

FEASIBILITY STUDY
I-85/I-77 INTERCHANGE UPGRADE
MECKLENBURG COUNTY

Division 10
FS-1210A



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1 General Description

The project is located in the City of Charlotte in Mecklenburg County, North Carolina Department of Transportation (NCDOT) Highway Division 10. The project location is shown on **Figure 1**. The proposed project is an upgrade to the I-85 /I-77 interchange while considering the incorporation of managed HOV or HOT lanes along I-85 and I-77. The improvements will be phased so that the interchange upgrade can be made without precluding the option for managed lanes. The study area includes approximately two miles of I-85, two miles of I-77, four existing interchanges, and six at grade intersections.

Six alternative concepts were initially evaluated and two alternatives were selected by NCDOT to be further evaluated at a functional design level for this feasibility study. This feasibility study evaluates the potential impacts associated with the two selected alternatives for the interchange upgrade to include the option of managed lanes. The two alternatives are as follows:

1. Upgrade I-85/I-77 Interchange with the option of dedicated I-85 managed lane access.
2. Interchange Upgrade to include managed lanes along I-85 with a direct managed lane connection from the south leg to the east leg and from the north leg to the west leg of the interchange.

2 Purpose of This Study

This feasibility study is a preliminary step proceeding the planning and design process for this project, and is not to be considered the product of exhaustive environmental or design investigations. The purpose of this study is to describe the transportation issues including proposed project cost, develop and evaluate alternatives at a screening level, recommend an alternative, and identify potential impacts to the human and natural environment that may require consideration in future planning and design phases.

If a candidate project is identified for funding in the State Transportation Improvement Program (STIP), the Feasibility Study is followed by a rigorous planning and design process that meets the requirements of the National Environmental Policy Act (NEPA), where either an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) is done. It is anticipated that a Categorical Exclusion will be the appropriate level of environmental documentation required for this project.

3 Project Need

The primary need for this project is to improve traffic flow, reduce traffic congestion, and reduce the potential for accidents at the I-85/I-77 Interchange.

I-85 turns northeastward just before reaching the City of Charlotte; traversing approximately 2.5 miles north of the Charlotte Uptown area where it junctions with I-77 (**Figure-1**). This interchange is one of the busiest in the state and experiences high traffic volumes and traffic accidents. The design of the interchange is a modified cloverleaf with I-77 through traffic crisscrossing prior to the interchange to accommodate two tight left-hand ramps. Due to the high number of trucks using this interchange, accidents (primarily overturned vehicles) occur frequently. NCDOT has implemented a number of measures along the southbound I-85 to southbound I-77 movement including signs, roadway markers, and flashing speed limit signs to caution motorists to slow down. The interchange upgrade would be designed to remove the short ramp radius and provide an easier, safer transition for the on and off ramps from I-77 and I-85. The improvements would be phased to incorporate the HOT/HOV lanes to meet long range transportation plans for I-77 and I-85. The interchange upgrade would improve traffic flow and reduce the potential for vehicle accidents.

Between March 2008 and February 2013, a total of 1,031 vehicle accidents were reported within the project study area (received from NCDOT Transportation Mobility and Safety Division, May 2013). Over half of the accidents (53 percent) occurred along I-77 from Lasalle Street-Atando Avenue to SR 2095 (Cindy Lane). Fifteen percent of the accidents occurred at the I-85 northbound and southbound ramps. The I-77 northbound and southbound ramps had the least number of accidents (5 percent). There was one reported fatal accident during the five year period. The accident data for fatal, non-fatal, and property damage is provided in **Table 1**. The accident types for the project study areas consisted mostly of rear end accidents and side swipes accidents.

Between March 2008 and February 2013, the accident crash data rates were as follows for each section of the project area, along I-77 from Lasalle Street-Atando Avenue to SR 2095 (Cindy Lane), 93.97 per 100 million vehicle miles traveled. Along I-85, from SR 2074 (Beatties Ford Road) to SR 2691 (Statesville Road), 100.42 per 100 million vehicle miles traveled; The I-85 northbound ramp to I-77 experienced a crash rate of , 3159.49 per 100 million vehicle miles traveled while the I-85 southbound ramp to I-77 had a crash rate of 141.74 per 100 million vehicle miles traveled. The I-77 northbound ramp to I-85 southbound had a crash rate of 141.74 20 per 100 million vehicle miles traveled, and the I-77 southbound ramp to I-85 northbound had a crash rate of 1322.8 per 100 million vehicle miles traveled.

The project area total crash accident rate (8765.9 per 100 million vehicle miles traveled) is higher than the statewide rate of 282 crashes per 100 million vehicle miles traveled. The crash rates were provided by the NCDOT along with the accident crash data for the project study area. 2009-

2011 crash rates for NC were identified on the NCDOT website

<https://connect.ncdot.gov/resources/safety>. **Table 1** shows the cash rate per 100 million vehicle miles traveled in the project area.

Table 1-Crash Statistics

Crash Type	Number of Crashes	Crashes per 100 Million Vehicle Miles Traveled	Statewide Rate ¹	Critical Rates ²
Total	1,031	8,765.9	281.95	291.74
Fatal	1	0.17	0.82	1.03
Non-Fatal	285	1,659.3	90.11	92.26
Property Damage ³	745	22,123.5		

1. 2009-2011 Statewide accident crash rates in accidents per 100 Million Vehicle Miles of Travel for Urban State Highways North Carolina.
2. Based on the statewide crash rate (95% level of confidence).
3. Data for property damage was not included in the 2009-2011 Three Year Crash Rate for North Carolina. Estimated Property Damage Only (EPDO) rate provided per 100 Million Vehicle Miles of Travel.

4 Alternative Concepts

Six alternative concepts (Appendix-A) were evaluated as part of this feasibility study to include conceptual alternatives for two (2) interim phases of construction for the preferred alternative. An alternative development meeting was held to discuss the conceptual designs with various NCDOT representatives. A qualitative process was used to evaluate social and environmental impacts, traffic operations, and construction cost to select up to two (2) alternative concepts to be further developed to a functional design level and are described below. The roadway typical sections along I-77 and I-85 as they approach the proposed interchange and the service road are shown in **Figure 2 and 2A**.

4.1 Alternative 3 and 3A Interchange Upgrade

Alternative 3 upgrades the I-85 and I-77 interchange. Alternative 3A includes the interchange upgrade with the incorporation of managed lanes to access I-85 and along I-85 with improvements to three adjacent interchanges. This concept accommodates the managed lanes through the existing interchange in the north/south directions along I-77, planned for opening in 2017 and provides access from north/south/ directions on I-85. This alternate also develops managed lanes in the median of existing I-85 on the west side of the interchange. Figure 3 shows the interchange upgrade with the future option to include managed lanes with the design of Alternative 3A (Figure 3A).

The alternative to upgrade the interchange and the option of managed lanes retains the basic interchange form while incorporating two new flyovers allowing the interchange to operate safer and more efficiently. Improvements that would be made to the interchange upgrade with the option of managed lanes are listed in **Table 2**.

Table 2-Alternative 3 and 3A Interchange Upgrade Improvements

Interchange	Improvements	Managed Lanes
I-85 /I-77	Two new fly overs with interchange upgrades to access I-85 and I-77.	Option for future connectivity to managed lanes north and south I-77
I-85 at Beatties Ford Road	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.
I-85 at Statesville Road	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.
I-77 at Lasalle Street	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.

4.2 Alternative 4 Interchange Upgrade

This alternative upgrades the I-85 and I-77 interchange with the incorporation of managed lanes along I-85. This alternative accommodates the anticipated managed lanes through the existing interchange in the north/south directions along I-77 and north/south directions along I-85. This alternative also develops a direct managed lane connection from the south leg to the east leg and from the north leg to the west leg of the interchange.

The interchange upgrade removes the I-77 “crossover” through movement, realigns I-77 through lanes to a more traditional placement within the interchange, and removes existing ramp movements with tight/sharp radii. The Beatties Ford Interchange will be improved to accommodate angular loop exits. Managed lanes will tie into the median of I-85 instead of connecting to existing ramp movements.

The alternative to upgrade the interchange removes dangerous curves and provides managed lanes to improve traffic flow and safer, efficient interchange movement. Improvements that would be made to the interchange upgrade with the option of managed lanes are listed in **Table 3**.

Table 3-Alternative 4 Interchange Upgrade Improvements

Interchange	Improvements	Managed Lanes
I-85 / I-77	Remove I-77 “crossover” and realign lanes through the interchange.	Option for future connectivity to managed lanes north and south I-77
I-85 at Beatties Ford Road	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.
I-85 at Statesville Road	Interchange Upgrade with access to general	Option to construct managed lanes in the

	purpose lanes.	median.
I-77 at Lasalle Street	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.
I-77 at Cindy Lane	Interchange Upgrade with access to general purpose lanes.	Option to construct managed lanes in the median.

Additional Information

Alternative 3A and Alternative 4 are different in design but allow for the ultimate condition to provide managed lanes to access I-85 and I-77. Alternative 3A will require improvements to Beatties Ford Interchange, additional right of way impacting neighborhood homes adjacent to I-85 and I-77 with potential impacts to the service road. The pedestrian bridge is planned to be removed as part of I-3311C which will provide managed lanes along I-77 between Uptown Charlotte to just north of I-85.

Alternative 4 is a complete interchange redesign that has the potential for more impacts compared to Alternative 3 and 3A with substantial increase in project cost. A significant portion of the interchange will require reconstruction with additional right of way impacts to neighborhood homes and businesses. Additional impacts to streams, wetlands, and flood plains will result from the increased project limits to accommodate the redesign and culvert extension. Improvements to the adjoining interchanges north, south, east, and west will be required. As noted in the impacts for Alternative 3 and Alternative 3A, Alternative 4 will also have potential impacts to the service road and existing pedestrian bridge over I-77.

Alternative 3 provides an upgrade to the existing interchange and Alternative 3A includes the ultimate design of managed lanes with fewer impacts to residential structures, commercial structures, the community, and natural resources.

5 Transportation Plans and Local Input

5.1 NC Transportation Improvement Program

The interchange upgrade to I-85 and I-77 is not included in the North Carolina Department of Transportation's *2012-2018 State Transportation Improvement Program (STIP)*.

The NCDOT's STIP does include the addition of High Occupancy Toll (HOT) lanes along I-77 from I-277 to NC- 150. NCDOT has elected to use variable tolling to create HOT lanes, which will allow HOVs to use the lanes free and charge a variable toll to single-occupant vehicles choosing to use the HOT lanes. The variable toll is adjusted to manage the traffic flow in the HOT lanes.

5.2 Local Transportation Plans

The 2004 (Updated March 21, 2012) Thoroughfare Plan for Mecklenburg is shown in **Figure 5**. The plan includes the widening of I-77 with a proposed interchange at Oaklawn Avenue north of the I-85 and I-77 Interchange. Both I-85 and I-77 are considered Freeway/Expressway. The MUMPO Comprehensive Transportation Plan (Dated June 13, 2013) identifies the interchange as needing improvement. This project proposes to upgrade the existing interchange at I-85 and I-77 with the addition of HOV/HOT lanes on I-77.

5.3 Input from Local Officials

The City of Charlotte, Mecklenburg County, and the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) were contacted to provide comments about this project. These comments are summarized below and are provided in the **Appendix**.

City of Charlotte. The City of Charlotte is in favor of this project. Charlotte is expected to continue to grow over the next 25 years. Charlotte Department of Transportation (CDOT) carefully considers challenges and opportunities when planning future transportation infrastructure improvements. As part of the Charlotte City Transportation Action Plan, the City will work with transportation partners to implement the recommendations of the regional Managed Lanes Study and create a regional network of high-occupancy toll (HOT) lanes and/or high occupancy vehicle (HOV) lanes. The I-85/77 Interchange upgrade will provide a safer means for traffic to access I-85 and I-77. The City of Charlotte is in favor of the project because it will reduce safety concerns and accidents associated with the existing interchange. Local officials expressed concerns in their comments regarding the impacts to the service road and requested the interchange upgrade design consider access to the existing service road.

Mecklenburg County. The County supports the interchange upgrade and has been coordinating with MUMPO on the Comprehensive Transportation Plan to identify the interchange as needing improvement.

CRTPO. The Charlotte Regional Transportation Planning Organization (formerly known as the Mecklenburg-Union Metropolitan Planning Organization or MUMPO) supports the project and has identified the interchange as needing improvements in the Comprehensive Transportation Plan. Comments obtained from CRTPO Transportation Planning staff in coordination with the City of Charlotte's Transportation Planner are summarized below for the selected alternatives to carry forward:

- Review design options to maintain access to I-77 North and I-77 South from Statesville Avenue and Beatties Ford Road.
- Provide a phased cost approach for the interchange upgrade and managed lanes option.

- Evaluate number of lanes required to sufficiently merge traffic from I-85 South managed lanes at LaSalle Street Bridge.

6 Existing Conditions

The project study area is located near the center of Charlotte. Charlotte is the largest city in North Carolina with a population of 1,417,053. Charlotte's central location between the population centers of the northeast and southeast create a transportation focal point and primary distribution center, with two major interstate highways, I-85 and I-77, intersecting near the city's center.

In Charlotte, I-85 passes by the Charlotte-Douglas International Airport and turns northeastward just before reaching uptown Charlotte and bypasses uptown to the north where it junctions with I-77. I-77 narrows to 6 lanes south of Charlotte and then widens back up to 8 and 10 lanes through downtown before entering the North Carolina Piedmont. In Charlotte it intersects I-85 as well as intersecting each of the loops of I-485 and I-277 (twice). There are six existing signalized intersections within the project interchange study area located on Beatties Ford Road and Statesville Road.

Land use within the project includes right of way for the existing I-85 and I-77 interstate corridor and interchange with a mix of residential, commercial, industrial, and forested land north and south of the interchange project area.

7 Traffic Analyses

Traffic analyses performed for this project are documented in the *FS-1210A, I-85/I-77 Interchange Traffic Operations Tech Memo* (prepared by Atkins August 2013). This section summarizes the results of the analyses for the preferred alternatives.

Traffic operations for the I-85/I-77 interchange were analyzed for the following scenarios:

- Alternative 3 and 3A Upgrade I-85/I-77 interchange with the option of dedicated I-85 managed lanes - Year 2035
- Alternative 4 Upgrade I-85/I-77 interchange with I-85 managed lanes - Year 2035

The traffic forecast was provided by NCDOT for use with this project. Traffic characteristics including design hour factor, directional split, PM peak direction flow, dual truck percentage and tractor-trailer/semi-trailer percentage, were provided in the NCDOT forecast. AM and PM peak hour intersection turning movement volumes were developed from the Average Annual Daily Traffic (AADT) volumes using NCDOT Congestion Management Section's Intersection Analysis Utility (IAU) tool for two-way volumes.

In order to determine peak hour HOT volumes, the LOS C threshold was used to determine the peak direction capacity of a HOT lane. Once the volumes increase above the LOS C threshold, travel speeds begin to breakdown, which should not occur in a HOT lane. The LOS C maximum service flow rate for a freeway with a 60 mph free-flow speed is 1,560 passenger-cars per hour per lane (Highway Capacity Manual [HCM] 2010, Exhibit 11-17). Based on this it was assumed that the peak direction HOT lane volume on the I-77 and I-85 mainlines is 1,500 vehicles per hour per lane. Because the HOT ramps have slower design speeds, a volume of 1,200 was used for peak direction ramp movements. The off-peak direction HOT lanes were assumed to operate at 60 percent capacity, or have 900 vehicles on the mainline and 720 vehicles on a ramp. General purpose lane volumes were calculated by subtracting the HOT volumes from the total volume developed in the peak hour breakouts.

A growth rate was determined using the traffic forecast for the 2012 HOT 3+ (2 Lane Option). The AADT on all four sides of the I-85/ I-77 interchange were used to calculate a straight line growth rate. The average growth rate (-0.8%) was applied to the year 2035 peak hour volumes to determine intermediate year peak hour volumes.

The traffic volumes for 2012 and 2035 at I-85/I-77 interchange are shown in **Table 4**.

Table 4. 2012-2035 Average Annual Daily Traffic Volumes

Roadway	Average Annual Daily Traffic (AADT)*
Year 2012	
I-85 North of Interchange	173,900
I-85 South of Interchange	113,200
I-77 North of Interchange	121,600
I-77 South of Interchange	175,900
Year 2035	
I-85 North of Interchange	218,600
I-85 South of Interchange	141,800
I-77 North of Interchange	149,400
I-77 South of Interchange	216,800

**The AADTs were based on the traffic forecast for the HOT 3+ (2 Lane Option) scenario.*

Straight line growth rate = (2012 AADT - 2035 AADT) / (23 years) / (2035 AADT).

The average was applied to peak hour volumes to determine intermediate year peak hour volumes.

The Build Alternatives were analyzed to determine how they are projected to operate in the design year 2035. The selected build alternative concepts are projected to improve the operations of freeway network within the study area. However, some of the build alternative segments are projected to operate with unacceptable LOS in the year 2035. This is due to having to maintain lane balance and not being able to add general purpose lanes to I-77, besides an auxiliary lane,

due to the HOT lanes project. The primary areas of unacceptable LOS are on I-77 south of the I-85 interchange and the general purpose ramps from I-77 northbound to I-85 northbound and from I-85 southbound to I-77 southbound.

Level of service, or LOS, is defined with letter designations from A to F. It is based on the average amount of delay experienced by the driver at an intersection. LOS A represents the best conditions (less than 10 seconds of delay). LOS F represents the worst conditions (greater than 80 seconds of delay). In general, an intersection operating at LOS D or better in the design year is considered acceptable.

Table 5 provides a summary of the year 2035 operations analysis results for the selected alternatives.

Table 5: Comparison of Year 2035 Analysis Results

Alternative	Percent of Total Segments		
	Good	Fair	Poor
Includes HOT Segments			
Build Alternative 3A	31%	50%	19%
Build Alternative 4	33%	28%	39%
Does Not Include HOT Segments			
Build Alternative 3	27%	42%	31%

The operations analysis of the individual freeway elements was performed in accordance with NCDOT Congestion Management's *Capacity Analysis Guidelines* (January 2012). The Highway Capacity Software (HCS) 2010 was used to analyze the basic freeway segments, merge areas, diverge areas, and weave areas within the study area.

8 Cost Estimates

Table 6 shows the project cost estimates, based on 2013 dollars, for Alternatives 3, 3A, and 4.

Table 6. Cost Estimates

	Alternative 3 (Interchange Upgrade)	Alternative 3A (Interchange Upgrade with I- 85 Managed Lanes)	Alternative 4 (Interchange Upgrade with I-85 Managed Lanes)
Utility Relocation Cost	\$600,000	\$600,000	\$800,000
Construction Cost	\$286,000,000	\$339,000,000	\$363,000,000
Right-of-Way Cost	\$14,600,000	\$14,600,000	\$46,500,000
Total Cost	\$328,200,000	\$354,200,000	\$410,300,000

Note: No tolling costs are included in the estimate as shown and will be evaluated upon final decision for the I-4505 project.

9 Impacts

As part of this feasibility study, various potential impacts to the human and natural environment were assessed in order to aid the NCDOT in project planning and development. Impacts were assessed using the following resources:

- internet research
- Geographic Information Systems (GIS) layers received from NCDOT
- aerial photography (dated October 2003)
- file research (for historic architectural resources, threatened and endangered species, and important natural areas)
- USGS topographic maps
- Tax map for Charlotte, NC

It should be noted that extensive environmental studies were not done as part of this feasibility study and would need to be completed in future stages of planning for this project. The Natural Resource Technical Report, Air Quality Analysis Report, and Design Noise Report prepared for the I-77 HOV/HOT Lanes project was referenced to further evaluate potential impacts within the project study area.

Table 7 summarizes the potential impacts to the human and natural environment for Alternatives 3, 3A, and 4. More detailed information about impact analysis for each is provided after **Table 7**.

Table 7. Impact Summary

Issue	<u>Alternative 3</u> Interchange Upgrade	<u>Alternative 3A</u> Interchange Upgrade with I-85 Managed Lanes	<u>Alternative 4</u> Interchange Upgrade with I-85 Managed Lanes
Total Cost (2013 dollars)	328,200,000	354,200,000	410,300,000
Social Impacts			
Community Services and Facilities	0	0	3
Relocations			
Residential	24	24	36
Businesses	3	3	12
Churches	0	0	1
Environmental Justice¹	unknown	unknown	unknown
Historic and Archaeological Resources	0	0	0
Historic Overlay District Impact (Acre)²			
Dalebrook	0.94	0.94	3.71
Oaklawn Park	0.37	0.37	0
Section 4(f)/6(f) Resources	none	none	none

Issue	<u>Alternative 3</u> Interchange Upgrade	<u>Alternative 3A</u> Interchange Upgrade with I-85 Managed Lanes	<u>Alternative 4</u> Interchange Upgrade with I-85 Managed Lanes
Hydrology and Drainage			
Stream impacts (linear feet)	5,606.17	5,606.17	5,908.24
Floodplains (acres)	10.86	10.86	12.58
Wetlands (acres)	0.45	0.45	1.02
Federally Protected Species	Not likely to impact	Not likely to impact	Not likely to impact
Important Natural Areas	none	none	none
Hazardous Materials Potential	Not Likely	Not likely	Not likely
Land Impacts by Use (acres)			
Residential	4.53	4.53	25.48
Commercial	5.67	5.67	9.16
Industrial	3.48	3.48	9.02
Utility	0.04	0.04	0
Churches	0	0	1.81
School	0	0	1.45
Forested	0.78	0.78	25.79
Total Land Impacted	14.5	14.5	46.92
Air Quality Impact	none	none	none
Traffic Noise (change in noise when compared to No- Build Alternative)³	minimal	minimal	minimal

1. Environmental Justice Neighborhoods are in the project study area, impacts are unknown at this time.
2. Historic Overlay Districts are located within the project study area, avoidance and minimization will be evaluated during early design stages of the project.
3. A Noise Impact Assessment will be required to further evaluate potential noise impacts.

9.1 Social Impacts

9.1.1 Community Facilities

Community facilities include schools, churches, fire stations, parks and recreation centers, libraries, hospitals, schools and post offices. The right Choices/Alternative Education at JT Williams Middle School is southeast of the interchange project area, located south of I-85 and east of I-77 with access from Statesville Road. There are two churches, Memorial Presbyterian and Cosmopolitan Community Church located



JT Williams Middle School

to the southwest of the interchange. Alternative 3 and 3A avoid impacts to the school and churches. Alternate 4 improvements encroach into the JT Williams Middle School grounds/track and the parking lot for the Memorial Presbyterian Church. The Cosmopolitan Community

Church building would require relocation with the extension of the proposed right-of-way for Alternative 4.

Mobility and access to community facilities are addressed in the following section (Section 9.1.2 Community Cohesion).

9.1.2 Community Cohesion

There are local businesses located within the project study area along Statesville Road and Beatties Ford Road. Commercial and Industrial facilities are also located within the project study area. The project study area is adjacent to two neighborhoods; Lincoln Heights and Wilson Heights which are high density neighborhoods.



University Park Neighborhood, south of I-85

Community cohesion impacts include the effects on neighborhoods, mobility and access, travel patterns, and visual impacts. The build alternatives (Alternatives 3, 3A, and 4) would alter the community in some way. The proposed alternatives have impacts to residential, industrial, and commercial facilities. Alternate 4 has the greatest impact to include two churches and school ground encroachment to the field and track area in addition to relocation of a church, residences, commercial buildings, and industrial facilities.

Alternative 3 and 3A Interchange Upgrade. Alternative 3 and 3A are discussed together because they both include the interchange upgrade with Alternative 3A providing the ultimate condition for future managed lanes along I-85. Two new flyovers will be incorporated into the interchange. Those in the community most likely to be affected by this alternative are those located adjacent to the project. Land from the properties fronting I-85 and I-77 within the project limits would be required for right-of-way.

Upgrades to the interchange would allow for a decrease in accidents and improve traffic movement through the I-85/I-77 interchange and upgrade the Beatties Ford Road interchange to better manage traffic flow. The upgrade meets the ultimate goal of the improvements for I-77. I-77 and I-85 are major thoroughfares in the state and serve as the primary north/south and east/west routes in the area. There is a high volume of traffic in the study area as a result of its geographic location. Noise levels will be evaluated to assess the impacts with the incorporation of the managed lanes and forecasted traffic volumes. Noise impacts associated with the I-77 managed lanes project have been addressed as part of that project and are included as part of the project upgrade.

Alternative 4 Interchange Upgrade.

Alternative 4 is an upgrade of the I-85 /I-77 interchange with the incorporation of managed lanes along I-85. This alternative accommodates the anticipated managed lanes through the existing interchange in the north/south directions along I-77 and east/west directions along I-85. A direct managed lane connection from the south leg to the east leg and from the north leg to the west leg of the interchange will be included in the design. Land from the properties fronting I-85 and I-77 within the project limits would be required for right-of-way.

The interchange upgrade removes the I-77 “crossover” through movement, realigns I-77 through lanes to a more traditional placement within the interchange, and removes existing ramp movements with tight/sharp radii. The Beatties Ford Road Interchange will be improved to accommodate angular loop exits. Managed lanes will tie into the median of I-85 instead of connecting to existing ramp movements. The alternative to upgrade the interchange removes dangerous curves and provides managed lanes to improve traffic flow and safer, efficient interchange movement. Noise levels could potentially increase with the incorporation of the managed lanes and forecasted traffic volumes.

9.1.3 Relocations

Additional land from several properties, mainly those properties fronting I-77 and I-85, would be required for additional right-of-way including properties within the Dalebrook and Oaklawn Park historic districts. The proposed right-of-way for Alternative 3 and Alternative 3A would relocate 24 residential units and 3 businesses. The proposed right-of-way for Alternative 4 relocates 36 residential units, 12 businesses, and 1 church.

9.1.4 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations) was established in 1994 and directs all federal agencies to determine whether a proposed action would have an adverse or disproportionate impact on low-income and/or minority populations.

A review of 2010-2011 Census data for the project study area was conducted to determine whether minority or low-income populations would receive adverse or disproportionate human health or environmental impacts as a result of this project. **Table 8** shows information about population and race for Mecklenburg County and the demographic study area where the project is located. Environmental Justice will need to be considered as a result of the minority and low income populations residing in the study area. Displacement effects to residences and churches within the study area will require consideration throughout the planning stages of the project.

Table 8: Population and Race Data

2010 Geography	Total	White		Black or African American		American Indian and Alaska Native		Asian		Native Hawaiian and Pacific Islander		Other	
		#	%	#	%	#	%	#	%	#	%	#	%
Mecklenburg County	919,628	508,946	55.3	282,804	30.8	4,261	0.5	42,352	4.6	668	0.1	57,113	6.2
CT 46, BG 1	1,249	24	1.9	1,204	96.4	4	0.3	0	0.0	0	0.0	8	0.6
CT 48, BG 1	1,199	65	5.4	997	83.2	2	0.2	25	2.1	0	0.0	80	6.7
CT 48, BG 2	1,070	27	2.5	1,008	94.2	2	0.2	10	0.9	0	0.0	9	0.8
CT 48, BG 3	1,153	34	2.9	1,072	93.0	5	0.4	9	0.8	0	0.0	2	0.2
CT 49, BG 1	737	17	2.3	705	95.7	1	0.1	6	0.8	0	0.0	5	0.7
CT 50, BG 1	1,328	52	3.9	1,236	93.1	18	1.4	0	0.0	0	0.0	2	0.2
CT 50, BG 2	13	0	0.0	13	100.0	0	0.0	0	0.0	0	0.0	0	0.0
CT 51, BG 1	1,351	83	6.1	1,106	81.9	2	0.1	81	6.0	0	0.0	66	4.9
CT 54.01, BG 1	2,935	488	16.6	2,077	70.8	22	0.7	87	3.0	8	0.3	151	5.1
CT 54.01, BG 2	2,443	86	3.5	2,261	92.6	1	0.0	7	0.3	0	0.0	29	1.2
CT 54.01, BG 3	1,475	93	6.3	1,230	83.4	3	0.2	20	1.4	0	0.0	81	5.5
CT 54.04, BG 1	2,707	213	7.9	2,217	81.9	18	0.7	59	2.2	0	0.0	160	5.9
Project Study Area	17,660	1,182	6.7	15,126	85.7	78	0.4	304	1.7	8	0.0	593	3.4

Source: US Census Bureau, Census 2010, Redistricting Data Summary File (PL 94-171), Table: US Census Bureau, Census 2010, Redistricting Data Summary File (PL 94-171), Table P1 "Race"

Note: Minority percentages greater than 10 percentage points higher than Mecklenburg County are shaded gray.

Race. The project study area is located within Mecklenburg County. As shown in **Table 8**, Mecklenburg County has a higher percentage of white residents (55%) compared to black residents (31%). American Native or Alaska Indian, Asian, Native Hawaiian, and other race groups have the lowest percentage (6% or less) compared to the percentage of white and black residents. The percentage of black residents is higher (86%) in the project study area compared to the percentage of black residents for Mecklenburg County (31%).

Poverty. The most recent poverty census data available is for 2011 and is shown in **Table 9**. The percentage of people in poverty within the project study area is 25%. This is more compared to the poverty percentage for Mecklenburg County at 14%.

Based on the American Community Survey (ACS) data presented in **Table 9**, just over one half (7 of 12) of the block groups in the study area have low-income populations that is higher in comparison to Mecklenburg County and exceeds NCDOT's Environmental Justice threshold. Two public housing complexes are located within the project study area. Since this project involves managed lanes, the potential impacts of tolling on Environmental Justice populations must be considered.

Table 9: Poverty Census Data

2010 Census Geography	Total Population	Below Poverty Level		Very Poor: Under 50% of Poverty Level		Near Poor: Between 100% and 150% of Poverty Level	
		#	%	#	%	#	%
Mecklenburg County	889,923	121,461	13.6%	53,512	6.0%	77,258	8.7%
CT 46, BG 1	1,543	186	12.1%	178	11.5%	245	15.9%
CT 48, BG 1	940	294	31.3%	127	13.5%	125	13.3%
CT 48, BG 2	1,295	398	30.7%	211	16.3%	105	8.1%
CT 48, BG 3	1,176	128	10.9%	100	8.5%	354	30.1%
CT 49, BG 1	661	120	18.2%	34	5.1%	42	6.4%
CT 50, BG 1*	1,282	536	41.8%	159	12.4%	299	23.3%
CT 50, BG 2	42	30	71.4%	10	23.8%	0	0.0%
CT 51, BG 1*	1,327	884	66.6%	443	33.4%	289	21.8%
CT 54.01, BG 1	2,652	157	5.9%	87	3.3%	324	12.2%
CT 54.01, BG 2	2,658	692	26.0%	373	14.0%	86	3.2%
CT 54.01, BG 3	1,378	321	23.3%	155	11.2%	315	22.9%
CT 54.04, BG 1	3,430	903	26.3%	503	14.7%	506	14.8%
Demographic Study Area	18,384	4,649	25.3%	2,380	12.9%	2,690	14.6%

Source: US Census Bureau, American Community Survey 5-Year Estimates (2007-2011), Table C17002

Note: Shaded block groups represent percentage of low-income residents greater than 10 percentage points higher than county.

*Block Groups with public housing.

9.2 Historic and Archaeological Resources

Research was conducted online at the North Carolina State Historic Preservation Office database January 16, 2013 to determine if any historic or archaeological resources are eligible for listing on the National Register of Historic Places are located within the project study area. There are two historic overlay districts (Dalebrook and Oaklawn Park) that will be impacted with the new right of way proposed for each alternative. Alternative 3 and Alternative 3A will impact .09 acres of the Dalebrook historic overlay district and 0.37 acres of the Oaklawn Park historic overlay district. Alternative 4 will impact 3.71 acres of the Dalebrook historic overlay district.

9.3 Section 4(f) and 6(f) Resources

9.3.1 Background Information

In accordance with Section 4(f) of the Department of Transportation Act of 1966 (49 USC § 303) and 23 CFR § 771.135, the FHWA “may not approve the use of land from a significant publicly owned park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: (i) there is no feasible and prudent alternative to the use of

land from the property; and (ii) the action includes all possible planning to minimize harm to the property resulting from such use.”

Section 6(f) of the Land and Water Conservation Act requires that any recreation lands that have received Land and Water Conservation Fund (LWCF) money and are converted to non-recreational purposes must be replaced with land of equal or greater value, location, and usefulness. Any land conversions on property that has received LWCF money must be approved by the US Department of the Interior – National Park Service (FHWA, 1987: pg. 44).

9.3.2 Section 4(f) and Section 6(f) Impacts

Aerial photography and GIS layers were reviewed for parks, recreation areas, and wildlife and waterfowl refuges. As stated in **Section 9.2**, there are two historic overlay districts within the project study area. Planning considerations will be made to minimize or avoid impacts to the historic districts.

Research was conducted to determine 6(f) resources for the I-77 HOV/HOT Lanes STIP# I-3311C along the I-77 corridor, no 6(f) resources are located within the project study area. A cursory review for the I-85 corridor was conducted and no 6(f) resources are located within the project study area.

9.4 Hydrology and Drainage

9.4.1 Streams

The project is located within the Catawba River Basin, HUC 03050101. According to the USGS topographic map for the project area there are streams within the project limits that will be impacted. Dillons Twin Lake and Lake Jo tributaries classified as a perennial stream system parallel I-77 and have existing storm pipes that route the stream under the interchange. Irwin Creek is classified as a perennial stream with associated unnamed intermittent tributaries that flow through the project study area and have existing storm pipes to convey the stream channel under the interchange and associated roadways. Culvert extensions and/or potential stream relocation will create stream impacts associated with Alternative 3, Alternative 3A, and Alternative 4.

9.4.2 Floodplains

The most recent flood insurance rate map (FIRM) for the project area (dated March 2009) was reviewed on the Federal Emergency Management Agency (FEMA) website (<http://map1.msc.fema.gov>, accessed January 15, 2013). There are floodplains (AE and X) within the project area associated with Dillons Twin Lake and Lake Jo and Irwin Creek. Floodplains totals for Alternatives 3, 3A, and 4 are 8.75 acres, 10.86 acres, and 12.58 acres respectively.

9.5 Wetlands

A field survey was conducted during 2011 for the I-77 HOT/HOV Lanes project within the project study area confirming the wetlands in the project study area. The classification of the wetland areas is described below:

Two jurisdictional wetlands were identified within the study area. Wetland classification and quality rating data identified the wetland areas as Headwater Forest. The wetlands are located within the Catawba River basin (USGS Hydrologic Unit 03050103). Alternative 3 and 3A would impact 0.45 acre of wetlands and Alternative 4 would impact 1.02 acre of wetlands. Impacts to the wetlands for each alternative are identified in Figure 3, Figure 3A, and Figure 4.

Jurisdictional confirmation should be conducted by the U.S. Army Corp of Engineers to determine the exact location of wetlands within the project for future planning stages for this project. Wetland impacts could change based on the results of jurisdictional determination for this project.

9.6 Federally Protected Species

Plants and animals with federal classifications of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act (ESA) of 1973, as amended.

There are five federally protected species listed for Mecklenburg County by the US Fish and Wildlife Service (USFWS) (<http://www.fws.gov>, accessed January 16, 2013). They are listed below:

- Bald eagle (*Haliaeetus leucocephalus*) – Bald and Golden Eagle Protection Act
- Carolina heelsplitter (*Lasmigona decorata*) – Endangered
- Michaux's Sumac (*Rhus michauxii*) – Endangered
- Schweinitz's Sunflower (*Helianthus schweintzii*)-Endangered
- Smooth Coneflower (*Echinacea laevigata*)-Endangered

According to the North Carolina Natural Heritage Program, habitat for the bald eagle consists of mature forests near large bodies of water. The USGS topographic map for the project study area shows the closest large body of water is the Catawba River. Because there are no large bodies of water near the project; it is assumed that the project likely would not affect the bald eagle.

According to the USFWS website (www.fws.gov), accessed January 16, 2013, the Carolina heelsplitter has been eliminated from the majority of its historical range, and only six populations

are presently known to exist. In Union County, NC, one small remnant population occurs in Waxhaw Creek, a tributary to the Catawba River, and another small population occurs in both Goose Creek, a tributary in the Rocky River, and Duck Creek, a tributary to Goose Creek, in the Pee Dee River system. Its habitat is located in streams and rivers with substrates including mud, clay, sand, gravel, and cobble/boulder/bedrock without significant silt accumulations, along stable, shaded stream banks.

The presence of pollutants and sediment from overland runoff likely precludes the establishment of Carolina heelsplitter in the stream reaches located in the study area. No populations of the mussel have been found within the stream drainages associated with the project corridor. The closest existing occurrence known in the Catawba River system is near the South Carolina state line in southern Union County. The closest Critical Habitat for the Carolina heelsplitter is in Waxhaw Creek, approximately 25 miles south of the study area. The project study area includes Dillons Twins Lakes and Lake Joe tributary and Irwin Creek and associated tributaries; however these streams have not been listed to have known populations of the Carolina heelsplitter. Therefore, it is assumed that this project likely would not affect the Carolina heelsplitter.

According to the USFWS website (www.fws.gov), accessed January 16, 2013, Michaux's sumac grows in sandy or rocky open woods in association with basic soils. The plant is also known to survive best in areas where some form of disturbance has provided an open area. Several populations in North Carolina are on highway rights-of way, roadsides, or on the edges of artificially maintained clearings.

The project study area is comprised of roadways and open areas creating favorable habitat for Michaux's Sumac. Mecklenburg County has been identified as having known populations of Michaux's Sumac. Detailed surveys for Michaux's sumac were performed by Atkins biologists on October 17-21, 2011 for STIP I-3311 C, I-77 HOV/HOT Lanes within the project study area. All areas of suitable habitat were systematically walked and visually surveyed. In areas where large blocks of habitat occurred, overlapping transects were employed to ensure coverage of all habitat. No occurrences of Michaux's sumac were found. Michaux's sumac surveys are valid for two years.

According to the USFWS website (www.fws.gov), accessed January 16, 2013, Schweinitz's sunflower is endemic to the piedmont of the Carolinas with 21 known populations in 10 counties in North Carolina. The species occurs in clearings and edges of upland woods on moist to dry clays, clay-loams, or sandy clay loams with high gravel content. The plant is also known to survive best in areas where some form of disturbance has provided an open area.

The project study area is comprised of roadways and open areas creating favorable habitat for Schweinitz's sunflower. Mecklenburg County has been identified as having known populations of Schweinitz's sunflower. Detailed surveys for Schweinitz's sunflower were performed by Atkins biologist on October 17-21, 2011 for TIP I-3311 C, I-77 HOV/HOT Lanes within the project

study area. All areas of suitable habitat were systematically walked and visually surveyed. In areas where large blocks of habitat occurred, overlapping transects were employed to ensure coverage of all habitat. No occurrences of Schweinitz's sunflower were found. Schweinitz's sunflower surveys are valid for two years.

According to the USFWS website (www.fws.gov), accessed January 16, 2013, Smooth coneflower is typically found in open woods, glades, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium and calcium rich soils. Optimal sites are characterized by abundant sunlight and little competition in the herbaceous layer. Natural fires, as well as large herbivores, historically influenced the vegetation in this species' range. Many of the herbs associated with Smooth coneflower are also sun-loving species that depend on periodic disturbances to reduce the shade and competition of woody plants.

The project study area is comprised of roadways and open areas creating favorable habitat for Smooth coneflower. Mecklenburg County has been identified as having known populations of Smooth coneflower. Detailed surveys for smooth coneflower were performed by Atkins on October 17-21, 2011 for STIP I-3311 C, I-77 HOV/HOT Lanes within the project study area. All areas of suitable open habitat were surveyed, with particular attention being paid to areas of neutral to basic soils. Habitat was systematically walked and visually surveyed, and overlapping transects were employed to ensure coverage of all habitat. No occurrences of Smooth coneflower were found. Smooth coneflower surveys are valid for two years.

Surveys for federally protected species should be updated and conducted by qualified biologists during future planning phases of this project.

9.7 Hazardous Materials

Hazardous material is defined as any material, or combination of materials that pose a hazard to human health, welfare, or the environment. Hazardous material sites may include underground storage tanks, auto salvage yards, landfills, and lagoons. Hazardous materials take the form of gas, liquid, sludge, or solids, and can be radioactive, corrosive, flammable, explosive, infectious, toxic, or reactive.

A review of geographic information data was conducted within the proposed study area, any sites adjacent I-85 and I-77 interchange project limits that appeared likely to contain hazardous materials were considered. There were no sites that contain hazardous materials. This was not a comprehensive investigation. A hazardous materials field investigation should be conducted in future planning phases of this project to locate any potential hazardous materials sites within the project study area.

9.8 Utilities

Major existing utilities within the project study area include overhead telephone lines, electrical transmission lines, water lines, and sanitary sewer lines.

Telephone service is provided by Windstream and BellSouth Telephone. Electrical service is provided by Duke Energy. Water and sewer service is provided by Charlotte-Mecklenburg Utility Department. All utility providers should be contacted and coordinated with to ensure that the proposed design and construction of the project would not disrupt service.

9.9 Air Quality

Air quality is regulated under the federal Clean Air Act (CAA) of 1970 and 1990, as amended (42 USC Sections 7401-7671q). The CAA was enacted for the purposes of protecting and enhancing the quality of the nation's air resources to benefit public health, welfare and productivity. The Environmental Protection Agency (EPA) is the federal regulatory agency charged with administering the CAA. The CAA established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation and buildings.

The EPA classifies urban environments as being either in "attainment" or "non-attainment." An urban area that exceeds the National Ambient Air Quality Standards (NAAQS) for one or more pollutants is said to be in "non-attainment" of the NAAQS enforced under the CAA. The EPA established primary and secondary NAAQS for six air pollutants: carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), particulate matter (PM) and lead (Pb). The designation of an area is determined on a pollutant-by-pollutant basis.

Attainment areas can be further categorized as a maintenance area for attainment, which means that the urban area has exceeded NAAQS levels for one or more pollutants in the past. Efforts in these maintenance areas must be made in order to maintain the status quo and not exceed the NAAQS. Non-attainment areas are classified in severity by pollutant depending on the degree of exceedance(s) over the NAAQS.

In 2011, the average annual air quality index (AQI) value for Mecklenburg County was 48. From 2002 to 2011, the average annual AQI has progressed from 59 to 48 - an 18.6% improvement over the period. The two primary contributors to the County's AQI value are particulate matter (PM 2.5) and ozone (O₃) and the most significant sources of air pollution are mobile sources. Although PM 2.5 contributes to decreased air quality, the County meets national standards. Mecklenburg County achieved compliance with the 1997 ozone standard but O₃ levels violate the 2008 national standard of 0.075 ppm. Currently Mecklenburg is

classified as a nonattainment area for ozone and as a maintenance area for carbon monoxide <https://connect.ncdot.gov/projects/planning/Pages/AirQualityTransportationConformity.aspx>.

The Air Quality Analysis report conducted for the I-77 HOV/HOT Lanes within the project study area concludes improvements associated with the addition of HOV/HOT lanes are not anticipated to create any adverse effects on the air quality of Mecklenburg County nonattainment and maintenance areas, thereby complying with the National Ambient Air Quality Standards.

10 Noise

The NCDOT *Traffic Noise Abatement Policy* effective July 13, 2011 establishes official policy on highway noise. This policy describes the NCDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the NCDOT approach to implementation.

Ambient noise monitoring data was collected at four locations along I-277 in conjunction with the I-3311C project on January 9, 2013. The noise monitoring data was used to characterize the existing noise environment and to validate the detailed computer models developed to predict traffic noise in the project area. There are existing walls located along segments of I-77 in the project corridor. South of I-85, there are brick walls, approximately 11 feet in height, located along the right of way line on both sides of I-77. These walls were constructed as privacy walls, not as sound barriers. All existing privacy walls within the I-77 right of way were included in the TNM models.

Noise impacts are anticipated in the project study area as a result of construction and increase vehicle traffic. Noise barriers for Alternative 3, Alternative 3A, and Alternative 4 are recommended to meet feasibility and reasonableness requirements based on available information. Locations of the barriers can be seen for each alternative in Figure 3, Figure 3A, and Figure 4. The final decision on feasibility and reasonableness of the noise barriers will be made upon completion of the project design and the public involvement process. Changes may occur as more detailed information on mapping and final design becomes available.

NCDOT *Traffic Noise Abatement Policy* (July 2011), the following traffic noise abatement measures may be considered: highway alignment selection, traffic systems management, buffer zones, noise barriers (earth berms and noise walls), and noise insulation of Activity Category D land use facilities. Noise abatement measures must be approved by the FHWA prior to implementation.

11 Recommendation

Based on the data and analyses conducted for this feasibility study, Alternative 3 (Interchange Upgrade) and Alternative 3A (Interchange Upgrade with I-85 Managed Lanes) are the alternatives that would best meet the project need, minimizes potential impacts to the human and natural environment, and would reduce the number of traffic accidents. These alternatives combined allow for the ultimate phase to include managed lanes.

The interchange upgrade would be designed to remove the tight left entrance ramps from I-85 to I-77 and provide an easier, safer transition for the on and off ramps from I-77 and I-85. The improvements would be phased to incorporate the HOT lanes currently being planned along I-77 as well as permit the future expansion of HOT lanes along I-85.

Resources:

National Environmental Policy Act

NCDOT Accident Data

NCDOT Crash Rates, Division 10: <https://connect.ncdot.gov/resources/safety>

FS-1201A, I-85/I-77 Interchange Traffic Operations Memorandum

Geographic Information System (GIS)

Aerial Photography Orthoimagery_2010 from NC OneMap

http://services.nconemap.com/arcgis/services/Imagery/Orthoimagery_2010/ImageServer.

Google Earth

North Carolina State Historic Preservation Office database

USFWS: <http://www.fws.gov>

Charlotte GIS

Natural Resource Technical Report I-77 HOV/HOT Conversion

Final Design Noise Report I-77 High Occupancy/Toll (HOT) Lanes

STIPs # I-3311C, I-5405, and I-4750AA, Mecklenburg and Iredell Counties Community

Impact Assessment & Indirect and Cumulative Effects Screening Assessment

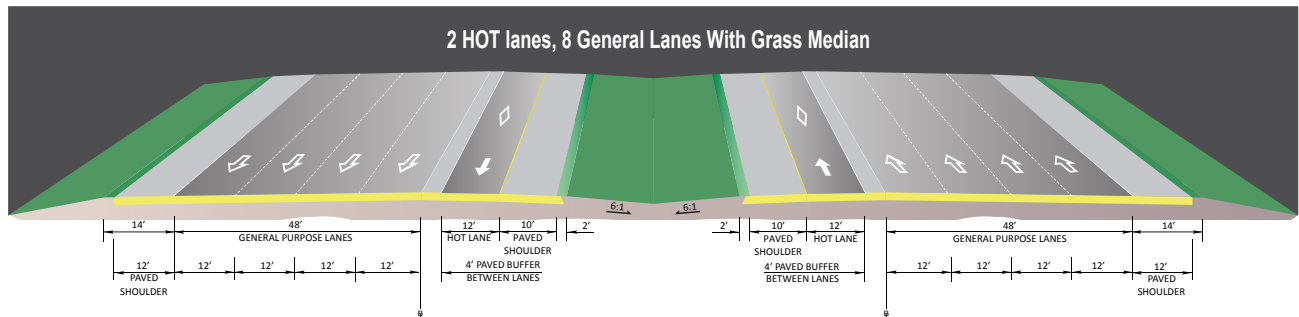
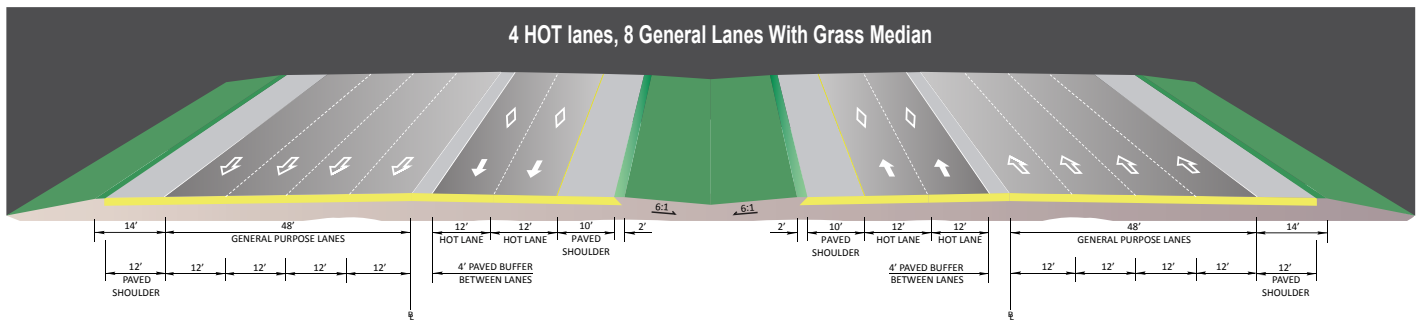
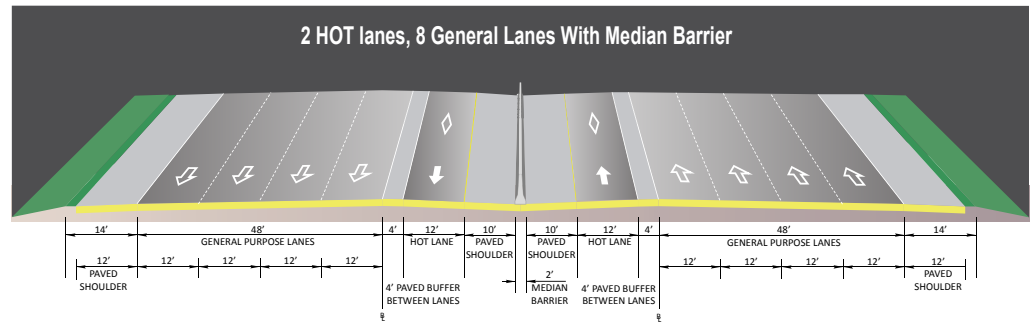
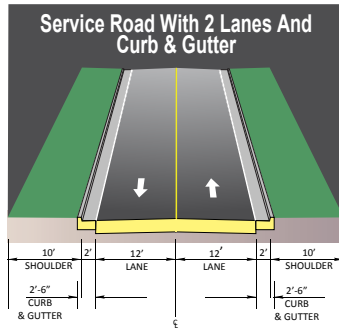
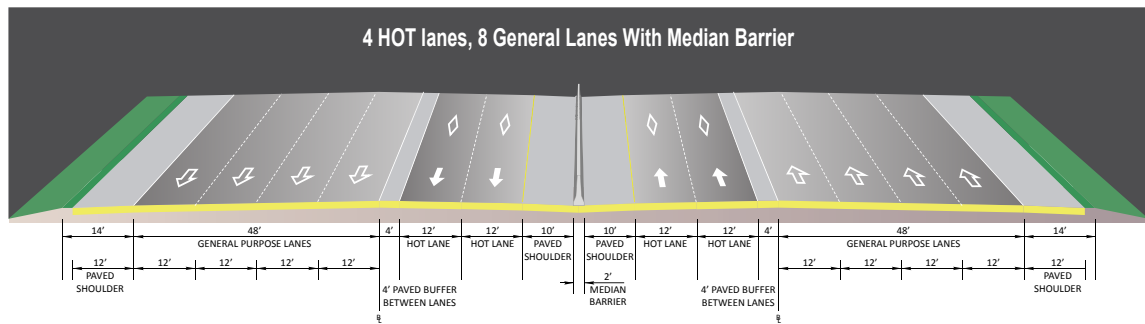
Federal Emergency Management Agency: <http://map1.msc.fema.gov>

Air Quality Transportation Conformity Website:

<https://connect.ncdot.gov/projects/planning/Pages/AirQualityTransportationConformity.aspx>

NCDOT Traffic Noise Abatement Policy (July 2011)

FIGURES



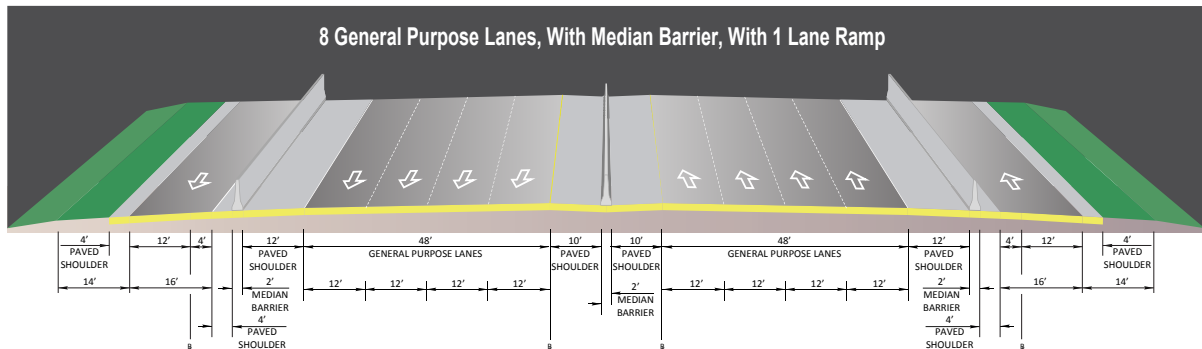
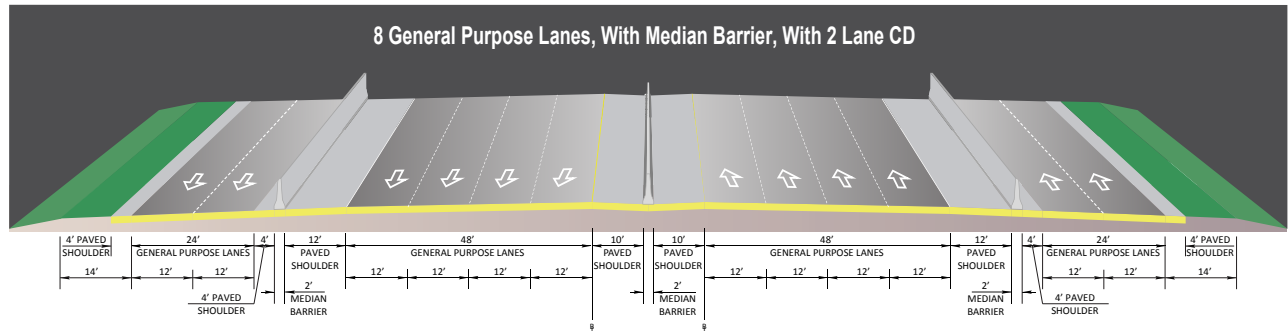
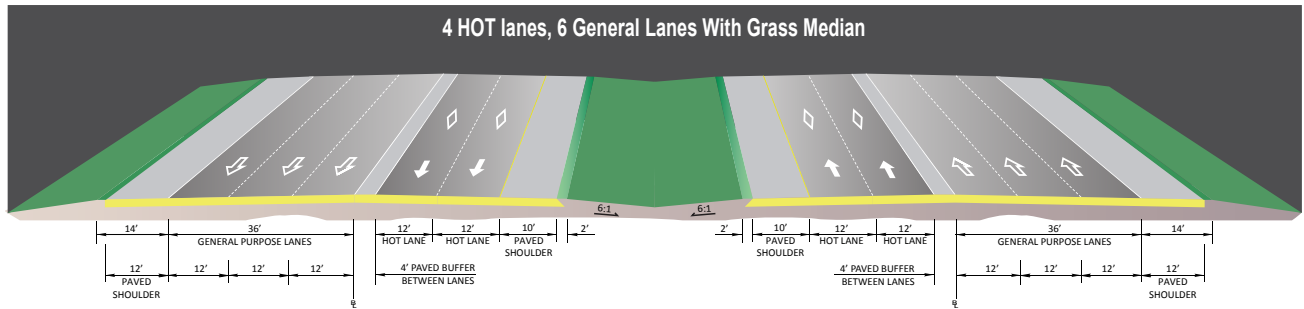
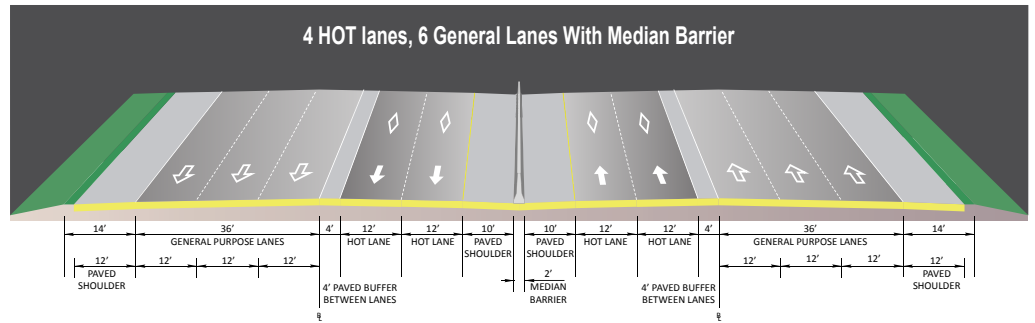
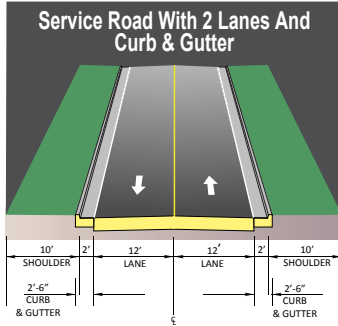
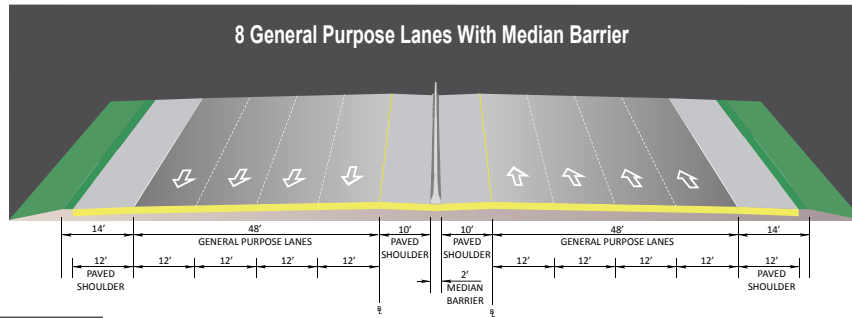
I-77, I-85 Interchange Typical Sections at JNL 10.17.2013



**I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY
PROJECT NO. FS-1210A**
Mecklenburg County, North Carolina

Note: Alternative 3 and 3A Typical Sections are combined to include the Interchange Upgrade with the ultimate condition of managed lanes.

**TYPICAL SECTIONS
ALTERNATIVES
3 and 3A
FIGURE 2**



I-77 I-85 Interchange Typical Sections at JNL 10.17.2013



I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY
PROJECT NO. FS-1210A
 Mecklenburg County, North Carolina

TYPICAL SECTIONS
ALTERNATIVE 4

FIGURE 2A

I-77_I-85_InterchangeAlternatives.mxd JNL 10.18.2013



**I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY**
PROJECT NO. FS-1210A
Mecklenburg County, North Carolina

0 600 1,200
Feet
Source: Mecklenburg County GIS,
NCDOT GIS, ESRI GIS, NCONEMAP

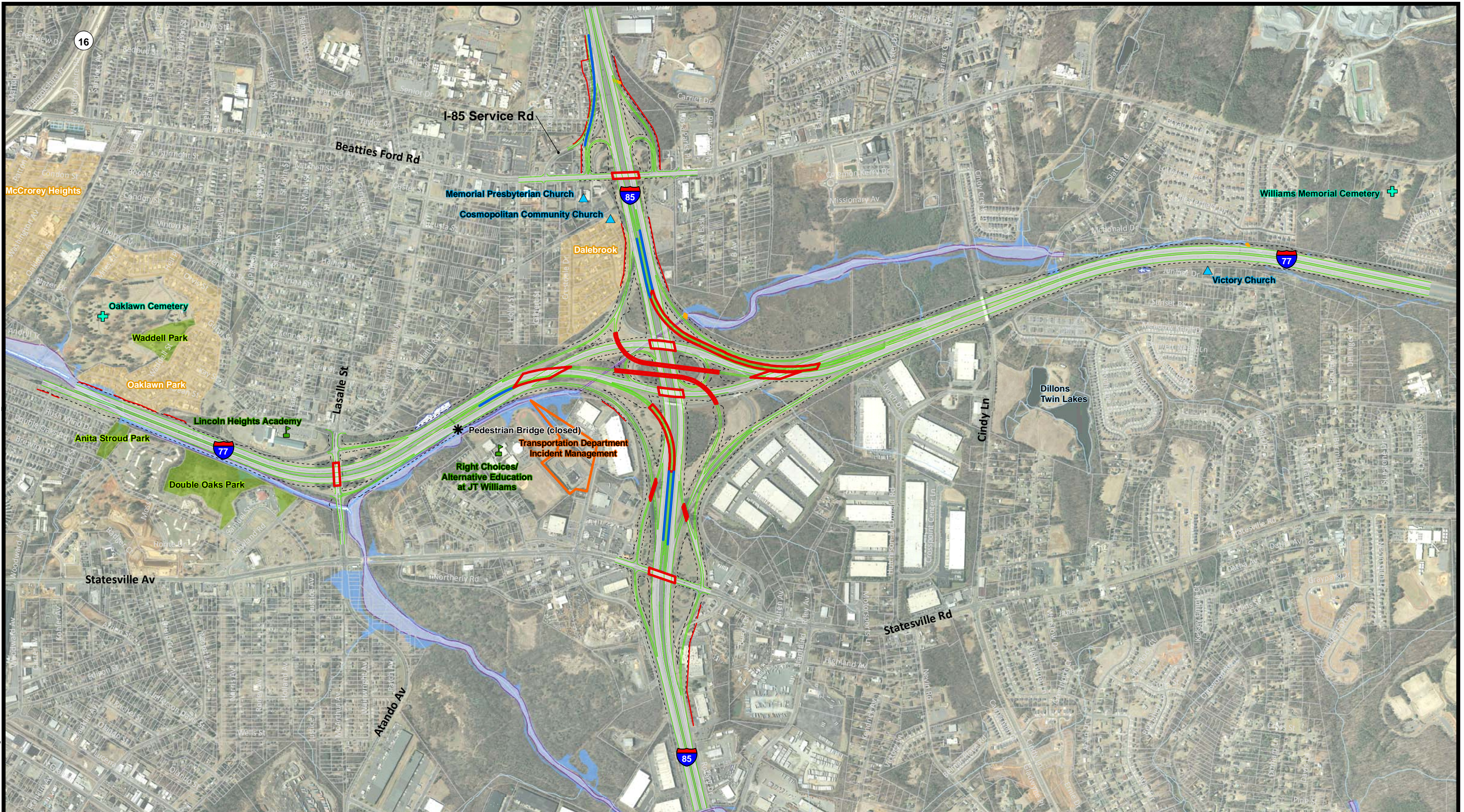
Legend

- | | | | | |
|---------------------------|-----------------------|---------------------|------------------------|--------------------|
| Proposed Roadway Bridge | Proposed Right of Way | Delineated Streams | Parcels | * Notable Features |
| Proposed Roadway Culvert | Proposed EOT | Delineated Wetlands | State Owned Land | + Cemeteries |
| Proposed Concrete Barrier | Proposed Lane Line | Floodway | SHPO Historic District | ▲ Churches |
| Proposed Slopestake Line | Creeks & Streams | 100 Year Floodplain | Parks | ▲ Schools |

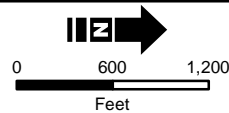
**ALTERNATIVE 3
UPGRADE I-85/I-77 INTERCHANGE**

FIGURE 3

I-77_I-85_InterchangeAlternatives.mxd JNL 10.18.2013



**I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY**
PROJECT NO. FS-1210A
Mecklenburg County, North Carolina



Source: Mecklenburg County GIS,
NCDOT GIS, ESRI GIS, NCONEMAP

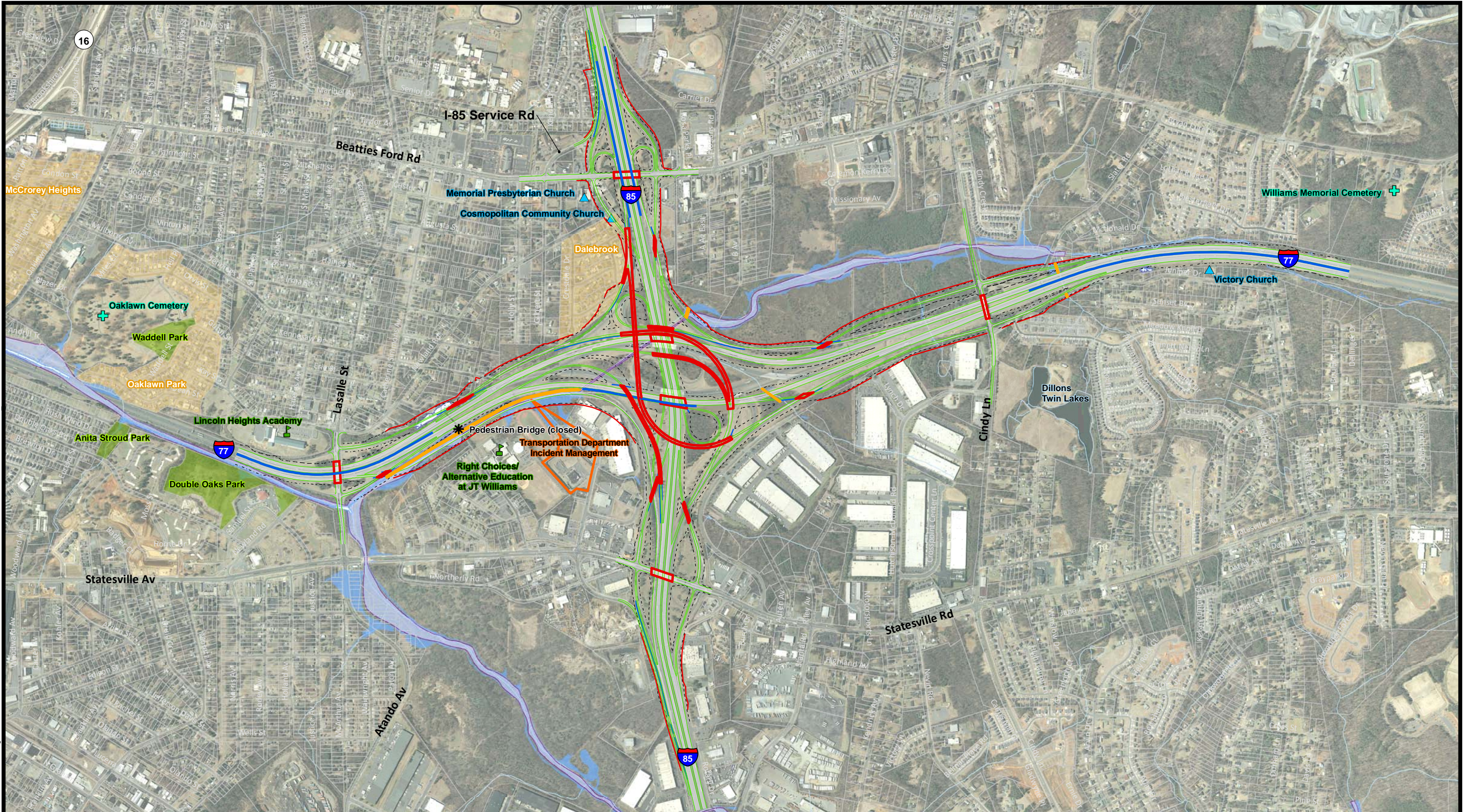
Legend

- | | | | | |
|---------------------------|-----------------------|---------------------|------------------------|------------------|
| Proposed Roadway Bridge | Proposed Right of Way | Delineated Streams | Parcels | Notable Features |
| Proposed Roadway Culvert | Proposed EOT | Delineated Wetlands | State Owned Land | Cemeteries |
| Proposed Concrete Barrier | Proposed Lane Line | Floodway | SHPO Historic District | Churches |
| Proposed Slopestake Line | Creeks & Streams | 100 Year Floodplain | Parks | Schools |

**ALTERNATIVE 3A
UPGRADE I-85/I-77 INTERCHANGE
WITH MANAGED LANES**

FIGURE 3A

I-77_I-85_InterchangeAlternatives.mxd JNL 10.18.2013



**I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY**
PROJECT NO. FS-1210A
Mecklenburg County, North Carolina

0 600 1,200
Feet
Source: Mecklenburg County GIS,
NCDOT GIS, ESRI GIS, NCONEMAP

Legend

- | | | | | |
|---------------------------|-----------------------|---------------------|------------------------|--------------------|
| Proposed Roadway Bridge | Proposed Right of Way | Delineated Streams | Parcels | * Notable Features |
| Proposed Roadway Culvert | Proposed EOT | Delineated Wetlands | State Owned Land | + Cemeteries |
| Proposed Concrete Barrier | Proposed Lane Line | Floodway | SHPO Historic District | ▲ Churches |
| Proposed Slopeline Line | Creeks & Streams | 100 Year Floodplain | Parks | ▲ Schools |

**ALTERNATIVE 4
INTERCHANGE REDESIGN
WITH MANAGED LANES**

FIGURE 4

2004 Mecklenburg-Union Metropolitan Planning Organization Thoroughfare Plan

MPO Adopted November 17, 2004
(Updated as of March 21, 2012)



I-77-I-85_Traffic.mxd JNL 09.10.2013



**I-85/I-77
INTERCHANGE UPGRADE
FEASIBILITY STUDY
PROJECT NO. FS-1210A**
Mecklenburg County, North Carolina



0 1.5 3
Miles

Source: Charlotte - Mecklenburg Planning Department,
www.charmeck.org.

**CITY OF CHARLOTTE -
MECKLENBURG COUNTY
THOROUGHFARE PLAN**

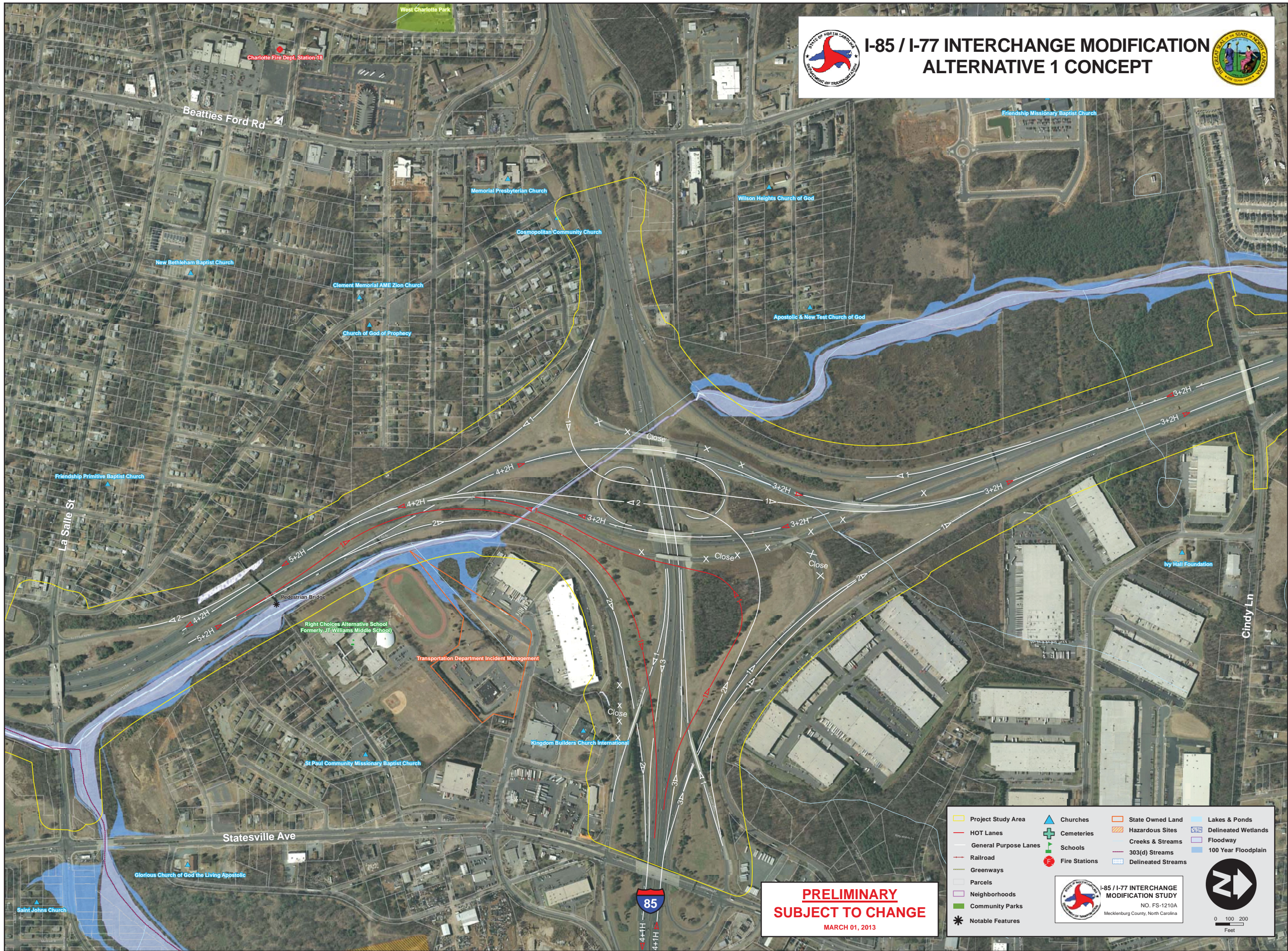
FIGURE 5

APPENDIX A

Alternative Concepts



I-85 / I-77 INTERCHANGE MODIFICATION ALTERNATIVE 1 CONCEPT



**PRELIMINARY
SUBJECT TO CHANGE**
MARCH 01, 2013

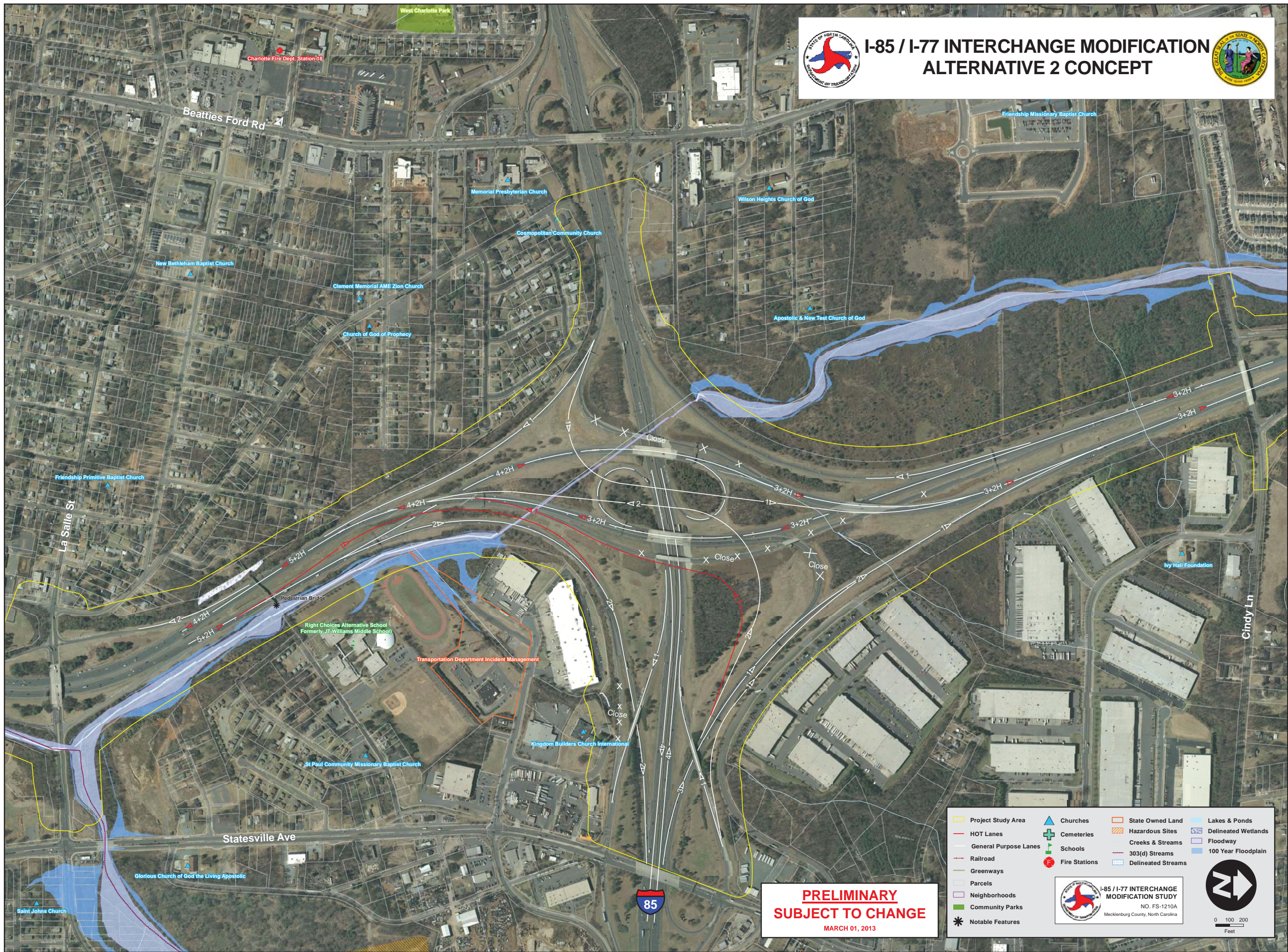
Project Study Area	Churches	State Owned Land	Lakes & Ponds
HOT Lanes	Cemeteries	Hazardous Sites	Delineated Wetlands
General Purpose Lanes	Schools	Creeks & Streams	Floodway
Railroad	Fire Stations	303(d) Streams	100 Year Floodplain
Greenways	Delineated Streams		
Parcels			
Neighborhoods			
Community Parks			
Notable Features			

I-85 / I-77 INTERCHANGE
MODIFICATION STUDY
NO. FS-1210A
Mecklenburg County, North Carolina

0 100 200
Feet



I-85 / I-77 INTERCHANGE MODIFICATION ALTERNATIVE 2 CONCEPT



**PRELIMINARY
SUBJECT TO CHANGE**
MARCH 01, 2013

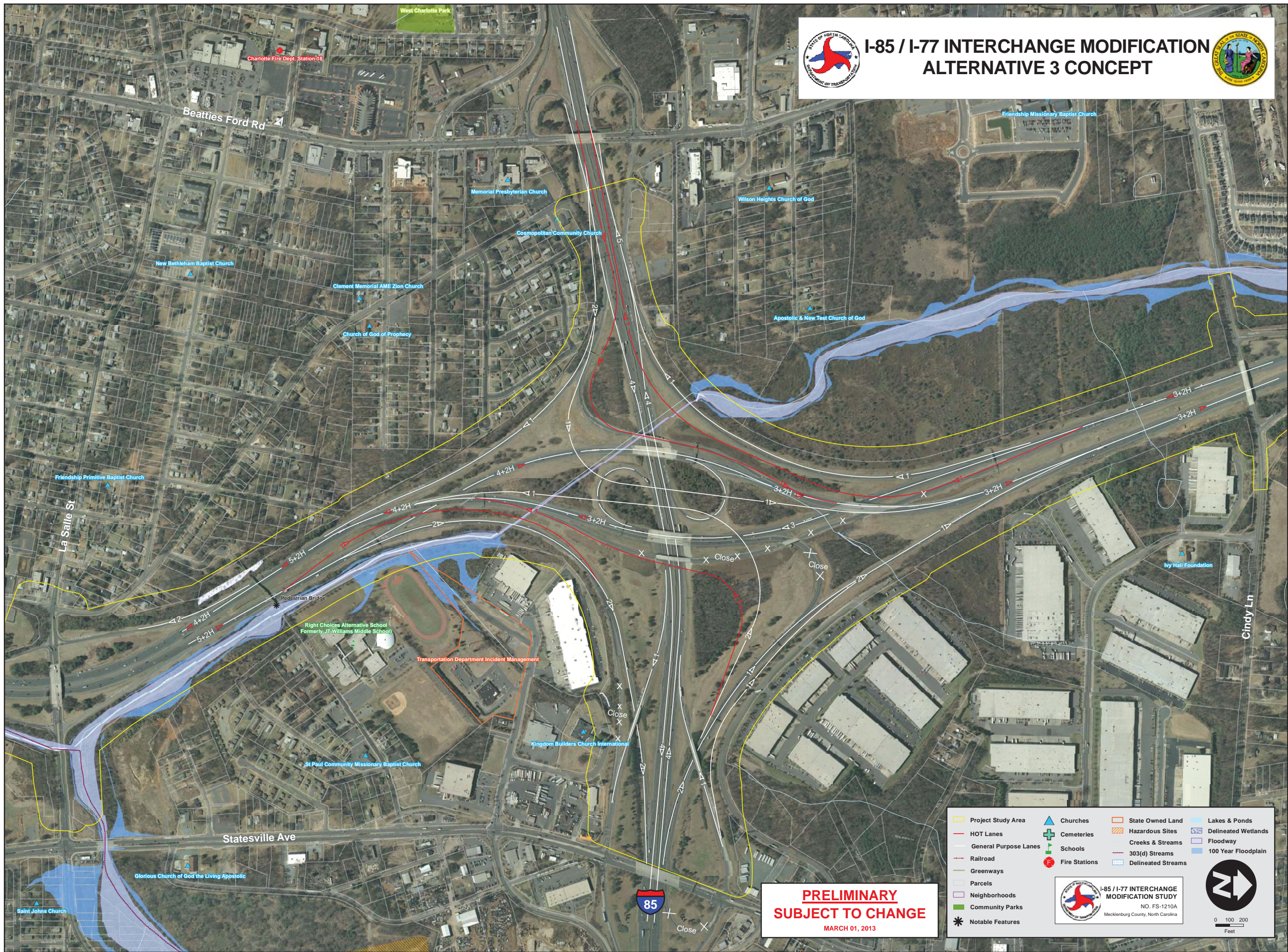
Project Study Area	Churches	State Owned Land	Lakes & Ponds
HOT Lanes	Cemeteries	Hazardous Sites	Delineated Wetlands
General Purpose Lanes	Schools	Creeks & Streams	Floodway
Railroad	Fire Stations	303(d) Streams	100 Year Floodplain
Greenways		Delineated Streams	
Parcels			
Neighborhoods			
Community Parks			
Notable Features			

0 100 200
Feet

I-85 / I-77 INTERCHANGE
MODIFICATION STUDY
NO. FS-1210A
Mecklenburg County, North Carolina



I-85 / I-77 INTERCHANGE MODIFICATION ALTERNATIVE 3 CONCEPT

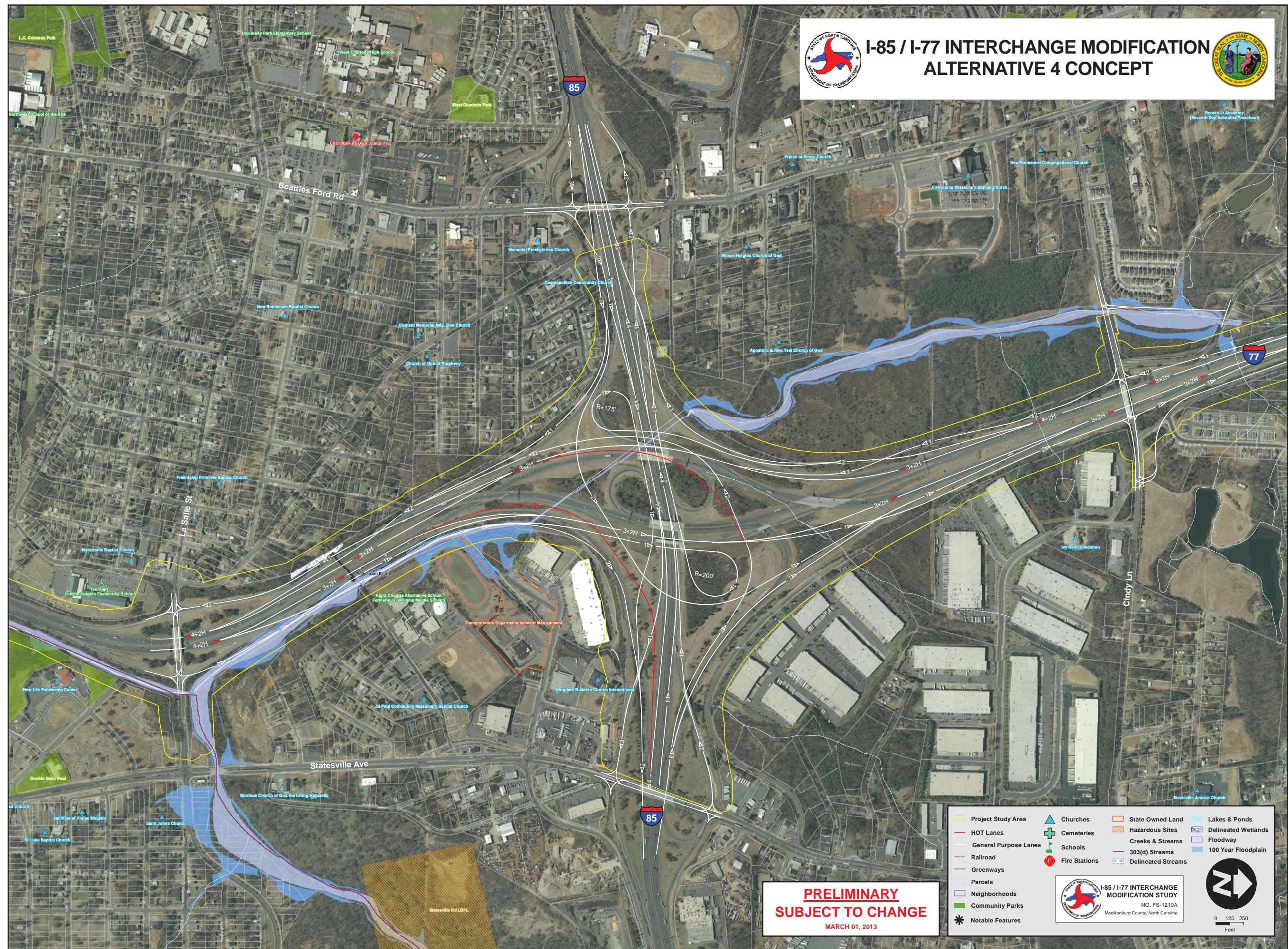
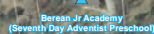


**PRELIMINARY
SUBJECT TO CHANGE**
MARCH 01, 2013

Project Study Area	Churches	State Owned Land	Lakes & Ponds
HOT Lanes	Cemeteries	Hazardous Sites	Delineated Wetlands
General Purpose Lanes	Schools	Creeks & Streams	Floodway
Railroad	Fire Stations	303(d) Streams	100 Year Floodplain
Greenways		Delineated Streams	
Parcels			
Neighborhoods			
Community Parks			
Notable Features			

0 100 200
Feet

I-85 / I-77 INTERCHANGE
MODIFICATION STUDY
NO. FS-1210A
Mecklenburg County, North Carolina



PRELIMINARY
SUBJECT TO CHANGE
MARCH 01, 2013



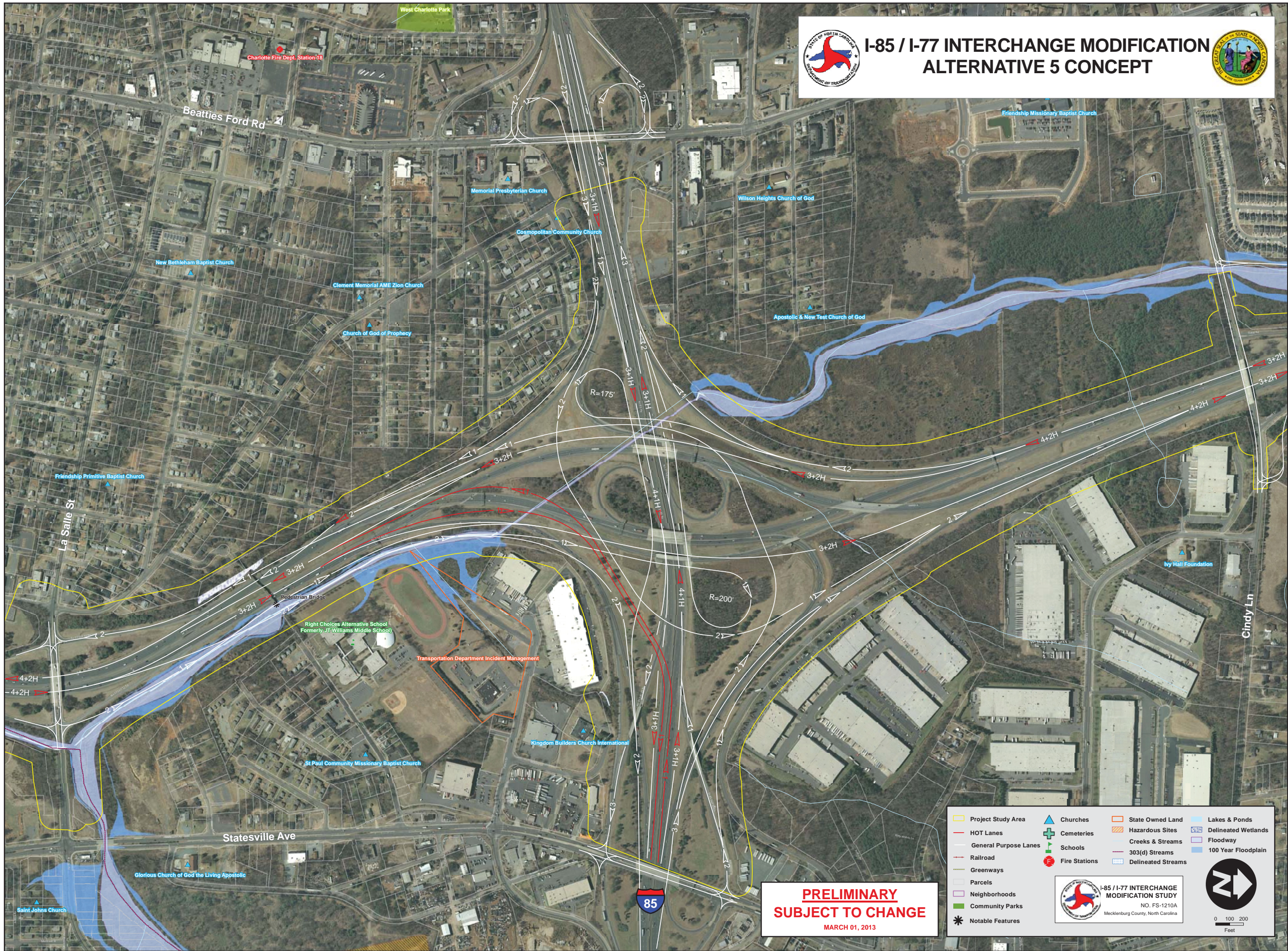
**I-85 / I-77 INTERCHANGE
MODIFICATION STUDY**
NO. FS-1210A
Mecklenburg County, North Carolina



0 125 250
Feet



I-85 / I-77 INTERCHANGE MODIFICATION ALTERNATIVE 5 CONCEPT

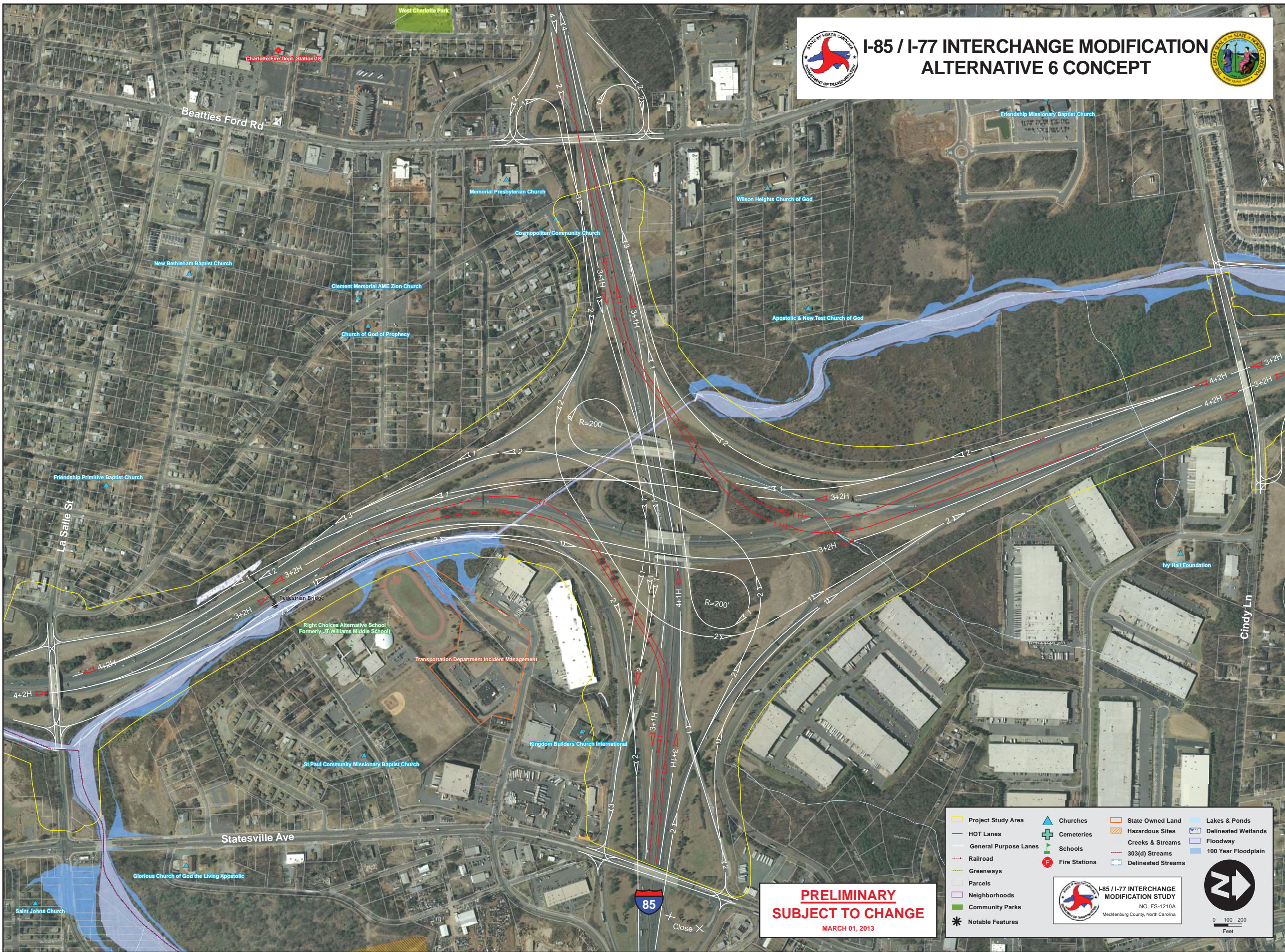


**PRELIMINARY
SUBJECT TO CHANGE**
MARCH 01, 2013

Project Study Area	Churches	State Owned Land	Lakes & Ponds
HOT Lanes	Cemeteries	Hazardous Sites	Delineated Wetlands
General Purpose Lanes	Schools	Creeks & Streams	Floodway
Railroad	Fire Stations	303(d) Streams	100 Year Floodplain
Greenways		Delineated Streams	
Parcels			
Neighborhoods			
Community Parks			
Notable Features			

0 100 200
Feet

**I-85 / I-77 INTERCHANGE
MODIFICATION STUDY**
NO. FS-1210A
Mecklenburg County, North Carolina



PRELIMINARY
SUBJECT TO CHANGE
MARCH 01, 2013



APPENDIX B

Local Official Comments



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May 7, 2013

Mr. Timothy D. Gibbs, AICP
Transportation Planner III
City of Charlotte Dept. of Transportation
600 E. 4th St.
Charlotte, NC 28202

**RE: Feasibility Study FS-1210A
I-77/I-85 Interchange Feasibility Study**

Dear Mr. Gibbs:

Thank you for taking the time to share the conceptual interchange drawings and to collect comments from the March meeting with Transportation staff of the Mecklenburg-Union MPO. Atkins appreciates your expeditious review of such a large and complicated project like the I-77/I-85 Interchange Feasibility Study. Your comments are recreated below, along with our responses.

General Comments

- Where possible, don't cut off Statesville Avenue or Beatties Ford Road from having direct I-77 North or South access.

Response: *Atkins will investigate the possibility of providing direct access to I-77 North and I-77 South. However, if the traffic analysis indicates that the weave created by these movements are not acceptable, alternative access will be provided.*

- Develop cost for various components of alternative segments so that the improvements can be constructed incrementally and not necessarily as one project.

Response: *As construction costs are developed, the basic interchange improvements will be separated from the managed lane improvements so that they can be phased in at the appropriate time.*

- Three southbound managed lanes are needed near the LaSalle bridge to allow the traffic from I-85 southbound to merge sufficiently.

Response: *For the feasibility study, Atkins will merge the I-85 South managed lane to the I-77 South managed lanes under standard interchange ramp guidelines. However, as preliminary designs and project specific traffic forecasts are developed later, it is anticipated that the need for extending this merge lane will be further investigated.*

- I-85 southbound general purpose lanes need to retain two lanes, when merging onto I-77 South and not drop to one lane upon merging with I-77 southbound traffic.

Response: *The design alternatives have been developed under the restriction that additional general purpose lanes cannot be added to I-77 due to the anticipated P3 contract requirements. I-85 southbound ramp was dropped to one lane to maintain the number of general purpose lanes approaching the LaSalle interchange. NCDOT will investigate the benefits of additional general purpose lanes as it relates to the P3 contractual agreement as the project progresses forward.*

Alternative 1 and 2

- Laneage numbers seem inconsistent on I-77 South between I-85 and LaSalle bridge.

Response: *The additional lane is an auxiliary lane that will be dropped at the LaSalle interchange.*

- Drop only one lane southbound onto LaSalle ramp instead of two lanes.

Response: *I-77 southbound consists of 5 general purpose lanes and 2 managed lanes. As it approaches the LaSalle interchange ramp, the two outermost lanes can exit to LaSalle Street with the outside lane being an exit only lane and the adjacent lane being a choice lane; exiting to LaSalle Street or continuing southbound on I-77. This lane configuration keeps the weave in its simplest form which requires only one lane shift to be performed.*

Alternative 3 and 6

- Since we don't anticipate the need for managed lanes between I-85 South and I-77 North, drop Alternatives 3 and 6 from further consideration. However, other alternatives still under consideration should not preclude this movement from being added if the need should arise.

Response: *Atkins concurs that managed lanes between I-85 and I-77 North is well into the future; however, Alternative 6 is recommended to be further studied to establish the upper impact and construction cost limit for the feasibility study.*

Alternative 4

- The mapping does not clearly show if I-77 is unbraided as it crosses I-85.

Response: *Traffic flow arrows were reviewed and updated.*

Alternative 5

- Add laneage numbers on I-77 near Cindy Lane and LaSalle bridges.

Response: *Additional traffic flow arrows were added.*

- Provide connections from Beatties Ford Road to I-77 North and South.

Response: *Atkins will investigate the possibility of allowing movements from Beatties Ford Road to I-77 via I-85. This adjustment will create a weave between the Beatties Ford Road loops and the I-77 exit/entrance ramps; therefore, detailed traffic analysis will determine its viability.*

- Should the northbound laneage on I-85 west of I-77 southbound bridges be “4+1H”?

Response: Yes, the laneage label was corrected.

If you have any questions, or need additional information, please do not hesitate to contact me at (919) 431-5254.

Sincerely,



David W. Bass, PE
Group Manager

cc: Derrick Lewis, PE
Lynnise Hawes, PE
Stuart Basham