

7. INDIRECT & CUMULATIVE EFFECTS



Section 7 describes a qualitative assessment of potential indirect and cumulative land use changes and environmental effects associated with the proposed project. Indirect impacts are identified with respect to land use changes, water resources, terrestrial communities, federally-protected species, cultural resources, and prime farmland soils. Cumulative effects are evaluated for water quality and aquatic habitat, federally-endangered Carolina heelsplitter mussel and its habitat, and terrestrial communities.

7.1 DEFINITIONS AND ANALYSIS SCENARIOS

This section is a summary of the *Indirect and Cumulative Effects Assessment* (HNTB, January 2009), incorporated by reference and available on the North Carolina Turnpike Authority Website (NCTA) Web site (www.ncturnpike.org/projects/monroe). An indirect and cumulative effects assessment specifically evaluates the potential land use changes and environmental effects associated with the proposed project. This qualitative assessment was performed in accordance with North Carolina Department of Transportation (NCDOT) guidance titled, *Assessing Indirect and Cumulative Effects of Transportation Projects in North Carolina* (November 2001), referred to in this section as *ICI Guidance*. This analysis was undertaken in five steps based on the NCDOT guidance, including:

- Definition of the Future Land Use Study Area (FLUSA) (Step 1)
- Identification of the FLUSA's Direction and Goals (Step 2)
- Inventory of Notable Features (Step 3)
- Identification of Important Impact-Causing Activities (Step 4)
- Identification and Analysis of Potential Indirect and Cumulative Effects (Step 5)

Steps 6, 7, and 8 (a quantitative assessment) of NCDOT's 8-step process would be conducted on the Preferred Alternative following the approval of the Draft EIS if it is determined by the Federal Highway Administration (FHWA) and the North Carolina Turnpike Authority (NCTA) that such analysis is needed.

To aid in defining the scope of the ICE assessment, representatives from the FHWA, NCTA, and NCDOT met with representatives from US Fish and Wildlife Service (USFWS) and NC Wildlife Resources Commission (NCWRC) on June 29, 2007, with NC Department of Environment and Natural Resources-Division of Water Quality (NCDENR-DWQ) on July 26, 2007, and with US Army Corps of Engineers (USACE) on August 14, 2007. The purpose of these meetings was to collaboratively identify the sensitive resources, identify the study methodologies, define the ICE study area boundaries, and confirm the timeframe for the assessment. Minutes of these meetings are included in **Appendix A-7**.

7.1.1 DEFINITIONS

The following is a listing of definitions as accepted by the NCDOT in their *ICI Guidance*, which follow the Council on Environmental Quality (CEQ) definitions as well as the Code of Federal Regulations (40 CFR 1500-1508).

Direct Effect. Direct effects are caused by the proposed action and generally occur at the same time and place as the project. Direct effects of the proposed action are discussed in **Sections 3** through **6** of this Draft EIS and other subject-specific technical memoranda referenced throughout this Draft EIS.

Indirect Effect. Indirect effects “. . . are caused by the action and are later in time and farther removed in distance, but must be reasonably foreseeable.” Indirect effects “may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (CEQ 1986, 40 CFR 1508). The terms effect and effects are used synonymously in the CEQ regulations (see 40 CFR 1508.8(b)). It is important to emphasize that indirect effects considered during the National Environmental Policy Act (NEPA) process must be reasonably foreseeable; not every conceivable scenario should be evaluated.

Cumulative Effect. Cumulative effects are “environmental effects resulting from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such actions. Cumulative effects can result from individually minor, but collectively significant, activities taking place over time and over a broad geographic scale, and can include both direct and indirect effects” (40 CFR 1500 to 1508).

7.1.2 ANALYSIS SCENARIOS

The evaluation of indirect and cumulative effects for the No-Build Alternative and two parallel New Location Corridor Alternatives (which together form 16 end-to-end new location Detailed Study Alternatives [DSAs]) are summarized in this section of the Draft EIS. Descriptions of these scenarios follow:

No-Build Alternative. The No-Build Alternative is the baseline comparative alternative. The No-Build Alternative assumes that the transportation systems for Union and Mecklenburg Counties would evolve as currently planned in the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) *2030 Long Range Transportation Plan (2030 LRTP)*, but without major improvements to the existing US 74 corridor from near I-485 to between the towns of Wingate and Marshville.

Detailed Study Alternatives. There are 16 DSAs encompassed in two parallel corridors (**Figure 2-8a-c**). Please refer to **Section 2** for additional information regarding these alternatives. The DSAs include four lanes with a 70-foot grassed median and would be a controlled-access toll highway with nine or ten interchanges, depending upon the DSA. For the purposes of the ICE assessment, variations in the DSA corridors are so small that indirect impacts are not expected to vary by alternative. The slight variations in the interchange locations by alternative are not anticipated to affect the location of residential development. Commercial and industrial development may shift somewhat due to the variations in interchange locations; however, these variations should not affect the quantity or type of development that occurs.

An additional alternative, the Improve Existing US 74 Alternative, is included in the *Indirect and Cumulative Effects Assessment* (HNTB, January 2009). The Improve Existing US 74 Alternative would improve existing US 74 within the project limits. This alternative would include the conversion of existing US 74 to a six-lane controlled-access toll highway with two-

lane, one-way frontage roads on either side. There would be no offsite new location component to this alternative. The Improve Existing US 74 Alternative was eliminated from detailed study as part of the alternatives screening process (Sections 2.3 and 2.4.4.3) and is not a DSA, therefore it is not included in the summary below. It was included in the *Indirect and Cumulative Effects Assessment* as an analysis scenario for informational purposes at the request of the environmental resource and regulatory agencies.

7.2 STUDY AREA FOR INDIRECT AND CUMULATIVE EFFECTS (STEP 1)

Spatial and temporal study areas were established as a basis from which to gather and analyze specific demographic, socioeconomic, land use, and environmental data and to further identify any potential indirect and cumulative effects of the qualitative analysis scenarios.

7.2.1 FUTURE LAND USE STUDY AREA

The NCDOT *ICI Guidance* indicates that the development effects of a new or improved roadway facility are most often found up to one mile around an interchange, and up to two to five miles along major intersecting roadways to the interchange. Using the *ICI Guidance*, it was determined that the potential for indirect and cumulative effects would be felt within about five miles of the various project alignments. This approximate five-mile radius, referred to as the FLUSA, is depicted in **Figure 7-1**. It is the area within which the DSAs have the potential to influence land use changes.

Based on a field survey of local conditions, interviews with local officials, and professional judgment, this area was determined large enough to encompass potential indirect and cumulative effects resulting from the analysis scenarios.

In order to better discuss specific areas within the FLUSA that are most likely to experience land use changes, the FLUSA was divided into five zones, shown in **Figure 7-1** and described below. The zone boundaries follow major roadway features as well as political boundaries to account for differences in existing and planned land uses, and among policies of the various units of government in the FLUSA.

- **Zone 1:** Portion of the FLUSA within Mecklenburg County; including the towns of Mint Hill and Matthews.
- **Zone 2:** North central areas of the FLUSA roughly north of Idlewild Road (SR 1501); including the Union County portion of the Goose Creek Watershed (excluding areas within the Town of Stallings jurisdiction); northern portions of the towns of Hemby Bridge and Indian Trail; and incorporated areas of the towns of Fairview and Unionville within the FLUSA.
- **Zone 3:** Areas of the FLUSA in Union County along US 74, bounded by Idlewild Road (SR 1501) to the north and Old Monroe Road/Old Charlotte Highway (SR 1009) to the south, areas within the Town of Stallings and all areas of the FLUSA within the City of Monroe. Zone 3 was extended north to include all areas within the Town of Stallings because the all areas of the town have the same planning and zoning ordinances. However, this zone does not include the entire Town of Indian Trail, because Indian Trail

has different planning guidelines for its northern areas that are within the Goose Creek watershed. This northern portion of Indian Trail is more similar in zoning and regulation to other localities, such as Unionville and Fairview, and was therefore included in Zone 2.

- **Zone 4:** Southwest area of the FLUSA in Union County, including portions of the towns of Stallings, Indian Trail, Weddington, and Wesley Chapel south of Old Monroe Road/Old Charlotte Highway (SR 1009) and west of Monroe Regional Airport.
- **Zone 5:** Eastern portion of the FLUSA, including areas east of NC 200 and the City of Monroe, and including unincorporated portions of Union County and the towns of Wingate and Marshville.

For purposes of evaluating potential indirect impacts on federally-protected species (particularly the Carolina heelsplitter mussel) and cumulative effects on Carolina heelsplitter habitat, the study area was expanded for this analysis to include all of the Goose Creek and Duck Creek watersheds (**Figure 7-2**). These watersheds provide habitat and include designated critical habitat for the federally-endangered Carolina heelsplitter. Including the Goose Creek and Duck Creek watersheds was suggested during scoping meetings held with representatives of environmental resource and regulatory agencies to determine the study and methodologies.

7.2.2 TIMEFRAME FOR ANALYSIS

According to the NCDOT *ICI Guidance*, the timeframe for analysis should be short enough in duration to anticipate reasonably foreseeable events, but should be long enough in duration to capture the development and relocation effects that may only transpire over the course of several years.

The planning design life of a project (from conception to completion) is usually around 20 years. This is also the time horizon used in most metropolitan planning organization and county-level planning forecasts, including the MUMPO *2030 LRTP*. In addition, population projections from the North Carolina Office of State Budget and Management are available through year 2030. Although the design year for the Monroe Connector/Bypass project is 2035, effects related to land use change as a result of the Monroe Connector/Bypass were qualitatively evaluated through 2030, since the current LRTP and population projections are based on year 2030. For purposes of the cumulative impacts analysis, which includes consideration of past actions, the timeframe includes trends from 1980 through the present, in addition to projections through 2030. 1980 was selected as the beginning timeframe for analysis because population growth and development in the FLUSA began to increase steadily at that time and has continued through the 1980s, 1990s, and 2000s.

7.3 STUDY AREA DIRECTIONS AND GOALS (STEP 2)

The majority of the FLUSA is within Union County, with a small portion extending into Mecklenburg County near I-485. Union County is bordered by Anson County to the east, Stanly and Cabarrus counties to the north, Mecklenburg County to the west, and the State of South Carolina to the south. As shown in **Figure 7-1**, the following municipalities are located partly or entirely within the FLUSA:

- Charlotte (Mecklenburg County)
- Matthews (Mecklenburg County)
- Mint Hill (Mecklenburg County)
- Weddington (Union County)
- Wesley Chapel (Union County)
- Indian Trail (Union County)
- Stallings (Union County)
- Hemby Bridge (Union County)
- Lake Park (Union County)
- Fairview (Union County)
- Unionville (Union County)
- Monroe (Union County)
- Wingate (Union County)
- Marshville (Union County)

7.3.1 DEMOGRAPHIC AND EMPLOYMENT TRENDS

Union County and Mecklenburg County experienced rapid population growth between 1980 and 2000 (75.6 percent, and 72.0 percent growth, respectively). Population growth in both counties is expected to continue through 2030. Growth rates between 2000 and 2010 are projected to be 67.8 percent for Union County and 34.7 percent for Mecklenburg County. Between 2010 and 2020, the populations are expected to grow 42.1 percent in Union County and 26.9 percent in Mecklenburg County. From 2020 to 2030, these rates are projected to be 32.1 percent for Union County and 22.6 percent for Mecklenburg County. In comparison, the State's population is expected to grow 14-18 percent during these same time periods (*County/State Population Projections*, NC Office of State Budget and Management Web site: www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/county_projections.shtm).

The North Carolina Employment Security Commission (NCESC) indicates that both Mecklenburg and Union counties experienced a greater overall increase in employment between 1990 and 2000, and again between 2000 and 2006, than North Carolina as a whole during the same periods of time. Healthcare and social assistance gained the most jobs of any industry sector. Although manufacturing had historically been the industry sector with the most employees, the government sector had the most employees in 2006.

7.3.2 LAND USE PATTERNS

Overall, the portion of the FLUSA west of US 601 is more developed than the portion east of US 601. The Mecklenburg County portion of the FLUSA (which is the entirety of Zone 1) is almost completely developed, with commercial and industrial uses concentrated along Independence Boulevard (US 74) and Old Monroe Road/Old Charlotte Highway (SR 1009), and residential uses elsewhere. In the Union County portion of the FLUSA, residential uses tend to be concentrated in the towns adjacent to the Mecklenburg County border (Weddington, Indian Trail, Stallings, Hemby Bridge and Lake Park), and in the vicinity of the DSAs between Mecklenburg County and US 601.

Neighborhoods are shown on **Figures 3-2a-c** of this Draft EIS. Several new subdivisions are located in the northwestern part of Union County, particularly in and around Stallings and Indian Trail. These new subdivisions include Bonterra Village, Fairhaven, Arbor Glen, and Lake Park. The unincorporated area east of US 601 is generally undeveloped, with scattered low-density residential and institutional uses throughout. The eastern part of Union County remains very active agriculturally.

Land uses along existing US 74 between I-485 and Marshville primarily include commercial and industrial businesses. Commercial and industrial uses also are concentrated in the Union West and Old Hickory Business Parks (shown on **Figure 3-2a**) along Indian Trail-Fairview Road (SR 1520) on the north side of US 74, and around the Monroe Regional Airport off of Old Monroe Road/Old Charlotte Highway (SR 1009).

7.3.3 LAND USE PLANS AND ORDINANCES

In order to determine FLUSA land use trends and goals, plans adopted by the local jurisdictions were reviewed and are summarized in the *Indirect and Cumulative Effects Assessment* (HNTB, March 2009). The level of planning varies among the jurisdictions in the FLUSA. For instance, Charlotte-Mecklenburg, Union County, and the City of Monroe all have adopted land use plans and zoning ordinances, as have the towns of Matthews, Mint Hill, Indian Trail, Weddington, Stallings, and the Village of Wesley Chapel. The towns of Unionville, Fairview, and Marshville have more basic land use plans prepared by the Centralina Council of Governments to establish goals for future land use decision-making. These towns also have some form of zoning regulation, such as an ordinance, zoning map, or both. A summary of local land use plans is included in **Section 3.3.1**.

7.3.4 ENVIRONMENTAL REGULATIONS

A complete list and description of environmental regulations and ordinances in the municipalities within the FLUSA can be found in the *Indirect and Cumulative Effects Assessment* (p. 35-39, HNTB, January 2009). The municipalities within Mecklenburg County have post-construction and stormwater ordinances to control the effects of stormwater runoff and non-point source pollution. Surface water improvement and management (SWIM) buffers have also been established along creeks in Charlotte, Mecklenburg County, Matthews, and Mint Hill. The Town of Mint Hill *Post-Construction Stormwater Ordinance* (June 30, 2007) also specifically indicates that areas within the Goose Creek Watershed require 100-foot undisturbed buffers on intermittent streams and 200-foot undisturbed buffers on perennial streams.

In Union County, the *Union County Stormwater Discharge and Quality Control Ordinance* requires countywide riparian buffers on all intermittent and perennial streams as follows:

- 30-foot buffers on intermittent streams
- 50-foot buffers on perennial streams, including a 30-foot buffer in the “streamside zone” and a 20-foot buffer in the “upland zone”
- 100-foot buffers for perennial streams with drainage areas greater than 640 acres, including a 50-foot buffer in the “streamside zone” and a 50-foot buffer in the “upland zone”

In addition, the ordinance requires greater riparian buffers on all intermittent and perennial streams in the Duck Creek, Goose Creek, and Waxhaw Creek watersheds; including 100-foot buffers on all intermittent streams and 200-foot buffers on all perennial streams. The towns of Fairview, Unionville, and Marshville adhere to this ordinance. Watershed boundaries are shown on **Figure 7-2**.

The City of Monroe requires a 100-foot vegetated buffer on all perennial streams in the city limits, and Wingate restricts development within 20 feet of stream banks. The towns of Indian Trail and Stallings have individual post-construction stormwater ordinances. Indian Trail's ordinance requires 100-foot buffers on intermittent streams and 200-foot buffers on perennial streams. Stallings' ordinance requires 30-foot buffers along intermittent and perennial streams.

7.4 INVENTORY OF NOTABLE FEATURES (STEP 3)

Notable features is a broad term that describes characteristics of the environment that society seeks protect, emphasizing characteristics such as 1) recovery time from disturbance/ destruction, 2) sensitivity to disruption, and 3) vulnerability to changes directly, indirectly, or cumulatively induced by a project (NCDOT *ICI Guidance*).

Based on upon an analysis of the data collected and discussions with environmental resource and regulatory agencies and local experts, the important features that may experience indirect and cumulative effects were identified as: federally-protected species, water resources, cultural resources, prime farmland soils, and terrestrial habitat. Brief summaries of these features are provided below. The direct impacts of the DSAs on these notable features and other resources, including regional air quality conformity (**Section 4.2.5.1**), are addressed in **Sections 3 to 6** of this Draft EIS. **Table S-2** in the **Summary** of this Draft EIS is a summary of all direct environmental impacts.

7.4.1 WATER RESOURCES

The FLUSA is intersected by two major river basins, the Catawba (sub-basins 03-08-34 and 03-08-38) and the Yadkin-Pee Dee (sub-basins 03-07-12 and 03-07-14). Principal streams (named streams on USGS 7.5-minute topographic maps) within the Catawba River Basin portion of the FLUSA are Fourmile Creek, McAlpine Creek, and Sixmile Creek. Named streams within the Yadkin-Pee Dee River Basin portion of the FLUSA include the North Fork Crooked Creek, South Fork Crooked Creek, Crooked Creek, Stewarts Creek, East Fork Stewarts Creek, Goose Creek, and Richardson Creek. These streams also have numerous unnamed tributaries. Additional information on water resources in the project study area can be found in **Section 6.2**.

Water Supply Watersheds. A Class III water supply watershed (Stewarts Creek/Lake Twitty watershed) and a Class IV water supply watershed (Richardson Creek/Lake Lee watershed) encroach on the FLUSA. These are described in more detail in **Section 6.2.1.2** and shown on **Figures 4-4a-c** of this Draft EIS.

303(d) List of Impaired Waters. The 2008 Draft 303(d) list also is available. According to the NCDENR-DWQ 2008 Draft 303(d) List (NCDENR-DWQ Web site: <http://h2o.enr.state.nc.us/tmdl/documents/B.Draft2008303dList.pdf>), the following streams in the FLUSA are impaired:

- Richardson Creek – from 0.2 miles downstream of the mouth of Beaverdam Creek to the Monroe Water Supply Dam (2.5 miles) and from Lake Lee to Watson Creek (13.1 miles) due to chlorophyll a and turbidity
- Lanes Creek – from its source to Rocky River (54.5 miles) due to poor biological integrity

- South Fork Crooked Creek – from its source to Crooked Creek (14.4 miles) for impaired biological integrity
- North Fork Crooked Creek – from its source to Crooked Creek (12 miles) for turbidity and impaired biological integrity
- Goose Creek – from SR 1524 to Rocky River (13.1 miles) for impaired biological integrity
- Stewarts Creek (Lake Twitty) – from a point 0.4 mile downstream of mouth of Stumplick Branch to SR 1681 (City of Monroe water supply intake due to chlorophyll a).

Streams listed on the 2006 *Final North Carolina 303(d) List* are discussed in Draft EIS Section 6.2.2.1.

7.4.2 TERRESTRIAL HABITAT

Seven terrestrial communities were identified within the FLUSA: urban/disturbed, mesic mixed hardwood forest, basic mesic forest, pine forest, piedmont/low mountain alluvial forest, agriculturally maintained, and successional/agriculturally unmaintained. **Figure 6-1** shows the location and extent of identified terrestrial communities within the DSAs. A brief description of each community type is included in **Section 6.3.1**.

7.4.3 FEDERALLY PROTECTED SPECIES

Four species with federal protection under the Endangered Species Act (ESA) of 1973 are considered by the USFWS to have ranges extending into Mecklenburg and Union counties. **Table 6-5** lists the ESA-protected species, which include the Carolina heelsplitter (*Lasmigona decorata*) (a freshwater mussel), Schweinitz's sunflower (*Helianthus schweinitzii*), smooth coneflower (*Echinacea laevigata*), and Michaux's sumac (*Rhus michauxii*).

As discussed in **Section 6.5.4**, surveys for Schweinitz's sunflower, smooth coneflower, and Michaux's sumac identified two populations of Schweinitz's sunflower within the project study area that lie within Zone 3 of the FLUSA. No specimens of Michaux's sumac or smooth coneflower were identified during the field studies. Habitat for these three species may be found throughout the FLUSA. Additionally, two of the six known populations of the Carolina heelsplitter are in Union County – in the Waxhaw Creek watershed south of the FLUSA and in the Goose Creek watershed within Zone 2 of the FLUSA.

Local planners and environmental agencies have also indicated that the Carolina darter fish (*Etheostoma collis*) and several other mussels, including Savannah lilliput (*Toxolasma pullus*), Atlantic pigtoe (*Fusconaia masoni*) and Carolina creekshell (*Villosa vaughaniana*), are federal species of concern that have been documented in South Fork Crooked Creek and North Fork Crooked Creek within Zone 3 of the FLUSA.

7.4.4 CULTURAL RESOURCES

The William Bivens House (FLUSA Zone 5), Perry-McIntyre House (FLUSA Zone 5), Secrest Farm (FLUSA Zone 3), and Hiram Secrest House (FLUSA Zone 3) are within the Area of Potential Effects for the DSAs. These are discussed in more detail in **Section 5.2.1.2**.

7.4.5 PRIME FARMLAND SOILS

Prime farmland soils are discussed in **Section 4.3.2** and shown on **Figure 4-2**. Most of these soils are located in three primary areas: the Mecklenburg County portion of the FLUSA (Zone 1), just west of the City of Monroe (Zone 3), and scattered along US 601 and NC 200 north of US 74 (Zone 5).

7.5 IDENTIFICATION OF IMPORTANT IMPACT-CAUSING ACTIVITIES (STEP 4)

Impact-causing activities in the FLUSA may result from implementation of one of the analysis scenarios for this project, as well as from other unrelated projects. These may include other existing or proposed transportation projects or other public or private development projects (infrastructure, residential, commercial, or industrial) that may cumulatively affect notable features.

A transportation project may involve a number of impact-causing activities such as construction impacts, induced growth, changes in traffic patterns, access alterations, and conversion of land from its existing use to transportation use.

7.5.1 RECENT AND PROPOSED DEVELOPMENT ACTIVITY AND TRANSPORTATION PROJECTS

To determine the extent of recent and proposed development activity with the FLUSA, representatives of each of the governmental bodies that comprise the FLUSA were interviewed. The following is a summary of planned and/or proposed development activity and transportation projects. Reasonably foreseeable transportation projects in the study area were assumed to be those in the MUMPO 2030 LRTP and those in the NCDOT 2009-2015 STIP. These activities and representative lists of transportation projects are discussed below by zone.

Zone 1. The Mecklenburg County portion of the FLUSA is almost completely developed, with commercial and industrial uses concentrated along US 74 and Old Monroe Road/Old Charlotte Highway (SR 1009), and residential uses elsewhere. Additional development, including the proposed Matthews Sportsplex, would likely be concentrated in the vicinity of the existing I-485/US 74 interchange. The NCDOT has numerous transportation projects planned in this area, the most notable being a new interchange at I-485 and Weddington Road (STIP Project R-211EC) scheduled for completion in 2011.

- The Levine Campus of Central Piedmont Community College (CPCC) is located in the southwest quadrant of the interchange at I-485 and US 74. The campus currently serves over 11,000 students, and local planners indicate that this facility is quickly expanding. The campus has also recently expanded with a second phase of classroom space and the addition of the 35,000 square foot Center for Automotive Technology.
- Hendrick Automotive Group has received approval from the Town of Matthews for an automall which can accommodate up to 16 auto dealerships on a parcel of land adjacent to the CPCC campus in the southwest quadrant of the interchange at I-485 and US 74. The parcel spans the Mecklenburg/Union County line.

- Presbyterian Hospital Matthews, which opened in 1994, continues to influence development along the NC 51 corridor, bringing additional medical offices to the area.
- The Bridges at Mint Hill, an open-air retail center, is under development near the interchange at I-485 and Lawyers Road (SR 3128) in the Town of Mint Hill. The development is proposed to have a total of 1.3 million square feet of retail and is bisected by Goose Creek.
- The Town of Matthews and Mecklenburg County are planning for a 160-acre Sportsplex in the southwest quadrant of the I-485/US 74 interchange. The park will contain a cluster of soccer and multi-use fields and a stadium, with necessary accessory uses as on-site parking, walking trails and greenways connecting fields and around the perimeter, picnic shelters, playgrounds, concession and restroom facilities, and a maintenance station. Buffers are being incorporated along creeks on the property.
- NCDOT is planning for a new interchange on I-485. The I-485 Interchange at Weddington Road (STIP Project R-0211) includes the proposed construction of a half-clover interchange to improve access to I-485 from Weddington Road and surrounding communities in Weddington, Matthews, and Charlotte. The new access would also redistribute some of the traffic at adjacent I-485 interchanges at Providence Road and John Street. Some widening of Weddington Road west of I-485 to five lanes would also be included. Construction is scheduled to begin in 2011.
- NCDOT is conducting a widening project on Weddington Road (U-5025). Weddington Road will be widened from Trade Street to Plantation Drive to three lanes. The project is expected to be complete in early 2009.
- Other examples of transportation projects include:
 - Extension of McKee Road from Pleasant Plans to US 74 in Union County, with some funding in 2013.
 - Widening of South Trade Street and Fullwood Lane by the Town of Matthews.
 - Conversion of US 74 to an expressway/freeway from uptown Charlotte to I-485 (STIP Project U-2509).
 - Completion of a parallel collector road system for US 74, which would connect the existing pieces of Independence Pointe Parkway and Northeast parkway to the Mecklenburg County line.
 - Extension of Sardis Road North as the Eastern Circumferential Road.
 - Rapid transit line to be a separate dedicated pavement running generally adjacent to Independence Pointe Parkway through the Town of Matthews with stations at 1) the current park-and-ride lot near Sam Newell Road, 2) near NC 51, 3) in the Family Entertainment District, and 4) a final stop with substantial park-and-ride facilities for Union County commuters near CPCC Levine campus.

Zone 2. In Zone 2, there are no major recent or planned projects due to environmental restrictions and poor soil suitability. There is a proposed STIP project (U-4913) to widen Idlewild Road (SR 1501) from I-485 to Stevens Mill Road (SR 1524) to multi-lanes. This project is currently unfunded.

Zone 3. Residential and complementary commercial development has increased in Zone 3 over the past twenty years as a result of the availability of affordable land and proximity to

employment centers in Charlotte and Mecklenburg County, particularly in the Union County border towns of Stallings and Indian Trail. However, Zone 3 still has considerable land available for development/redevelopment that is primarily zoned for residential, office, retail and industrial. Localities in this area are generally encouraging commercial development to provide services and employment opportunities for residents.

- Town of Stallings shows 10 percent (570 acres) of its total land (5,667 acres) as redevelopable, most zoned for office or retail uses. Also, just over 35 percent (1,998 acres) is currently undeveloped with just over half (1,076 acres) zoned for residential and most of the rest zoned for office and retail uses. Areas within the Town of Stallings jurisdiction north of Idlewild Road (Goose Creek watershed) are already largely built out, and undeveloped areas are programmed for traditional residential development, with the exception of the area near the interchange of I-485 and Idlewild Road (SR 1501), where commercial and retail development has occurred in the past few years and is expected to continue.
- Old Hickory Business Park in Indian Trail currently has 52 acres developed with an additional 173 undeveloped acres remaining.
- Wal-Mart has proposed a 205,000-square foot super center at US 74 and Stouts-Indian Trail Road.
- Town of Indian Trail is proposing 140,000 square feet of retail space in its Town Center area on Indian Trail Road south of US 74.
- Indian Trail planners indicate that 3,800 homes have been approved for development, but they are not built yet because of utility constraints.
- The Town of Indian Trail estimates build out of approved residential subdivisions by 2015 to be 7,868 additional housing units. Indian Trail build out – 38,700 dwelling units, comprised of 6.6 percent low density (1 dwelling unit/2 acres), 50% medium density (3 dwelling units/acre), 19.4 percent high density (5 dwelling units/acre), and 24% multi-family (12 dwelling units/acre).
- Stinson-Hartis Corridor – Town of Indian Trail planning for this to become a mixed-used area and employment center with residential, office, industrial, and retail uses. Planning for 6.3 million square feet of commercial space, housing and nearly 14,000 jobs at build out. Mixture of medium density, high density, and multi-family residential with a potential future population of 2,900 people.
- Aerospace industries are being established near the Monroe Regional Airport, and the runway is being extended here as well. Monroe planners indicate that the airport area is a vibrant and vital employment center for the city.
- Examples of other transportation projects in this zone include:
 - o McKee Road connection to US 74 and possible future extension north of US 74.
 - o Stallings Road (SR 1365) widening from Old Monroe Road/Old Charlotte Highway (SR 1009) to US 74 to multi-lanes (STIP Project U-3825).
 - o Indian Trail-Fairview Road (SR 1008) widening from Old Monroe Road/Old Charlotte Highway (SR 1009) to US 74 to multi-lanes (STIP Project U-3809).

- o Old Monroe Road/Old Charlotte Highway (SR 1009) widening from Trade Street (SR 3448/SR 3474) to Wesley Chapel-Stouts Road (SR 1377) to multi-lanes (STIP Project U-4714).
- o Completion of Martin Luther King, Jr. Boulevard (SR 1223) from NC 200 to Charlotte Avenue (SR 1009) in Monroe (STIP Project U-3412).
- o US 601 widening from US 74 to the proposed Monroe Connector/Bypass to multi-lanes and improvements to the US 601/US 74 interchange (STIP Project U-4024).
- o Charles Street (SR 2188) widening from Sunset Drive (SR 2181) to Franklin Street (SR 2100) to multi-lanes (STIP Project U-2547).
- o Construction of Monroe Northern Loop on new location from US 74 to Walkup Avenue (SR 1751) at Bivens Road (SR 1763) (STIP Project U-2549).
- o Construction of Secrest Avenue Extension from Walkup Avenue (SR 1751) to Olive Branch Road (SR 1008) on new location with possible interchange with proposed Monroe Connector/Bypass (STIP Project U-3619).
- o Charlotte Avenue (SR 1009) widening to multi-lanes from the railroad to Concord Avenue (STIP Project U-0213).

Zone 4. As in Zone 3, residential growth has been very strong over the past few decades as people working in Charlotte and Mecklenburg County look for more affordable, suburban neighborhoods like Weddington and Wesley Chapel. Some continued residential development is anticipated for Zone 4.

- Wesley Chapel – Though mostly outside of the FLUSA, the Village of Wesley Chapel is estimating up to 2,600 additional homes by 2030 in the Village and its ETJ.

Zone 5. In Zone 5, growth has been slower than in areas of Union County further west. Anticipated development in Zone 5 is primarily residential, with the exception of the Carolinas Medical Center-Union and recently-proposed Legacy Park commercial development. Lack of water and sewer availability is a driving force for the location and rate of development in Union County.

- Carolinas Medical Center-Union recently announced the expansion of its Emergency Department from 11,500 square feet to 34,700 square feet, with construction expected to be complete by 2010. The Emergency Department currently treats more than 45,000 patients per year, and by 2015, the number of emergency room visits is projected to exceed 65,000.
- Two subdivisions in Wingate are under construction – Glencross and Noble Oaks, which will have 201 and 177 units, respectively, when complete. Town planners note that anticipation of the Monroe Connector/Bypass contributed to the development of these subdivisions.
- 74X CATS Express Bus Service to Marshville.
- Union County Partnership for Progress recently announced plans for a 5,000-acre business-industrial-educational park – to be called Legacy Park – north of US 74 in Wingate. Plans are preliminary, but the group estimates the project would be built over 30 years or more, could employ up to 20,000 workers, and bring \$2.3 billion in investment to the area.

- Examples of other transportation projects in this zone include:
 - o Upgrading US 74 to freeway standards with a bypass of Wadesboro from the Monroe Bypass to the Rockingham Bypass (STIP Project R-4441).
 - o US 601 widening from the South Carolina state line to US 74 in Monroe to multi-lanes (STIP Project R-2616).

7.5.2 WATER AND SEWER AVAILABILITY AND ALLOCATION

Water and sewer service are provided for all incorporated areas along US 74. Service is not widely available in Zone 5 of the FLUSA, other than in the municipalities of Wingate and Marshville. Union County has a total water treatment capacity of 20 million gallons per day (MGD) from two water treatment plants and a total wastewater treatment capacity of 8.1 MGD from five wastewater treatment plants.

Provision of water and sewer service for most of the FLUSA, particularly Union County, is constrained, and will continue to be an impediment to future development and transportation projects. Union County adopted a water allocation policy in October 2008 and is currently evaluating options to increase treatment capacity.

7.6 IDENTIFICATION AND ANALYSIS OF POTENTIAL INDIRECT IMPACTS (STEP 5)

The magnitude of change in land use between the No-Build Alternative and DSAs analysis scenarios is discussed below. The potential for project-induced and land use changes is described as low, moderate, or high. Additional detailed discussion on these impacts is included in the *Indirect and Cumulative Effects Assessment* (p. 51-56, HNTB, January 2009).

7.6.1 NO-BUILD ALTERNATIVE

If the Monroe Connector/Bypass is not constructed, land use patterns would likely continue as they are currently. Growth and development are prevalent in Mecklenburg County and western portions of Union County due to their proximity to Charlotte, the economic and employment hub of the region. The eastern portion of Union County would remain undeveloped due to its distance and travel times to and from Charlotte.

Zone 1. The proximity to Charlotte and I-485 would continue to drive development in this area, attracting additional residential, commercial, and retail development and redevelopment to the extent possible. This zone is already highly developed.

Zone 2. This area is much less intensely developed than other areas of the FLUSA, and local land use plans indicate a desire to maintain the rural character of the area. Development would likely continue to be primarily low density residential and would occur at a slow rate. Localities in this area have a history of resisting unwanted development, including commercial development along US 601, and it is expected that this would continue with the No-Build Alternative.

Zone 3. Complementary retail development has been built along the US 74 corridor to serve the residential growth that has occurred over the years. With the No-Build Alternative, these patterns are likely to continue, with additional residential development occurring in Stallings and Indian Trail, subject to availability of water and sewer service, and retail, commercial, and industrial development occurring along major road corridors, including US 74, Old Monroe Road/Old Charlotte Highway (SR 1009), and US 601 in the City of Monroe.

Interviews with planners in the City of Monroe and Union County indicate that their jurisdictions would like to encourage additional commercial and light industrial development to increase their tax bases. The City of Monroe, in particular, indicated that they are not promoting additional residential development within their jurisdiction, but are focusing on attracting industrial development in the Monroe Corporate Center and AeroPointe Industrial Centre industrial parks near the Monroe Regional Airport. In fact, Monroe and Union County have economic development incentive grants to encourage the location of new businesses and expansion of existing businesses within their jurisdictions. These include offering property tax based economic development incentives or cash payments to companies that commit to investing capital and creating full-time jobs.

Zone 4. Development in this area is influenced by proximity to I-485 and Charlotte. Therefore, under the No-Build Alternative, recent growth patterns of primarily residential development would likely continue.

Zone 5. The eastern part of Union County remains more rural in character than areas farther west. The lack of available water and sewer service in this area is a limiting factor to commercial and residential development. With the No-Build Alternative, this area would see the current mainly rural land use and growth patterns continue. This area would experience little growth in residential, commercial, or industrial uses.

The distance and travel times to and from Charlotte and the lack of accessibility due to traffic congestion on US 74 have not made the Zone 5 area as attractive for residential development for commuters, and the area has not experienced high rates of residential development that other parts of Union County have seen. Planners indicated that with the No-Build Alternative, population in this area could actually decline.

7.6.2 DETAILED STUDY ALTERNATIVES

The DSAs would improve overall mobility and accessibility in the US 74 corridor by providing an additional transportation corridor between I-485 and US 74 just west of Marshville. The project would provide an alternative to using existing US 74 and the local street network, and would provide a high-speed regional facility to facilitate east-west travel in Union County. The DSAs would provide direct access between eastern Union County and I-485 and the Charlotte-Mecklenburg County urban area employment center, as well as provide improved regional connectivity between Charlotte and eastern North Carolina, including Wilmington.

Table 7-1 summarizes the potential for indirect impacts from the DSAs to occur in each FLUSA zone. Locations of the DSA are close enough together such that indirect impacts are not expected to vary substantially by DSA. The slight variations in the interchange locations by alternative are not anticipated to affect the location of residential development. Commercial and industrial

development may shift somewhat due to the variations in interchange locations; however, these variations should not affect the quantity, type, or rate of development that occurs.

The potential for indirect impacts were qualitatively described as “None,” “Low,” “Moderate,” or “High” for the potential for improved access and mobility, potential for accelerated growth as a result of the project, and the potential for indirect effects on sensitive resources as a result of accelerated growth. The criteria used to assign these descriptors are generally as follows:

- None – there would be no change from current or expected future No-Build conditions
- Low – there would be some change from current or expected future No-Build condition, but the change would be minor and likely not noticeable
- Moderate – there would be a noticeable change from current or expected future No-Build conditions
- High – there would be a substantial change from current or expected future No-Build conditions

TABLE 7-1: Summary of Potential Indirect Impacts by Zone

Zone	Potential for improved access and mobility	Potential for accelerated growth as a result of the project	Potential for indirect effects on sensitive resources as a result of accelerated growth
1	None	None	None
2	Moderate	Low	Low
3	Moderate	Moderate	Moderate
4	None	None	None
5	High	High	Moderate

Zone 1. Existing growth and development patterns are not expected to change substantially, as these areas are already mostly developed. The project would not provide increased accessibility or mobility in Mecklenburg County. Construction of any of the DSAs would likely result in no change from the No-Build Alternative.

Zone 2. Although the DSAs would not be located directly within this area, they would improve accessibility between this area and the Charlotte-Mecklenburg County area by adding access to a high-speed freeway via interchanges in proximity to this zone (Unionville-Indian Trail Road [SR 1367] and US 601). However, sensitive environmental resources, development regulations, lack of water and sewer service, unsuitable soils for development, and a strong local interest in preserving the area’s rural character should help minimize the potential for induced development related to this project. Therefore, the DSAs would be expected to have a low potential for accelerated growth and low potential for causing indirect impacts to sensitive resources. Localities in this area are enforcing buffers along perennial and intermittent streams, and

Goose Creek Rules

The Goose Creek watershed in the Yadkin Pee-Dee River Basin provides habitat for the Carolina heelsplitter, a federally-endangered aquatic species. Management of streamside zones in the watershed to stabilize streambanks and prevent sedimentation is critical to restore water quality to sustain and enable recovery of the Carolina heelsplitter. The Goose Creek Rules (15A NCAC 2B.0600-.0609) implement site-specific management strategies to control stormwater and wastewater discharges, control toxicity to streams, and maintain riparian buffers.

the Goose Creek Rules (NCDENR-DWQ Web site:

<http://h2o.enr.state.nc.us/csu/GooseCreek.html>) strengthen these regulations and further reduce the potential for indirect impacts to water quality and federally-protected species.

Zone 3. The DSAs would enhance access to Charlotte by providing a high-speed freeway in this zone with access to I-485. In addition, mobility throughout the area would be improved by diverting traffic off of local roads, particularly US 74, onto the new facility. It is likely that additional residential development would occur in the towns of Stallings and Indian Trail, subject to availability of water/sewer service. Additional retail, commercial, and industrial development would be likely near the planned interchanges and along intersecting roadways. There would be moderate potential for accelerated growth and indirect impacts as a result of the DSAs in this area.

Zone 4. There would be no change in this area compared to the No-Build Alternative due to the distance (minimum 2.62 miles) between this zone and the DSAs.

Zone 5. The DSAs would be expected to have the greatest influence on development in this area due to the improved access to the Charlotte-Mecklenburg County area. The travel time savings are expected to exceed 20 minutes in 2030. This, coupled with the availability of affordable land, would make this area very attractive for residential development, especially where water and sewer service is available. There would be high potential for accelerated growth and moderate potential for indirect impacts to sensitive resources as a result of accelerated growth in this area. This could include impacts to prime farmland soils, water resources, and terrestrial habitat.

7.6.3 ANALYSIS OF INDIRECT IMPACTS TO NOTABLE FEATURES

Potential impacts to notable features associated with the indirect impacts of the project, including land use changes and induced growth, for each analysis scenario are summarized in **Table 7-2**. Additional detailed discussion on this analysis is included in the *Indirect and Cumulative Effects Assessment* (p. 58-64, HNTB, January 2009). The potential for indirect impacts should be minimized as most of the municipalities and Union County have land use plans and ordinances (including post-construction and stormwater ordinances) in place to control the type and density of development.

TABLE 7-2: Indirect Impacts to Notable Features

Notable Features	No-Build Alternative	DSAs
Water Resources	Continued degradation of water quality due to ongoing growth; enforcement of stormwater management plans and best management practices at the local level will help to minimize these impacts.	Zones 1 and 4 – continued degradation of water quality due to existing development. Zones 2, 3, and 5 – induced growth would contribute to increased impervious area, non-point source runoff, and reduction of riparian buffers.
Terrestrial Communities	<i>Indirect impacts can result in loss of habitat or habitat fragmentation, which occurs when large, contiguous forests are divided into smaller patches by urbanization, roads, and agriculture.</i>	
	Continued growth would result in further loss of wildlife habitat and fragmentation of forested areas.	Potential to indirectly affect terrestrial communities through fragmentation, which would be the result of road construction and induced land use change.
Federally-Protected Species	<i>Indirect impacts can result in modification of existing habitat or creation of new habitat for threatened and endangered species.</i>	
Michaux's sumac	Continued development could modify existing habitat or create new habitat.	May create new habitat areas along side of proposed roadway or other roadways in association with induced growth.

TABLE 7-2: Indirect Impacts to Notable Features

Notable Features	No-Build Alternative	DSAs
Smooth coneflower	Continued development could modify existing habitat or create new habitat.	May create new habitat areas along side of proposed roadway or other roadways in association with induced growth.
Schweinitz's sunflower	Continued development could modify existing habitat or create new habitat.	May indirectly modify existing habitat through land use change and/or may create new habitat areas along the side of the proposed roadway or other roadways in association with anticipated growth and development in Zone 3.
Carolina heelsplitter	Continued development could modify existing habitat in Goose and Duck Creek watersheds.	Low potential for induced growth in Goose and Duck Creek watersheds could have indirect impact on water quality and heelsplitter habitat.
Cultural Resources	<i>Indirect impacts can affect historic sites by altering surrounding land uses and viewsheds or creating pressure to convert historic property to another use.</i>	
Secrest Farm and Hiram Secrest House	Development along Secrest Shortcut Rd (SR 1501) and Rocky River Rd (SR 1514) could indirectly impact properties.	Because current growth rates in Zone 3 are already high, the potential for indirect impacts is low to moderate and the DSAs were determined to have No Adverse Effect on these properties.
William Bivens House	Could be indirectly impacted by continued residential development in Zone 5.	Could be indirectly impacted by continued and induced residential development in Zone 5; however, lack of an interchange on Monroe Ansonville Road would minimize indirect impacts from the project.
Perry McIntyre Farm	Could be indirectly impacted by continued residential development in Zone 5.	Could be indirectly impacted by continued residential development in Zone 5.

Source: *Indirect and Cumulative Effects Assessment* (HNTB, January 2009).

7.7 IDENTIFICATION AND ANALYSIS OF POTENTIAL CUMULATIVE EFFECTS (STEP 5)

Direct impacts of the project would contribute to cumulative effects on notable features and other resources in the project study area and FLUSA. The potential direct impacts of the project are discussed in **Sections 3** through **6** of this Draft EIS. Scoping meetings were held with environmental resource and regulatory agencies, including US Environmental Protection Agency, US Army Corps of Engineers, USFWS, NCDENR-DWQ, and NC Wildlife Resources Commission prior to the start of the *Indirect and Cumulative Effects Assessment* to identify resources of concern that should be evaluated in detail for potential cumulative effects. Minutes of these meetings are included in **Appendix A-7**. Based on these meetings, the following resources were identified as resources to be evaluated from a cumulative effects perspective:

- water quality and aquatic habitat
- Carolina heelsplitter habitat (Goose Creek and Duck Creek Watersheds)
- terrestrial communities and habitat

Impact-causing activities in the FLUSA that contribute to cumulative effects may result from implementation of one of the analysis scenarios for this project, as well as from other projects unrelated to this project. These may include other existing or proposed transportation projects or other public or private development projects (residential, commercial, or industrial) that may affect notable resources. These activities and projects are considered below in the cumulative effects analysis as the reasonably foreseeable actions in the FLUSA.

Effects associated with the DSAs could result from construction impacts, induced growth, changes in traffic patterns, access alterations, and conversion of land from its existing use to a transportation use. In addition, other recent and proposed development and transportation projects may contribute to cumulative effects. A listing of other reasonably foreseeable actions considered in this analysis is included in **Section 7.5.1** above.

7.7.1 WATER QUALITY AND AQUATIC HABITAT

Water quality information for the sub-basins crossed by the FLUSA is included in basinwide water quality plans for the Yadkin-Pee Dee River Basin and the Catawba River Basin prepared by NCDNR-DWQ (NCDENR-DWQ Web site: http://h2o.enr.state.nc.us/basinwide/basinwide_water_quality_plans.htm). The data show a trend of generally poor water quality throughout the FLUSA, with the number of stream miles listed as impaired continuing to increase as a result of stormwater runoff and non-point source pollution from surrounding development and agricultural land. The plans do indicate some improvements in isolated areas as local water quality protection measures and regulations are put into practice and take effect.

No-Build Alternative. Actions including residential and infrastructure improvements in Union County have the potential to cumulatively impact water quality through erosion and stream sedimentation. Increasing non-point source pollution associated with increasing impervious surfaces and land disturbing activities are anticipated with or without the construction of any of the DSAs.

Detailed Study Alternatives. The DSAs and associated growth and development in Zones 3 and 5 would increase the amount of soil disturbing activities, thus increasing the risk of stream sedimentation and turbidity from construction-related erosion. This impact is also possible in Zone 2, but to a lesser extent, as less development is expected to occur there. However, local sediment and erosion control regulations, post-construction and stormwater ordinances, and other water quality protection measures should help to minimize these effects. The delisting of some streams from the 303(d) list is evidence that these measures are showing some effectiveness.

7.7.2 CAROLINA HEELSPLITTER HABITAT (GOOSE CREEK AND DUCK CREEK WATERSHEDS)

Goose Creek watershed straddles the Mecklenburg/Union County line in the urbanizing Charlotte area, draining a variety of land uses, including residential, commercial and industrial developments, agriculture, and associated infrastructure. Duck Creek is a major tributary of Goose Creek and also contains potential habitat for the Carolina heelsplitter. Both creeks originate in eastern Mecklenburg County and flow east to the Rocky River in Union County, including portions of seven municipalities (Mecklenburg and Union counties, and the towns of Mint Hill, Indian Trail, Stallings, Fairview, and Hemby Bridge).

The Carolina heelsplitter is a freshwater mussel on the federally-endangered species list. There is a known population in the Goose Creek watershed. Portions of Goose Creek and Duck Creek are designated critical habitat for the heelsplitter, including approximately 4.5 miles of Goose Creek and 5.5 miles of Duck Creek. Information from USFWS and NCWRC indicate that populations of the mussel have been in decline, and that it has been eliminated from the majority

of its historical range. The decline in its populations has generally been attributed to degradation of habitat and water quality due to human activities such as development, agriculture, and forestry.

For purposes of evaluating potential cumulative effects on Carolina heelsplitter habitat, the study area for this assessment was expanded to include all of the Goose Creek and Duck Creek watersheds. This assessment involved data collection on past and current water quality, land use, and regulations, as well as an evaluation of ongoing trends and potential cumulative effects to these resources.

No-Build Alternative. Due to the proximity of the area to Charlotte and I-485, some residential growth is expected to continue to occur in the Goose Creek and Duck Creek watershed area that could contribute to impacts on water quality and Carolina heelsplitter habitat. However, local land use and water quality protection regulations should help minimize these effects.

Detailed Study Alternatives. The DSAs would have the potential to induce a low amount of additional development in the Goose Creek and Duck Creek watersheds, as these areas are north of the proposed DSAs. There are no direct impacts of the DSAs in these watersheds that would contribute to cumulative effects. Induced growth would be limited by land use regulations currently in place in these watersheds that promote low-density residential development, protect riparian buffers, and limit impervious area that have been put in place and enforced at the local level to help protect Goose Creek watershed. These regulations will help minimize cumulative effects on the watershed and heelsplitter habitat.

In addition, the DSAs may serve to shift growth and development demand away from the Goose Creek and Duck Creek watersheds compared to the No-Build Alternative by improving accessibility and reducing travel times for Zones 3 and 5, which are well outside these watersheds (Figure 7-1). As discussed in Section 7.6.2 and shown in Table 7-1, these two zones would have the most potential to experience accelerated growth as a result of the project.

7.7.3 TERRESTRIAL COMMUNITIES AND HABITAT

As shown in Table 7-3, estimates of land cover in Union County between 1984 and 2003 show a nearly 30 percent reduction in trees and an almost 64 percent increase in urban area.

TABLE 7-3: Land Cover in Union County

Land Cover	1984	2003	Change
Trees	163,019	114,954	-29.5%
Open Space	80,400	120,279	49.6%
Urban	4,645	12,778	175.1%
Water	1,130	1,181	4.5%
Total Acres		249,195	

Source: American Forests Web site: www.americanforests.org

In 2003, trees still covered nearly half (46.1 percent) of Union County, with another 48.3 percent considered open space or grass with scattered trees (including agricultural land). Approximately 5.1 percent of the County's land cover was classified as urban, up from 1.9 percent in 1984.

No-Build Alternative. Habitat loss is a result of agricultural conversion and urban and residential development. Development is expected to continue in Union County with the No Build Alternative, resulting in habitat loss and conversion of forest to urban and residential uses.

Detailed Study Alternatives. Construction of the DSAs has the potential to add to forest fragmentation and wildlife habitat disturbance, particularly in portions of eastern Union County where the project is anticipated to induce moderate additional growth. Cumulatively, there are several projects planned for Zones 1, 3, 4, and 5 which could add to this effect. There are few projects proposed in Zone 2, and the DSAs are not anticipated to have a substantial impact on that area; therefore, there are not expected to be cumulative effects on terrestrial habitat in Zone 2.

7.8 CONCLUSIONS

This section summarizes the conclusions of the indirect and cumulative effects analysis for this project. More detailed information is provided elsewhere in this chapter and in the *Indirect and Cumulative Effects Assessment* (HNTB, January 2009).

Union County is one of the fastest growing counties in the country according to the US Census Bureau. It is part of the Charlotte-Gastonia-Rock Hill NC-SC MSA, and Charlotte is the largest city in the Carolinas. The Monroe Connector/Bypass would improve mobility and accessibility along the US 74 corridor. According to local planners, there is a heightened awareness of the need to support controlled non-residential growth throughout most the municipalities and the County; however, most of the municipalities and Union County have land use plans and ordinances (including post-construction and stormwater ordinances) in place to control the type and density of development.

With respect to estimating the indirect impacts associated with this project, the research, interviews, and analysis suggest that growth is already occurring and would continue to occur within the majority of the FLUSA with or without construction of the project. Growth as an indirect impact of the construction of the DSAs would be governed through adherence to local zoning, subdivision, and comprehensive plans which would direct growth to appropriate areas and within acceptable densities.

7.8.1 POTENTIAL INDIRECT EFFECTS

If a DSA is constructed, residential development patterns are expected to continue at relatively the same pace and intensity as with the No-Build Alternative in the western and northwestern part of the FLUSA (Zones 1 and 4). These areas tend to be more influenced by proximity to Charlotte and I-485.

Residential growth would not be expected to increase substantially in Zone 2 as a result of the project as land use and environmental restrictions, lack of water/sewer service, unsuitable soils for development, and a local desire to maintain rural character are constraints to development in that area. Because of these constraints in Zone 2 and low expected indirect impacts, there would not be a discernable difference in land use change with or without the US 601 interchange with respect to indirect land use effects in the vicinity of Goose Creek.

Given the already strong residential growth in the area, the DSAs would not cause major shifts in population to the FLUSA, but could increase the pace of development in some parts of the FLUSA, particularly in Zones 3 and 5. Because the DSAs would noticeably improve travel time to Charlotte and provide increased accessibility, and in some areas new accessibility, they have the potential to encourage residential development along the intersecting roads to the interchange locations, as well as increased residential densities as compared to current plans. There is high potential for additional infill residential development in Zone 3, which has experienced high levels of residential growth in past years. Water and sewer service are likely to limit the pace of urban development, particularly in Zone 3, which has struggled to keep up with demand for these services over the past several years and only recently lifted a moratorium on development. It is likely that growth in this area may continue to occur in spurts as water and sewer capacity becomes available over the next several years. Construction of the project may influence the locations where this growth occurs.

There is also high potential for new residential growth in Zone 5, especially in areas where water and sewer service is available, where the DSAs would improve access and allow for easier and faster commutes to the Charlotte-Mecklenburg County urban area.

With the DSAs, it is also expected that some development would shift to land parcels in the vicinity of project interchanges as opposed to locating elsewhere in the FLUSA, depending on the provision of water and sewer service, which is one of the primary factors limiting growth in the area. The shift would occur to take advantage of the improved access and visibility that these parcels would have to the new freeway and the reduced commute times to the major employment center in the region.

The DSAs would not be expected to induce substantial land use changes or growth in Zone 2, which includes habitat for the federally-endangered Carolina heelsplitter. These alternatives would also have low (Zone 3) to moderate (Zone 5) potential for indirect impacts to other sensitive resources including water resources, farmland, and terrestrial communities.

It is anticipated that any indirect impacts that occur within the FLUSA would be in the form of complementary land development (such as highway-retail oriented businesses) surrounding the interchange locations, potential shifts of commercial development to more accessible and visible interchange locations, and residential and associated development in proximity to the new location facility or upgraded facility. Construction of this facility (as a New Location Alternative) has been anticipated for many decades, and it has been programmed into land use plans and other local regulations; in addition, local officials are targeting development for the major feeder roads in anticipation of the project.

7.8.2 POTENTIAL CUMULATIVE EFFECTS

Cumulative effects were evaluated for water quality and aquatic habitat, Carolina heelsplitter mussel habitat (including the Goose Creek and Duck Creek watersheds), and terrestrial habitat. Cumulative effects appear to be most likely in Zones 3 and 5, where there are higher potentials for induced growth.

The DSAs would likely contribute only minimally to cumulative effects on water quality and terrestrial habitat, because development that is affecting these resources is already occurring, and is expected to continue to occur. Union County and the project study area have experienced

rapid population growth since 1990. Between 1990 and 2007, the population of Union County more than doubled, increasing from 84,211 to 182,344. Growth in the county is expected to continue with population reaching nearly 275,000 by 2020 and more than 350,000 by 2030, according to estimates by the NC State Data Center. Much of this growth has been concentrated in the western portion of the county in the towns of Stallings, Indian Trail, and Weddington, and in the City of Monroe.

Local plans are in place and under development that will help minimize cumulative impacts to water quality. The DSAs are not expected to contribute to direct impacts or cumulative effects on the Carolina heelsplitter and Goose Creek and Duck Creek watersheds. In fact, the DSAs may serve to shift growth and development demand away from the Goose Creek and Duck Creek watersheds compared to the No-Build Alternative by improving accessibility and reducing travel times for Zones 3 and 5, which are well outside these watersheds (**Figure 7-1**).