1462 Interchange

Two build alternatives are considered in Section E at the SR 1462 (Park Drive/Presnell Street) interchange. The first option, **Alternative E1**, reconstructs the existing tight diamond interchange to a standard diamond interchange type configuration. The interchange configuration includes a loop-ramp in the southwest quadrant and has space for a future loop in the southeast quadrant. **Alternative E1** relocates the mainline 500' west of the existing highway. The second option, **Alternative E2**, maintains the tight diamond interchange configuration with widening improvements in order to minimize impacts to existing development. **Alternative E2** widens the mainline along the existing centerline. Both options include collector-distributor roads which are continuous through sections D, E, and F. Both options recommend widening and control-of-access improvements along SR 1462 through the interchange. Both options also recommend reconstructing the SR 1462 structure over the Norfolk Southern Railroad line. See **Map 3 Options 1 and 2**.

As shown previously in **Table 11**, weaving movements between NC 42 and SR 1462 are estimated to operate at LOS A in the DY for both options. **Table 12** below shows the levels of service for **Alternatives E1 and E2**:

Table 12 – Section E Levels of Service – Build Alternatives		
Description	Type	Design Year
SR 1462 (Park Drive) *	Two-Lane Highway	D
SR 1462 (Presnell Street) *	Two-Lane Highway	E**
Alt. E1 Western Ramp Terminal	Signalized Intersection	C
Alt. E1 Eastern Ramp Terminal	Signalized Intersection	C
Alt. E2 Western Ramp Terminal	Signalized Intersection	C
Alt. E2 Eastern Ramp Terminal	Signalized Intersection	A

* Both Options.

** Fails prior to the DY. Additional consideration should be given to Presnell Street improvements in subsequent stages of the project.

Alternative E1 improvements include constructing 0.9 mile of future I-73/74 on new location 500' west of the existing highway. Improvements include constructing the six-lane mainline section with collector-distributors, replacing the SR 1462 grade separation over the railroad, reconstructing the SR 1462 interchange, and providing improved control-of-access along the Y-line. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders, and a 22' wide median with a concrete barrier. The proposed section also includes collector-distributor roads which are continuous through Sections D, E, and F. Please refer to "Typical Section No. 1" and to the "Collector-Distributor Detail", **Exhibit 3**. Proposed right-of-way along the mainline is 275' wide west of the centerline. Proposed right-of-way is approximately 150' along Park Drive. Presnell Street work can be accomplished within existing right-of-way. Proposed interchange right-of-way is approximately 90' outside of ramps. Proposed right-of-way is 100' along service roads.

It is anticipated that **Build Alternative E1** will require the relocation of 76 residences and no businesses. The total cost, including construction and right-of-way, is estimated to be \$ 49,400,000.

Construction.....	\$ 34,200,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 15,200,000</u>
Total Cost.....	\$ 49,400,000

Alternative E2 sections and right-of-way are the same as **Alternative E1** with the exception that varying widths of proposed right-of-way are needed along the mainline. Mainline widening is mostly accomplished within existing right-of-way. Proposed right-of-way is approximately 150' along Park Drive and approximately 200' along Presnell Street. Proposed interchange right-of-way is approximately 90' outside of ramps. Proposed right-of-way is 100' along service roads.

It is anticipated that **Build Alternative E2** will require the relocation of 10 residences and 1 business. The total cost, including construction and right-of-way, is estimated to be \$ 26,600,000.

Construction.....	\$ 22,200,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 4,400,000</u>
Total Cost.....	\$ 26,600,000

Section F – SR 2269 Interchange

Build Alternative Section F improvements include widening 1.8 miles of future I-73/74 to a six-lane section with collector-distributors, relocating the SR 2269 three-leg interchange northward 1,300', constructing a new grade separation over the railroad on proposed SR 2269, and providing standard control-of-access. Please refer to “Typical Section No. 2”, **Exhibit 3**. The collector-distributor roads are continuous through Sections D, E, and F. The SR 2269 (Vision Drive) interchange has been included in this study because of its proximity to preceding interchanges and the need for collector-distributor roads.

Operational safety of the mainline weaving movements between the interchanges is of foremost concern. Installing collector-distributor roads between the NC 42, SR 1462 (Park/Presnell), and SR 2269 (Vision Drive) interchanges will promote safer weaving movements and improve levels of service for through-moving traffic. Because the distances between the SR 1462 ramps and the SR 2269 ramps are greater than 2,500' with the relocation of the SR 2269 interchange, the movements are no longer considered weaving movements. It is anticipated that the movements will operate at desirable levels of service in the design year. The relocated SR 2269 loop-ramp radius has been improved from 150' to 230' in order to meet a 30-mph design speed for interstate loops. All of the SR 2269 interchange ramps are free-flowing movements and are also anticipated to operate at desirable levels of service in the design year.

Build Alternative Section F mainline widening can be accomplished within existing right-of-way. Additional right-of-way is needed to relocate and construct the SR 2269 interchange. The proposed mainline typical section has six 12' lanes, 12' wide full-depth outside paved shoulders, 10' wide full-depth inside paved shoulders, and a 22' wide median with a concrete barrier. The proposed section also includes collector-distributor roads which are continuous through Sections D, E, and F. Please refer to “Typical Section No. 2” and to the "Collector-Distributor Detail", **Exhibit 3**. Proposed SR 2269 is a four-lane divided section with a 16' raised concrete island. Proposed right-of-way is approximately 250' along the relocated SR 2269. Proposed interchange right-of-way is approximately 90' outside of ramps. Proposed right-of-way varies from 100' to 200' along the flyover.

It is anticipated that **Build Alternative Section F** will require the relocation of no residences and 1 business. The total cost, including construction and right-of-way, is estimated to be \$ 44,300,000.

Construction.....	\$ 34,800,000
<u>Right-of-way & Utilities.....</u>	<u>\$ 9,500,000</u>
Total Cost.....	\$ 44,300,000

V. Project Costs & Recommendations

It is the recommendation of this study that approximately 10 miles of US 220, from south of NC 134/US 220 Business to north of SR 2269 (Vision Drive), be widened to a six-lane section with a narrow median in order to accommodate future I-73/74 traffic. Proposed travel lanes are 12' wide. The narrow median is 22' wide and includes 10' wide full-depth paved shoulders and a concrete barrier. The outside shoulders are 12' wide full-depth paved shoulders. **Exhibit 3** shows the proposed typical sections for the mainline. Collector-distributor roads have 12' wide travel lanes and 4' wide full-depth paved shoulders. Interchange ramps vary from 16' to 24' wide and have 4' wide full-depth paved shoulders. The majority of the mainline widening can be accomplished within existing right-of-way. Varying widths of proposed right-of-way are needed for the portions to be constructed on new location or with collector-distributors.

The project has been broken up into six sections, Sections A through F, for consideration of individual interchange options and recommendations. Section recommendations are described on the following pages. **Table 13** shows the construction, right-of-way, and utility costs for each section:

Table 13 – Build Alternative Section Costs				
Alternative	Relocateses	Construction Cost	Right-of-Way & Utility Cost	Total Cost
Section A	10	\$ 43,400,000	\$ 5,400,000	\$ 48,800,000
Alternative B1	3	\$ 20,800,000	\$ 17,800,000	\$ 38,600,000
Alternative B2	1	\$ 17,200,000	\$ 4,600,000	\$ 21,800,000
Alternative C1	27	\$ 30,300,000	\$ 14,000,000	\$ 44,300,000
Alternative C2	39	\$ 35,700,000	\$ 20,700,000	\$ 56,400,000
Alternative D1	133	\$ 37,500,000	\$ 37,900,000	\$ 75,400,000
Alternative D2	109	\$ 41,900,000	\$ 39,200,000	\$ 81,100,000
Alternative E1	76	\$ 34,200,000	\$ 15,200,000	\$ 49,400,000
Alternative E2	11	\$ 22,200,000	\$ 4,400,000	\$ 26,600,000
Section F	1	\$ 34,800,000	\$ 9,500,000	\$ 44,300,000

The NCDOT Intelligent Transportation System (ITS) Section has recommended the installation of ITS equipment, namely, six Closed Circuit Television (CCTV) cameras and radio stations, three shoulder-mounted Dynamic Message Signs (DMS), and equipment to upgrade the signal system along US 220 Business. This equipment will be used for incident management, traffic management, and detour routing on future I-73/74. The estimated project cost for this ITS deployment is \$ 1,240,000.

The following describes the recommended build alternatives for each section of the project:

There is only one group of improvements considered in Section A. **Build Alternative Section A** improvements include widening 3.75 miles of the mainline as previously described, relocating and reconstructing the NC 134/US 220 Business diamond interchange, and replacing the SR 1114 (Pisgah Covered Bridge Road) grade separation. Existing local roads provide a short detour route for the construction of the new SR 1114 grade separation. Reconstructing the US 220 Business interchange north of the existing interchange will facilitate construction and minimize impacts to the south. Section A mainline improvements taper out approximately 0.5 mile south of existing US 220 Business. It is the recommendation of this study that these improvements be included in the future project.

Two build alternatives are considered in Section B. The first option, **Alternative B1**, reconstructs the tight diamond interchange at SR 1150 (McDowell Road) to a larger, standard diamond interchange configuration with space for future loops. The second option, **Alternative B2**, maintains the tight diamond interchange configuration with widening improvements in order to minimize impacts to existing development. Both options widen 0.75 mile of future I-73/74. Both options recommend widening McDowell Road to a four-lane divided section with a 23' raised grass median and improving the control-of-access along McDowell Road. **Alternative B2** achieves acceptable levels-of-service in the DY, has horizontal and vertical alignments which provide good sight distance, does not significantly impact existing development, is more context sensitive, and is more cost-effective. It is the recommendation of this study, therefore, that **Alternative B2** improvements be included in the future project.

Two build alternatives are considered in Section C. **Alternative C1** reconstructs the existing cloverleaf interchange at US 64 (Dixie Drive) to a smaller, single-point urban interchange (SPUI) configuration and maintains the half-diamond ramps at SR 1713 (Albemarle Road). **Alternative C2** maintains the cloverleaf-type interchange configuration with the addition of collector-distributor roads and removes the SR 1713 (Albemarle Road) half-diamond interchange ramps. Both options widen 1.6 miles of future I-73/74. Both options recommend widening US 64 (Dixie Drive) to a six-lane section with a concrete island median and improving the control-of-access along US 64 (Dixie Drive). Constructability will be a complicated issue at this location with either alternative. However, the smaller footprint of the **Alternative C1** SPUI allows more room for construction. **Alternative C1** improvements also distribute the traffic load more evenly among the existing Y-lines, achieve higher levels of service in the DY, give more flexibility to the design of the future NC 49/US 64 interchange, eliminate the cloverleaf weaving movements, and cost less to construct. It is the recommendation of this study, therefore, that **Alternative C1** improvements be included in the future project.

Two build alternatives are considered in Section D at the NC 42 (W. Salisbury Street)/SR 1004 (Lexington Road)/SR 1442 (Sunset Avenue) interchange. **Alternative D1** improvements reconstruct the existing interchange to a standard diamond interchange and relocate 1.3 miles of mainline 300' west of existing. **Alternative D2** improvements reconstruct the existing interchange to a SPUI and widen 1.3 miles of mainline about the southbound travel lanes. Both options include collector-distributor roads that continue

through sections E and F. The **Alternative D1** standard diamond interchange has less impact along NC 42 but more impact to residential neighborhoods in the western quadrants with its larger footprint. The **Alternative D2** SPUI fits the urban environment better and has a smaller overall footprint, but impacts NC 42 more and has higher bridge structure costs. Constructability is similar with either alternative. Both alternatives will require a significant number of relocatees. **Alternative D2** costs more than **Alternative D1** with the difference essentially being the higher bridge structure costs for the **Alternative D2** SPUI. Although either interchange configuration could be considered in future planning and design stages, it is the recommendation of this study to include **Alternative D2** in the future project because of its smaller footprint and longer lasting acceptable levels-of-service.

Two build alternatives are considered in Section E at the SR 1462 (Park Drive/Presnell Street) interchange. **Alternative E1** improvements reconstruct the existing interchange to a standard diamond interchange with a loop-ramp in the southwest quadrant and relocate 0.9 mile of mainline 500' west of existing. **Alternative E2** improvements maintain the tight diamond interchange configuration and widen 0.9 mile of mainline. Both options include continuous collector-distributor roads through sections D, E, and F. The **Alternative E1** standard diamond interchange has a larger footprint, more residential impacts, and higher costs. Although the **Alternative E2** TDI does not allow for future loops it does fit the urban environment, has a smaller footprint, has better levels-of-service, and has significantly lower costs. It is the recommendation of this study, therefore, that **Alternative E2** improvements be included in the future project.

There is only one group of improvements considered in Section F of this study. **Build Alternative Section F** improvements include widening 1.8 miles of future I-73/74 to a six-lane section with collector-distributors and relocating the SR 2269 three-leg interchange 1,300' northward. Mainline widening and collector-distributors taper out approximately 1.1 mile north of proposed SR 2269. It is the recommendation of this study that these improvements be included in the future project.

Table 14 – Recommended Improvements & Project Cost			
Recommended Alternative	Construction Cost	Right-of-Way & Utility Cost	Total Cost
Section A	\$ 43,400,000	\$ 5,400,000	\$ 48,800,000
Alternative B2	\$ 17,200,000	\$ 4,600,000	\$ 21,800,000
Alternative C1	\$ 30,300,000	\$ 14,000,000	\$ 44,300,000
Alternative D2	\$ 41,900,000	\$ 39,200,000	\$ 81,100,000
Alternative E2	\$ 22,200,000	\$ 4,400,000	\$ 26,600,000
Section F	\$ 34,800,000	\$ 9,500,000	\$ 44,300,000
Subtotals:	\$ 189,800,000	\$ 77,100,000	\$ 266,900,000
		ITS Project Cost:	\$ 1,240,000
		Project Total:	\$ 268,200,000

The recommended improvements, as seen in **Table 14**, yield a total project cost of **\$ 268,200,000**.

VII. Additional Comments

A detailed environmental study was not conducted for this feasibility study. However, an environmental screening did result in the following possible occurrences, which will need further evaluation in subsequent stages of the development of this project:

- The National Wetland Inventory (NWI) mapping indicates that this project will have minimal impacts to wetlands. Two small wetlands, located in the northern quadrants, will be impacted by the US 220 Business interchange reconstruction in Section A. A wetland associated with the Little River will be impacted by McDowell Road interchange improvements in Section B.
- One impaired (303d listed) stream, Haskett Creek, will be impacted by Park/Presnell interchange improvements. The creek travels just east of Norfolk Southern Railroad under Presnell Street in Section E.
- The Department of Natural Resources – Natural Heritage Section indicates that there are no occurrences of threatened or endangered species located along the study corridor.
- The Department of Natural Resources indicates three Superfund (Hazardous Sites) are located along the future I-73/74 corridor. Ulah Battery Lead Reclaiming is located 750' east of the mainline corridor off of US 220 Business between SR 1114 and SR 1145 on Map 1. Jung Corp. is located 300' east of the mainline on Industrial Park Avenue on Map 2 Section C. Union Carbide Corp. is located 1,000' east of the mainline on SR 1713 on Map2 Section C.

Other items or comments that should be noted from this study and considered during future planning and design phases of this project:

- Coordination with adjacent projects should be maintained throughout the phases of this project. Adjacent projects are shown on **Exhibit 2** and described in **Section II** of the report.
- An economic atlas was developed in 2004 by the Piedmont Triad RPO and COG for the I-73/74 corridor through North Carolina. Information on the interstate routes' positive economic impact on the states, counties and regions through which they pass can be found on the Piedmont Triad RPO website (<http://www.ptcog.org/rpo.html>).

- If SR 1713 (Albemarle Road) ramps are removed as described in **Alternative C2** of this study, greater consideration should be given to truck routing to and from Klausner Furniture Industries on SR 1446 (Lewallen Road).

- McCrary Park, home to Asheboro high-school, legion, and minor league teams, is located in the northwest quadrant of the NC 42/SR 1004 interchange in Section E. The park will be impacted by this project. Available information is that the park is privately owned and is not a Section 4(f) impact.

- Additional consideration could be given to the interchange configuration at NC 42/SR 1004 in the subsequent stages of this project. A single or double roundabout interchange configuration may be useful in maintaining access to SR 1442 (Sunset Avenue) as well as creating a gateway feature for the city of Asheboro.

LEGEND	
	PROPOSED ROADWAY
	PROPOSED RIGHT-OF-WAY
	PROPOSED RW, CA
	PROPOSED CONC BARRIER
	PROPOSED STRUCTURES, ISLANDS, CURB & GUTTER
	EXISTING STRUCTURES TO BE RETAINED
	RAILROAD
	PARCEL LINES
	STREAMS
	LAKES, RIVERS, STREAMS AND PONDS
	WETLANDS
	SUPERFUND SITES
	EXISTING SIGNAL
	PROPOSED SIGNAL

SECTION A
US 220 BUSINESS INTERCHANGE

BEGIN STUDY FS-0408A
FUTURE I-73 I-74

BEGIN PROJECT I-4407

NOTE: THESE ALIGNMENTS ARE PRELIMINARY AND ARE SUBJECT TO CHANGE WITHOUT NOTICE. THIS STUDY IS NOT THE PRODUCT OF EXTENSIVE DESIGN OR ENVIRONMENTAL ANALYSIS.



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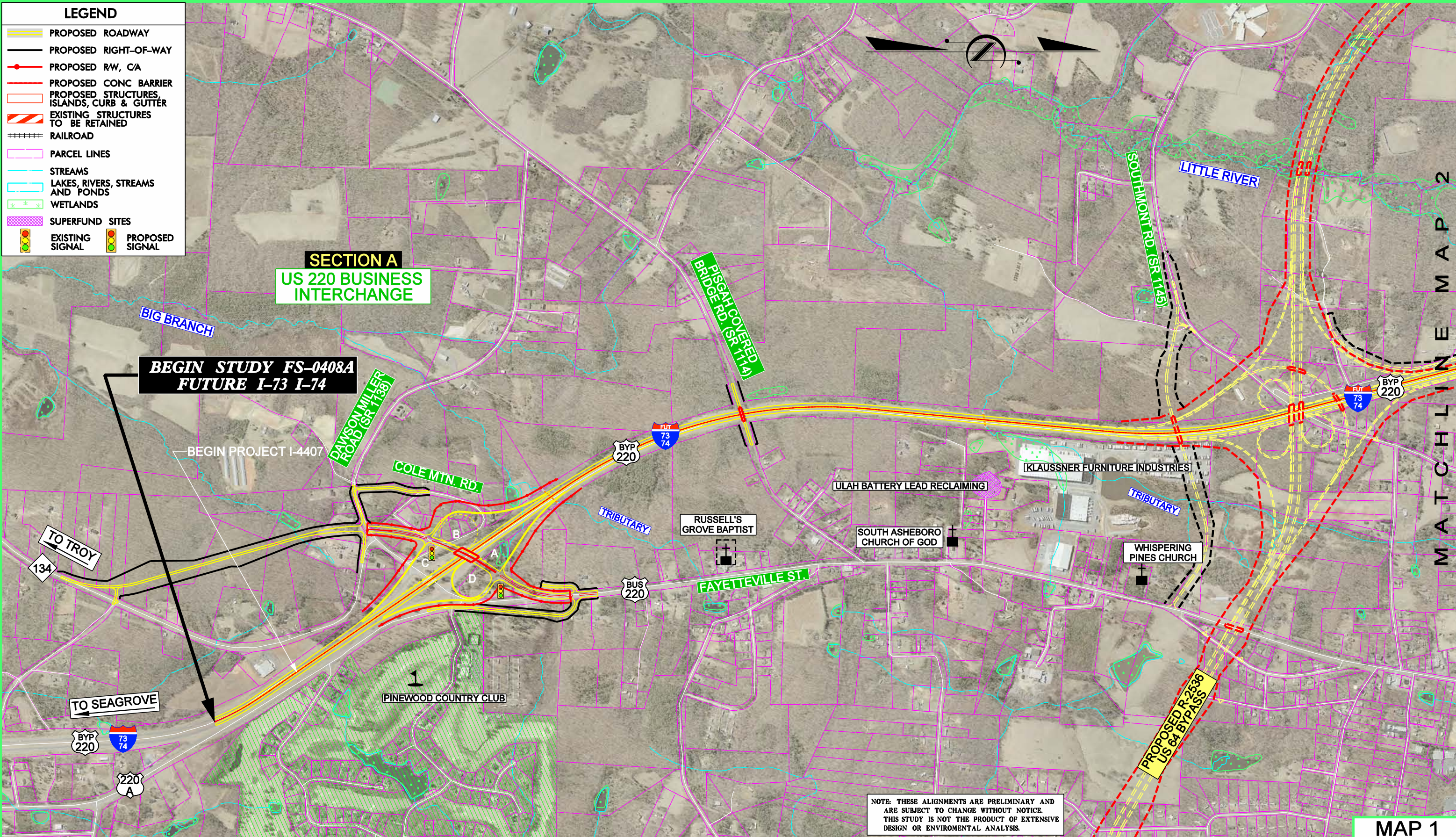
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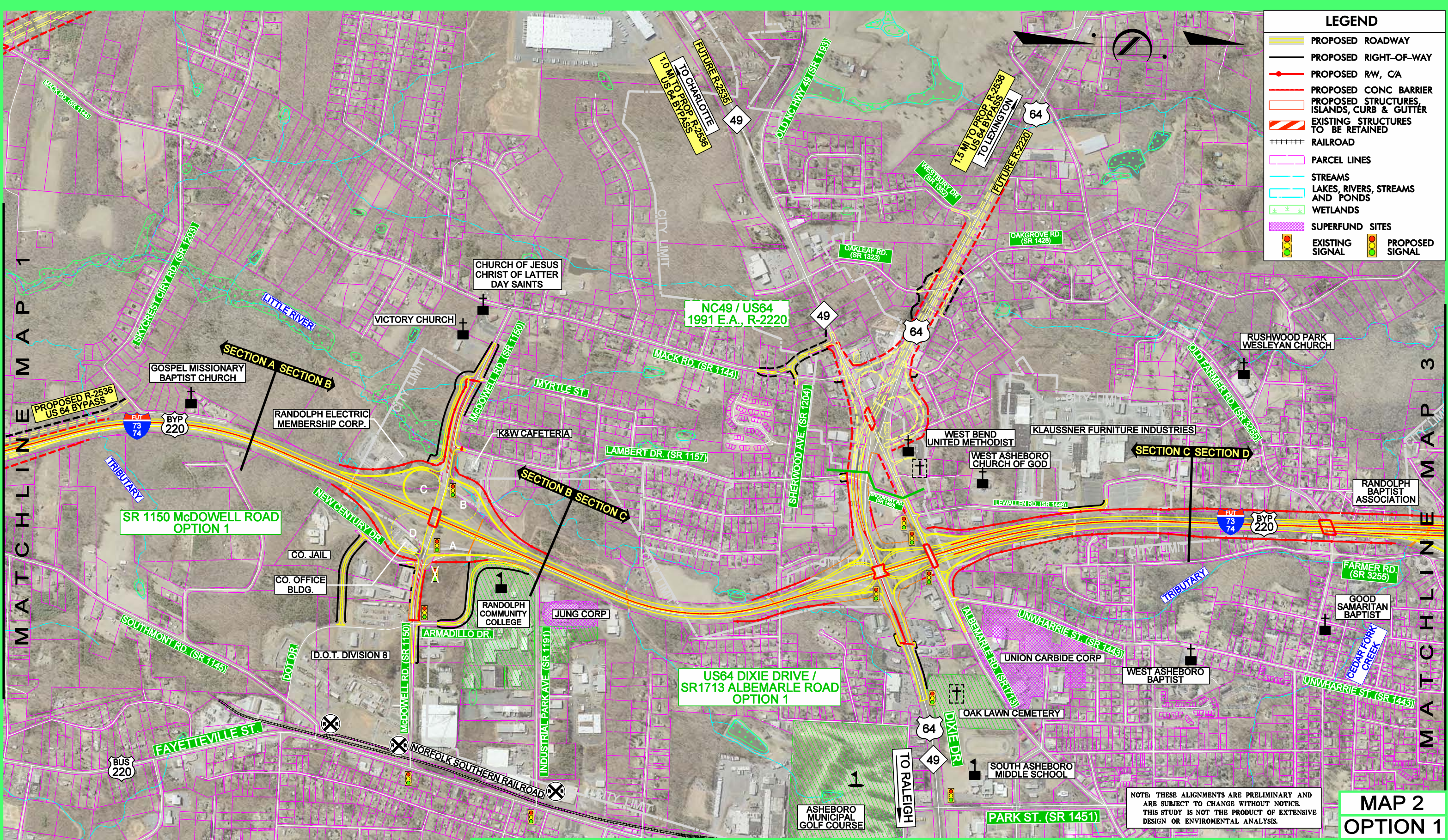


FS-0408A
 US 220 / FUTURE I-73 / I-74
 FROM SOUTH OF NC 134 / US 220 BUSINESS
 TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY

MAP 1

MATCHLINE MAP 2





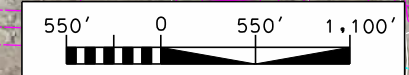
LEGEND	
	PROPOSED ROADWAY
	PROPOSED RIGHT-OF-WAY
	PROPOSED CONC BARRIER
	PROPOSED STRUCTURES, ISLANDS, CURB & GUTTER
	EXISTING STRUCTURES TO BE RETAINED
	RAILROAD
	PARCEL LINES
	STREAMS
	LAKES, RIVERS, STREAMS AND PONDS
	WETLANDS
	SUPERFUND SITES
	EXISTING SIGNAL
	PROPOSED SIGNAL

MATCHLINE MAP 1

MATCHLINE MAP 3

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**MAP 2
OPTION 1**




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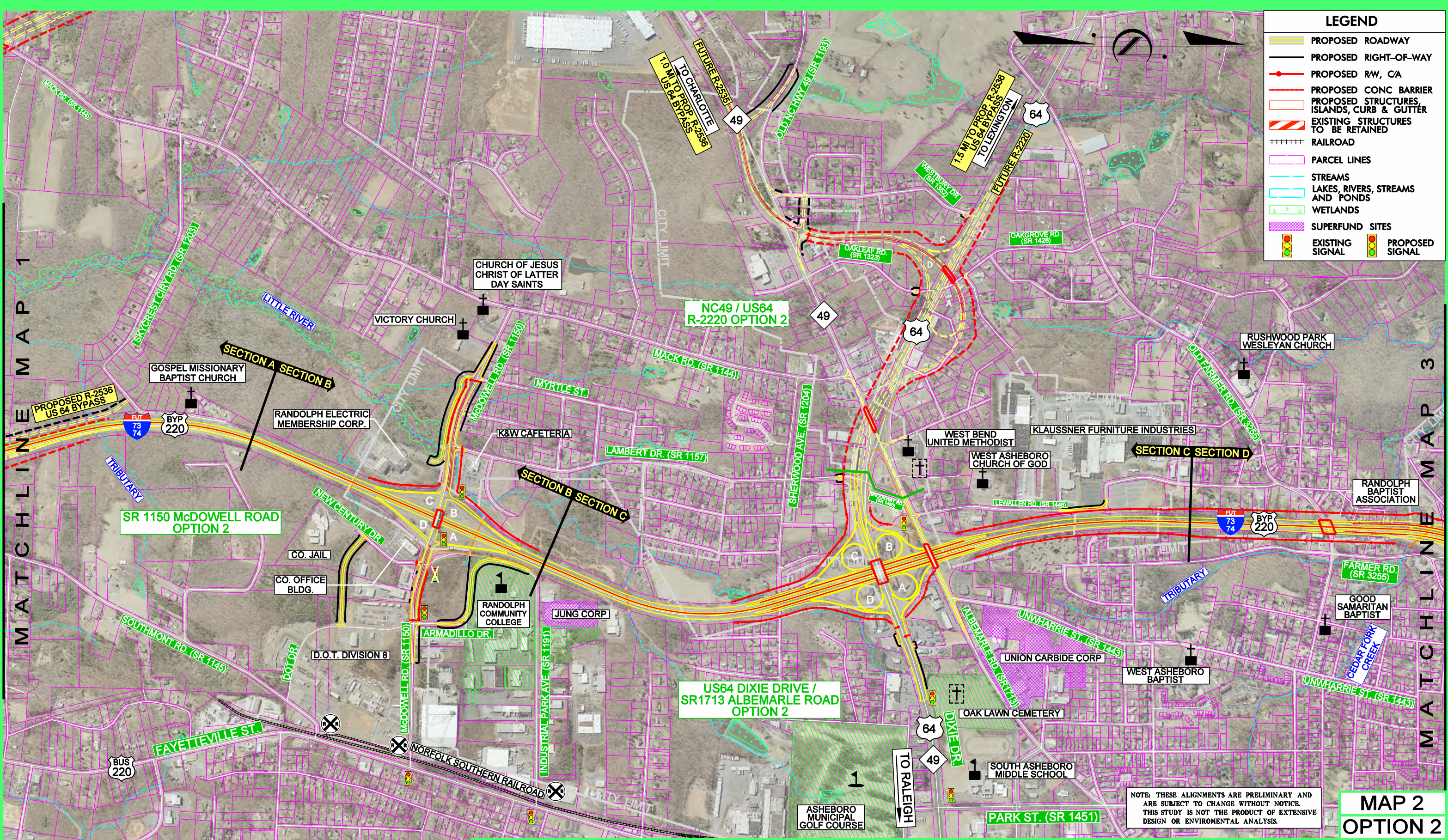


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FROM SOUTH OF NC 134 / US 220 BUSINESS
TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY



LEGEND	
	PROPOSED ROADWAY
	PROPOSED RIGHT-OF-WAY
	PROPOSED RW, CA
	PROPOSED CONC BARRIER
	PROPOSED STRUCTURES, ISLANDS, CURB & GUTTER
	EXISTING STRUCTURES TO BE RETAINED
	RAILROAD
	PARCEL LINES
	STREAMS
	LAKES, RIVERS, STREAMS AND PONDS
	WETLANDS
	SUPERFUND SITES
	EXISTING SIGNAL
	PROPOSED SIGNAL

MATCHLINE MAP 1

MATCHLINE MAP 3

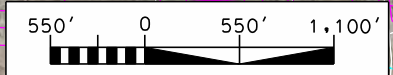
SR 1150 McDOWELL ROAD OPTION 2

US64 DIXIE DRIVE / SR1713 ALBEMARLE ROAD OPTION 2

NC49 / US64 R-2220 OPTION 2

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MAP 2
OPTION 2



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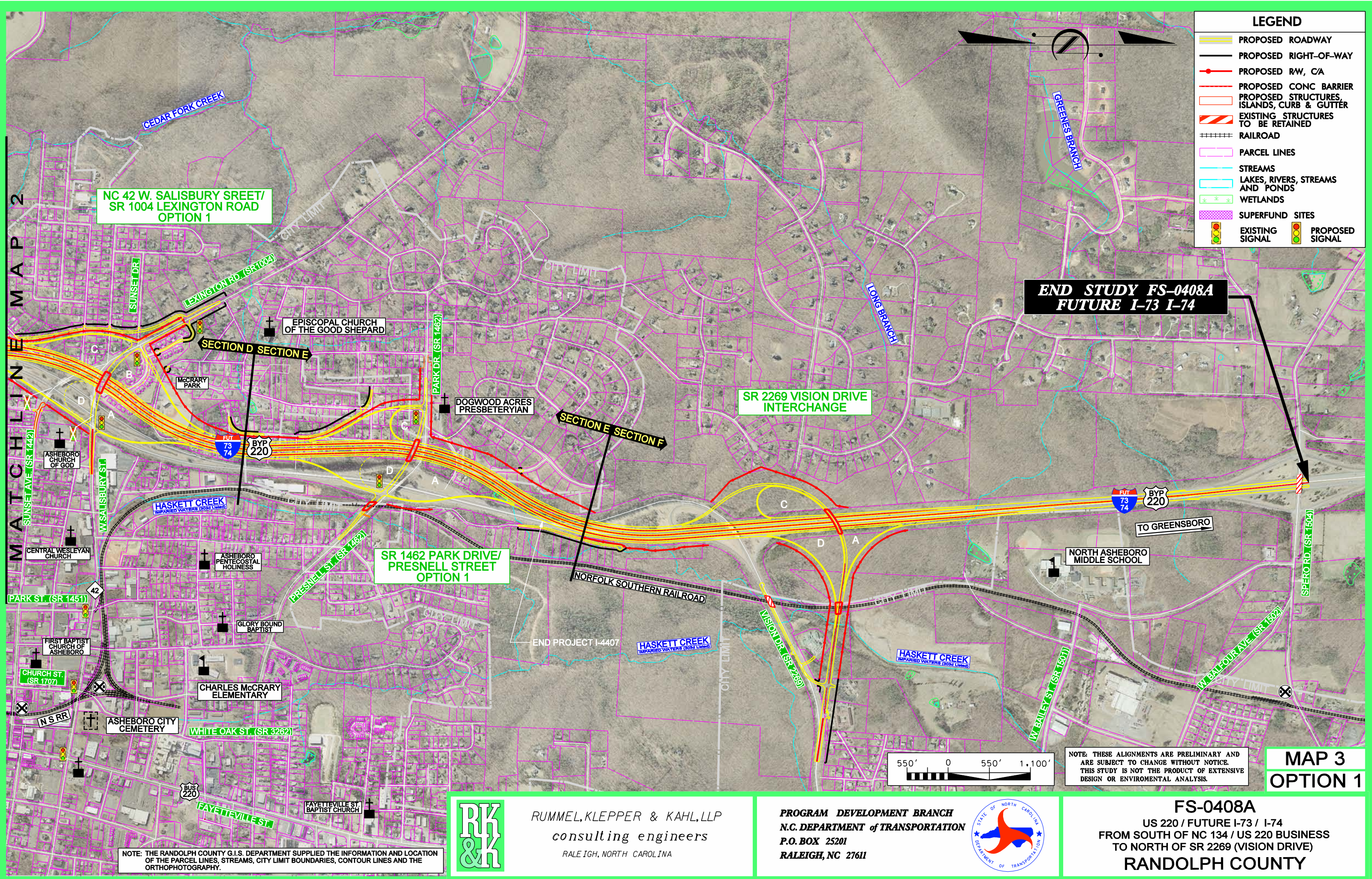


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FS-0408A
US 220 / FUTURE I-73 / I-74
FROM SOUTH OF NC 134 / US 220 BUSINESS
TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY



LEGEND	
	PROPOSED ROADWAY
	PROPOSED RIGHT-OF-WAY
	PROPOSED RW, C/A
	PROPOSED CONC BARRIER
	PROPOSED STRUCTURES, ISLANDS, CURB & GUTTER
	EXISTING STRUCTURES TO BE RETAINED
	RAILROAD
	PARCEL LINES
	STREAMS
	LAKES, RIVERS, STREAMS AND PONDS
	WETLANDS
	SUPERFUND SITES
	EXISTING SIGNAL
	PROPOSED SIGNAL

**END STUDY FS-0408A
FUTURE I-73 I-74**

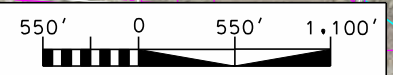
**NC 42 W. SALISBURY SREET/
SR 1004 LEXINGTON ROAD
OPTION 1**

**SR 2269 VISION DRIVE
INTERCHANGE**

**SR 1462 PARK DRIVE/
PRESNELL STREET
OPTION 1**

**MAP 3
OPTION 1**

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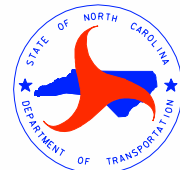


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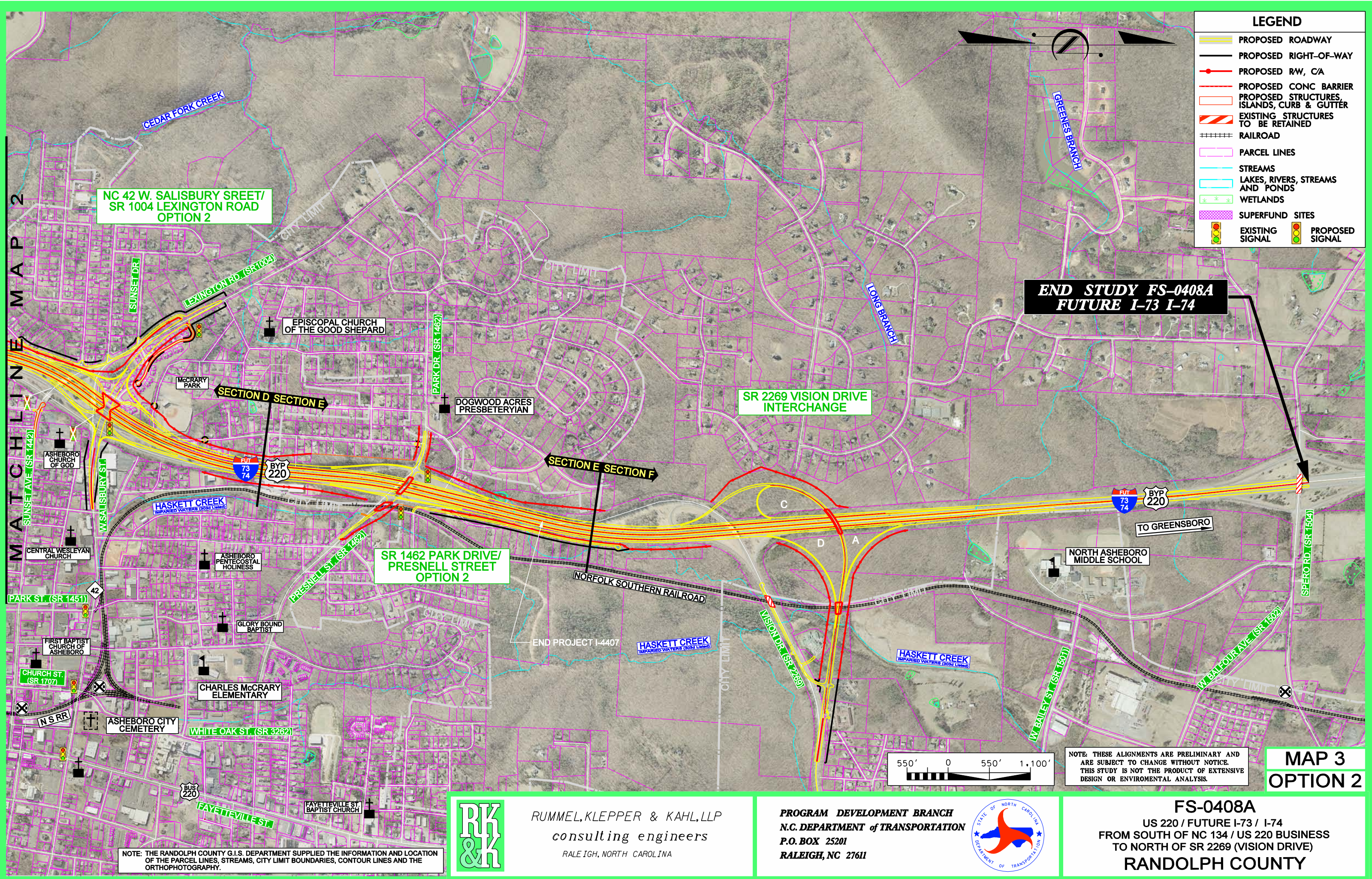


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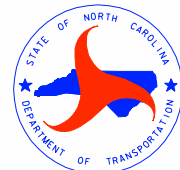


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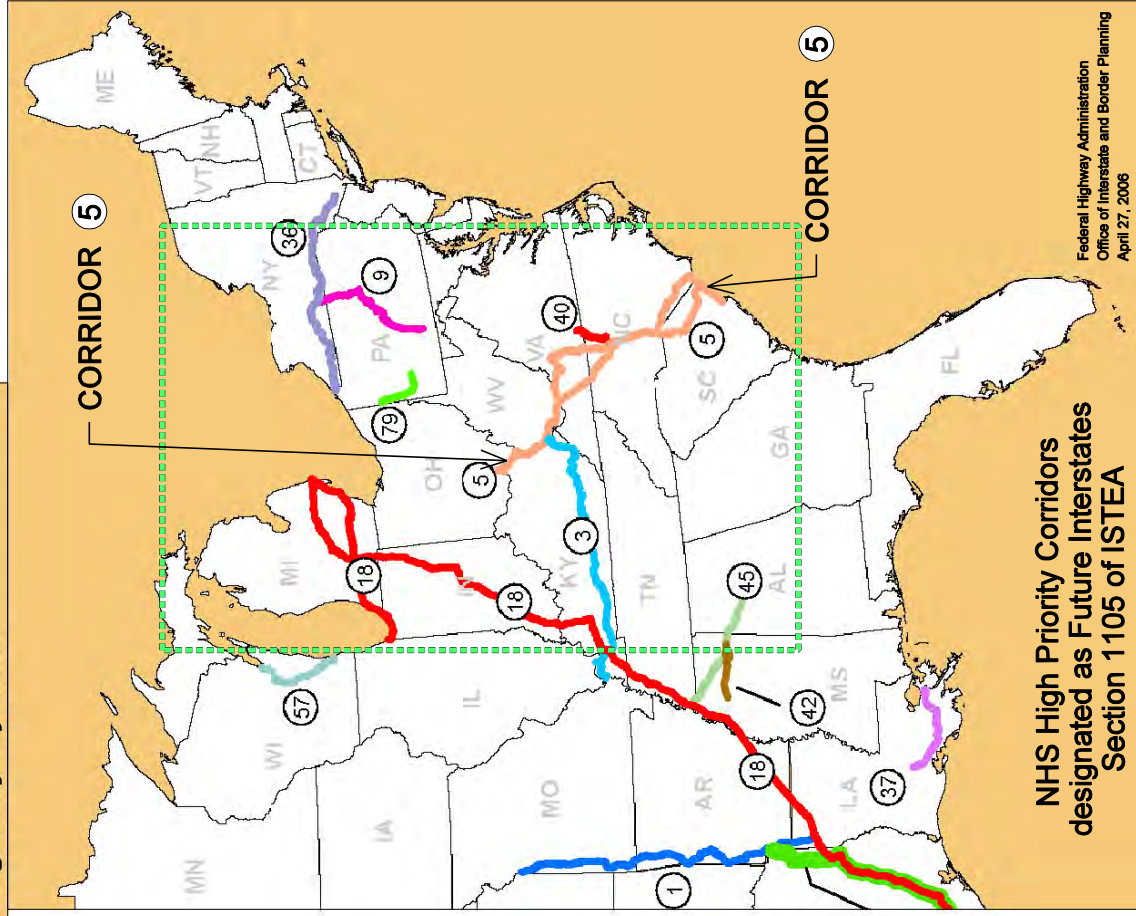
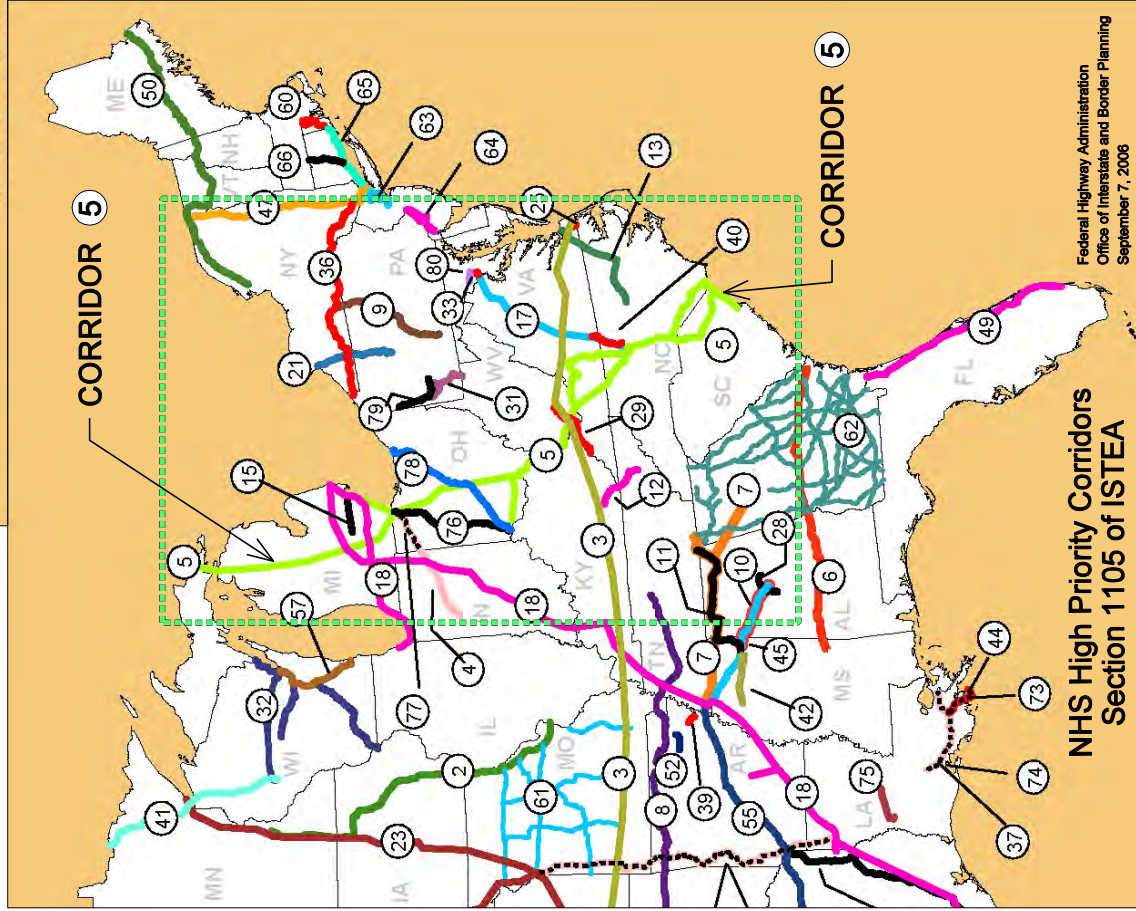


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RANDOLPH COUNTY

APPENDICES



Congressional High Priority Corridors on the National Highway System



United States Department of Transportation - Federal Highway Administration <http://www.fhwa.dot.gov/hep/10/nhs/hp/corridors/index.html>

APPENDIX A

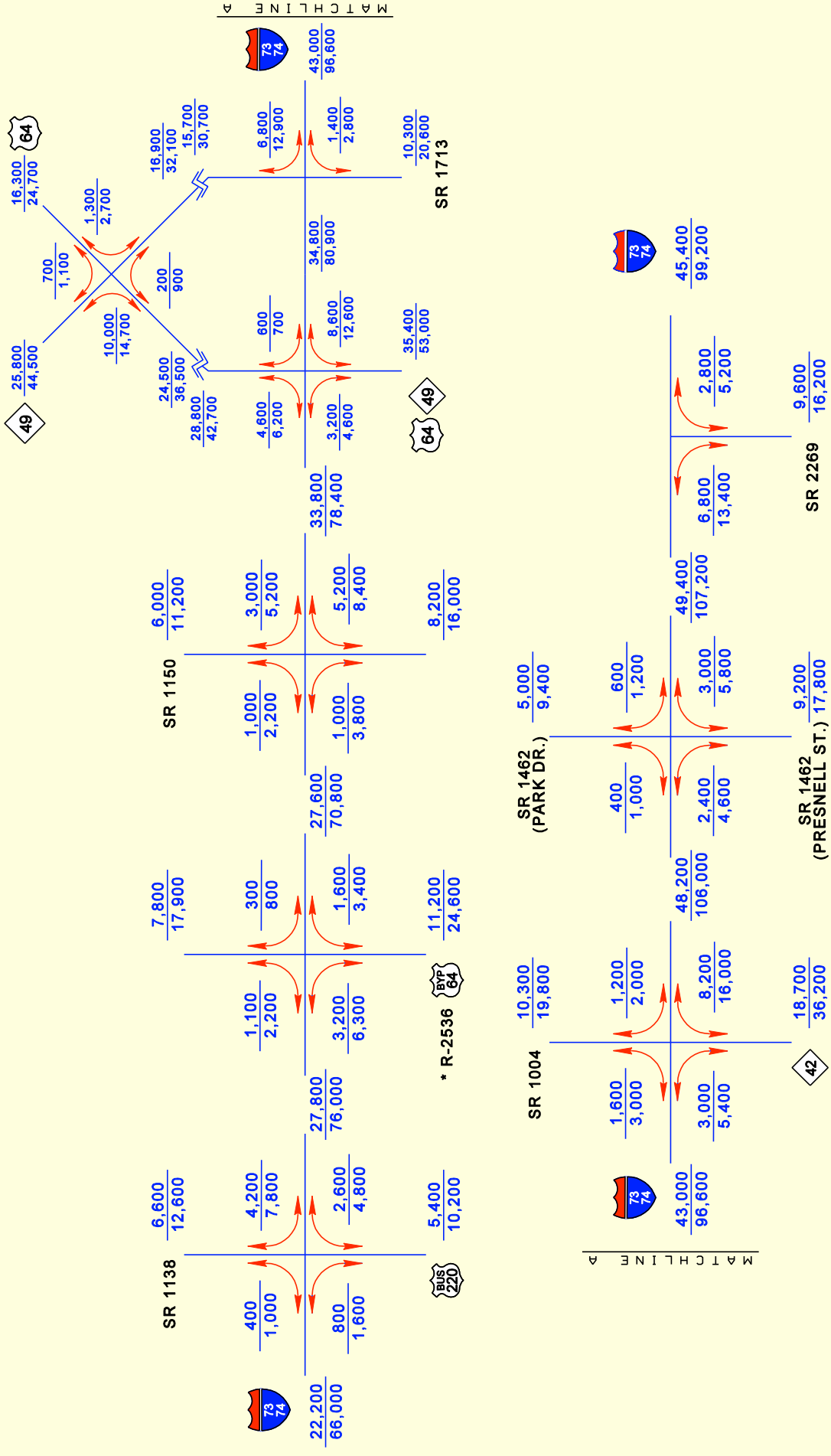


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SHC Vision Plan / Adjacent Projects
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FROM SOUTH OF NC 134 / US 220 BUSINESS
TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY

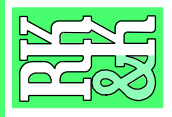


BUILD ALTERNATIVE - OPTION 1 - TRAFFIC VOLUMES

BASE YEAR 2006 ADTs
DESIGN YEAR 2035

* R-2536 US 64 BYPASS VOLUMES EXTRAPOLATED FROM 2003 CORRIDOR PUBLIC HEARING MAP

NOTE: BASE YEAR AND DESIGN YEAR ADTs INTERPOLATED AND EXTRAPOLATED FROM 2004, 2005, AND 2030 YEAR FORECASTS PROVIDED BY NCDOT TPB.



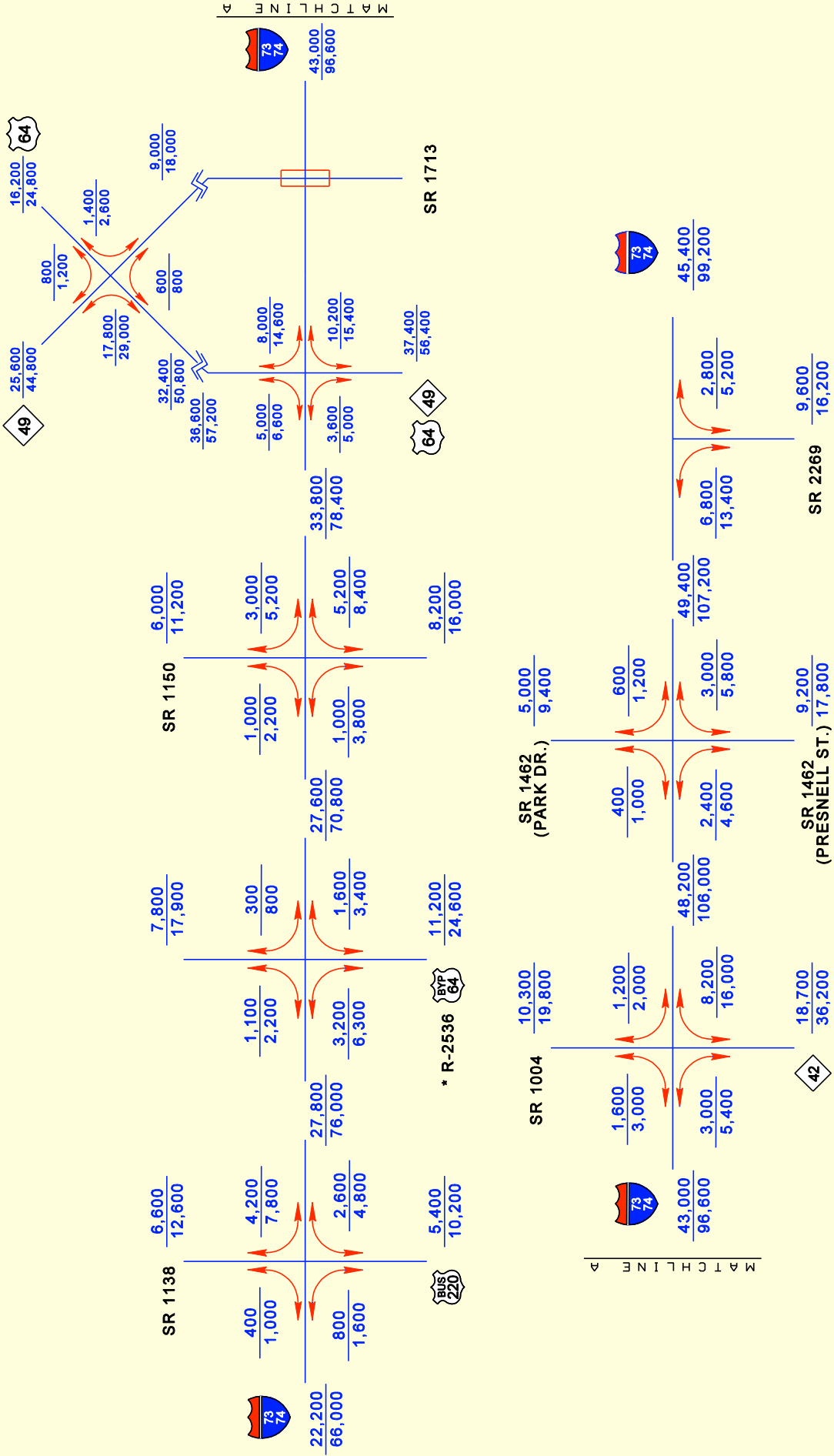
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APPENDIX B.1

SHC Vision Plan / Adjacent Projects
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FROM SOUTH OF NC 134 / US 220 BUSINESS
TO NORTH OF SR 2269 (VISION DRIVE)
RANDOLPH COUNTY

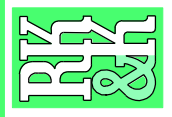


BASE YEAR 2006 ADTS
DESIGN YEAR 2035

BUILD ALTERNATIVE - OPTION 2 - TRAFFIC VOLUMES

* R-2536 US 64 BYPASS VOLUMES EXTRAPOLATED FROM 2003 CORRIDOR PUBLIC HEARING MAP

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APPENDIX B.2

SHC Vision Plan / Adjacent Projects
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