# INDIRECT AND CUMULATIVE EFFECTS REPORT

**For**

**ADMINISTRATIVE ACTION**
**ENVIRONMENTAL IMPACT STATEMENT**

**Wake and Johnston Counties**

STIP Project Nos. R-2721, R-2828, and R-2829
State Project Nos. 6.401078, 6.401079, and 6.401080
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# EXECUTIVE SUMMARY

This Indirect and Cumulative Effects (ICE) assessment qualitatively evaluates the potential of the subject project to cause environmental effects as a result of induced growth, as well as the incremental impacts of the project when added to other past, present, or reasonably foreseeable public and private projects.

The North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), proposes transportation improvements in the project study area and surrounding region to address transportation needs as defined in the project's *Purpose and Need Statement* (Lochner, 2011). The focus of these improvements is a potential extension of the Triangle Expressway (NC 540) from NC 55 Bypass in Apex to the US 64/US 264 Bypass in Knightdale. This action is designated as three projects in the NCDOT 2009-2015 STIP: R-2721, R-2828, and R-2829. Together, these STIP projects would combine to complete the 540 Outer Loop around the Raleigh metropolitan area. The Complete 540 - Triangle Expressway Southeast Extension (540 Outer Loop) project is also included in the Capital Area Metropolitan Planning Organization (MPO) and Durham-Chapel Hill-Carrboro MPO joint *2035 Long Range Transportation Plan* (LRTP).

Based on the identified transportation needs, the purpose of the proposed action is to improve transportation mobility for trips within, or traveling through, the project study area during the peak travel period. A second purpose of the proposed action is to reduce forecast congestion on the existing roadway network within the project study area. Based on state and local plans, a desirable outcome of the project will be to improve system linkage in the roadway network in the project study area.

The Raleigh metropolitan area is a rapidly growing mid-sized city, surrounded by numerous small cities and towns. Many of the surrounding cities and towns retain distinctive identities. There is a notable, but diminishing, amount of rural land between these areas. The area is strongly characterized by travel in single occupancy vehicles, with limited options for alternative modes of transportation. Over 80 percent of residents of Wake and Johnston Counties commute to work by driving alone, according to 2010 data from the U.S. Census. Within southern and southeastern Wake County, there are limited alternatives for efficient local and long distance travel. For residents in rapidly growing areas of southern and southeastern Wake County and northern Johnston County, routes for travel to many of the region's major employment centers consist of unlimited access, primary and secondary roads with lower posted speed limits and frequent traffic signals.

**ICE Analysis Methods**

- A Future Land Use Study Area (FLUSA) was determined based on development and commuting patterns, the location of major transportation facilities, and natural features. The FLUSA boundary extends southward into northern Harnett County, such that the FLUSA also encompasses most of southern Wake County and a large portion of northern Johnston County.

- Because the current long range transportation plan and population projections are based on a 2035 horizon, the planning horizon used for this ICE analysis is also 2035. This planning horizon is generally consistent with other planning documents for jurisdictions in the study area.

- The NCDOT Indirect Land Use Effects Screening Tool was used to qualitatively evaluate nine factors that influence land development decisions.

- The NCDOT Indirect Scenario Assessment Tool was used to compare projected land use under the No-Build Alternative and under various Build Alternatives. To facilitate discussion of specific areas in the FLUSA that are most likely to experience land use changes as a result of the new location facility, the FLUSA was divided into nine zones.

- Cumulative effects analysis focused on key resource issues identified by environmental resource agencies, including potential effects on the federally endangered Dwarf wedgemussel and potential effects on water quality, particularly in the Swift Creek watershed.

**Transportation Impact-Causing Activities**

- The Complete 540 project would notably reduce travel times from various project area locations to major employment and commercial centers in the Raleigh metropolitan area and the broader Triangle Region, which also includes the Durham and Chapel Hill metropolitan areas.

- As a major new location facility, the project would permanently alter the existing road network, creating connections both within the project area and between locations in the project area and employment and commercial centers outside the project area. It will also influence changes in travel patterns across the project area.

- The project will add access points for properties, which will be most notable at the project's interchange locations, where nearby parcels will become attractive for higher intensity development such as retail and other commercial uses.

- By introducing a new location facility into the area, the project will permanently increase exposure to properties along the length of the roadway. This will be a particularly notable change in the more rural parts of the area.

- Local planners fully anticipate that the project will play a major role in influencing the land uses and intensities that will develop across the project area, influencing the development of land use and transportation nodes.

**Existing Conditions and Trends**

- All of the areas in the FLUSA have experienced rapid population growth in recent decades, with Wake, Johnston, and Harnett Counties experiencing 3.7%, 3.3%, and 2.3% average annual population growth, respectively. The Raleigh-Cary metropolitan area was the nation's second fastest-growing metropolitan area from 2000 to 2010. Rapid growth is expected to continue over the next two decades.

- The Raleigh area has one of the nation's strongest job markets, with a 21.5% increase in jobs between 2010 and 2020 in Wake and Johnston counties, and a 13.5% increase in Harnett, Lee and Sampson counties over the same time period. This strong employment growth is anticipated to continue over the next decade.

- Large parts of the FLUSA are not currently served by municipal water and sewer service, with no plans for these services to be introduced. However, areas near incorporated towns are generally served by municipal infrastructure. Local expansion plans include extending service into several areas, including areas west of Holly Springs and eastern Garner/southeastern Raleigh. Existing water and sewer infrastructure is sufficient to support a notable amount of growth in the FLUSA.

Availability of adequate water and sewer capacity allows for continued development in served areas.

- Most areas within the FLUSA are subject to fairly stringent comprehensive growth management and development regulations and most of the jurisdictions within the FLUSA indicate that their elected officials support continued adherence to these policies.

- Most of the jurisdictions in the FLUSA have anticipated the Complete 540 project for many years, tailoring their expectations and plans for future growth around the assumption that the project will eventually be constructed, with the specific expecation that the road's alignment will follow the existing protected corridor between NC 55 Bypass and I-40.

**Notable Features**

- There are hundreds of established neighborhoods located within the FLUSA, including residential subdivisions, rural communities near crossroad areas, and communities with strong ties to local churches. There are numerous parks and other recreational resources throughout the FLUSA.

- Most of the FLUSA lies within the Neuse River basin, with a portion of the western edge of the FLUSA in the Cape Fear River basin.

- Several streams in the FLUSA are included on the North Carolina 303(d) list of impaired waters. These include portions of Swift Creek, Middle Creek, Little Creek, Crabtree Creek, Walnut Creek, Beddingfield Creek, and the Neuse River in the Neuse River basin; and portions of Kenneth Creek and Neills Creek in the Cape Fear River basin.

- Swift Creek is classified as a Water Supply-III watershed with nutrient sensitive waters. Development in the Swift Creek watershed area is limited by watershed protection policies within Wake County's *Swift Creek Land Management Plan* (1990).

- The Cape Fear River in Harnett County is classified as a Water Supply-IV watershed.

- Hector Creek, in Harnett County, is the only High Quality Water (HQW) in the FLUSA. There are no identified Outstanding Resource Waters in the FLUSA.

- There are four federally protected species documented within Wake and Johnston counties: the Red-cockaded woodpecker (*Picoides borealis*), Michaux's sumac (*Rhus michauxii*), the Dwarf wedgemussel (*Alasmidonta heterodon*) and the Tar River spinymussel (*Elliptio steinstansana*). Two additional federally protected species are documented within Harnett County: the Cape Fear shiner (*Notropis mekistocholas*) and the Rough-leaved loosestrife (*Lysimachia asperulaefolia*).

- The Dwarf wedgemussel is found throughout Swift Creek in the FLUSA; however, the portion of Swift Creek downstream of the Lake Benson dam is particularly important for the long-term survival of this species.

- There are numerous Natural Heritage Program Natural Areas in the FLUSA.

**Development Regulations and Local Plans**

- The counties, cities, and towns in the FLUSA maintain zoning ordinances and land use plans that influence the location, densities, and intensities of development.

- Wake County's *Swift Creek Land Management Plan* identifies the Swift Creek basin's Watershed Critical Area and watershed buffer areas, within which development activities are limited. It also identifies appropriate low-density land use categories for the surrounding areas.

- The City of Raleigh is a National Pollutant Discharge Elimination System (NPDES) Phase I community. As a Phase I community, Raleigh is required to maintain a citywide stormwater management program. The following jurisdictions are Phase II stormwater permittees: Apex, Cary, Clayton, Fuquay-Varina, Garner, Knightdale, Holly Springs, Wendell, Wake County, Johnston County, and Harnett County.

- Development within the Neuse River basin is subject to the Neuse River Buffer Rules, which require development within the basin to maintain minimum 50-foot buffers along each side of perennial and intermittent streams. Several jurisdictions in the FLUSA have more stringent buffer requirements. These more stringent buffer requirements also apply in the Cape Fear River basin for Holly Springs and Wake County.

- All waters in the Neuse River basin are subject to the Neuse Nutrient Sensitive Waters rules, a set of permanent rules designed to address eutrophication in the Neuse basin. These rules include stormwater and agricultural regulations designed to limit nutrient loading and peak flow rates from new development.

**Land Use Patterns, Available Land and Market for Development**

- Land use in the FLUSA is of mixed intensity and density, although low-density residential subdivisions and rural land uses are the most prevalent characteristics of the area. Low-density residential uses include both single-family subdivisions and mobile home parks.

- The FLUSA for the Complete 540 project is approximately 450 square miles in size. Since much of the FLUSA has only begun to develop within the last 10 to 20 years, a large proportion of this area is still available for new development and redevelopment at higher densities and intensities, particularly in southern Wake County, northern Harnett County, and northern Johnston County. There is sufficient available land in the FLUSA to accommodate a continuation of the rapid growth experienced in the area over the last three decades.

- Population projections for the project area indicate continued rapid growth in the area, suggesting that there will continue to be a high demand for residential development in the FLUSA and increasing demand for commercial and industrial development.

**Potential Indirect Effects**

- All of the build alternatives would introduce a high-speed, controlled-access facility into the FLUSA, providing faster and more direct routes to major employment and commercial centers in the region. For this reason, the Complete 540 project is anticipated to be a major driver of development patterns in the coming years. However, it should be noted that local planners and

elected officials have indicated that there is a notable market for development within the FLUSA and continued growth is anticipated with or without the Complete 540 project.

- Surrounding the Complete 540 project's interchange areas, the project would likely encourage higher land use densities, more commercial and industrial development, and a greater mix of uses than would occur in these areas without the project.

- Under the No-Build Alternative, growth and development patterns are likely to be influenced by proximity to existing major transportation facilities and commercial and retail centers. Given that local land use plans assume construction of Complete 540 along the protected corridor would help concentrate development in desired locations, it is possible that the No-Build Alternative would promote future development patterns that differ from those envisioned in local land use plans.

- West of I-40, the Orange Corridor Alternative has the greatest potential to support growth and development in accordance with local plans. The Lilac Corridor Alternative would also support growth patterns similar to those anticipated by local plans. The Red Corridor Alternative is expected to shift development farther to the north in a pattern somewhat different from that envisioned in local plans.

- The Purple to Blue Corridor Alternative would likely shift development farther to the south into more rural areas, possibly increasing the overall effects of the project on induced land development, and leading to development patterns that would diverge more notably from those envisioned in local plans. This option would shift several interchange areas well to the south of the corresponding interchanges under other build scenarios, into areas without underlying plans in place or planned infrastructure to support the mixed use activity centers envisioned in local plans. These interchange areas may instead develop with more conventional strip commercial development in less concentrated, more scattered patterns. The Purple to Blue Corridor Alternative has greater potential than the other scenarios to induce development along the southern edge of the FLUSA, into Harnett County.

- East of I-40, the Green Corridor Alternative has the greatest potential to support growth and development in accordance with local plans, but there is little variation in the ability of the various corridors in this area to achieve this goal.

- Growth and development under either the build or no-build scenarios would result in indirect effects on Swift Creek, its surrounding Watershed Critical Area, and its associated natural features. These effects could be somewhat greater under a build scenario. The *Swift Creek Land Management Plan* and other local land development regulations will limit development density and intensity in much of this area.

- Growth and development under either the build or no-build scenario would result in indirect water quality effects on Middle Creek and its associated natural features. These effects could be somewhat greater under a build scenario. Development regulations including the Neuse River Buffer Rules, the more stringent riparian buffer requirements in some jurisdictions, and NPDES Phase II requirements will help to minimize these effects.

**Potential Cumulative Effects**

- Overall development trends in the FLUSA for the Complete 540 project have been largely influenced and shaped by the area's proximity to the robust employment centers of the Triangle

Region. Large residential projects and some notable commercial projects began to develop in the FLUSA in the 1990s as a result of this proximity.

- Several past infrastructure projects have influenced development in the FLUSA, including the NC 55 Bypass, the Clayton Bypass, the Dempsey E. Benton Water Treatment Plan, the Neuse River Wastewater Treatment Plant, and the South Cary Water Reclamation Facility.

- Several planned development and infrastructure projects are also expected to influence development in the FLUSA. In addition to several roadway projects, these include the Veridea mixed-use project in Apex, the new Western Wake Regional Wastewater Treatment Plant, and major retail development near US 70 and White Oak Road in Garner.

- Anticipated continued growth and development across the FLUSA will continue to affect area water quality and aquatic habitat. These effects are likely in either the build or no-build scenario. Construction of any of the new location alternatives under consideration for the project would have the potential to affect water quality and to contribute to aquatic habitat degradation. Under any of the build scenarios, however, these effects could shift farther to the south and east in the FLUSA.

- Continued development in the lower Swift Creek watershed, below the Lake Benson dam, will pose challenges for the long-term viability of Dwarf wedgemussel habitat in this area. These challenges will exist in either the build or no-build scenario. The addition of the Complete 540 project to this area has the potential to add to the cumulative effects of other past and planned future projects on the long-term viability of the Dwarf wedgemussel in the lower Swift Creek watershed.

- Continued growth under either the build or no-build scenarios will have the potential to contribute to forest fragmentation and wildlife habitat disturbance, but the Complete 540 project could shift these effects farther to the south and east. The Complete 540 project, combined with past and planned future projects in the vicinity of US 70 between Garner and Clayton, could contribute to cumulative effects on habitat fragmentation in this area. The cumulative effect of the Complete 540 and the planned Randleigh Farm project in southeastern Raleigh may also influence habitat fragmentation.

**Conclusions**

- The FLUSA will be marked by growth and land use change under either the build or no-build scenarios. Continued growth and land use change are not dependent on construction of the Complete 540 project. However, compared to the no-build scenario, the build scenarios could lead to more rapid growth and more intense development in some areas. In this way, any of the build scenarios would likely lead to indirect effects in the form of induced land development.

- Construction of any of the Build Alternatives would likely result in a higher concentration of high-density development and more intense land uses near interchange areas; these locations vary with the different Build Alternatives. The build alternatives would also likely promote residential development in proximity to these interchanges. Local governments generally anticipate that these areas will be along the Orange Corridor Alternative west of I-40 and the Green Corridor Alternative east of I-40.

- An alignment farther to the south, such as those using the Purple to Blue Corridor Alternative, would push these indirect land use effects farther south into rural areas in southern Wake County and in northern Johnston and Harnett counties, possibly increasing the overall effects of the project on induced land development.

- The No-Build Alternative may not support the locally desired concentration of higher density development and more intense land uses near the project's proposed interchange areas and may instead result in less concentrated, more piecemeal growth. This would differ from the future land use vision in many local land use plans.

- The Complete 540 project, along with other past and planned future projects, has the potential to affect water quality and habitat fragmentation in the FLUSA. The project also has the potential to add to the cumulative effects of other past and planned future projects on the long-term viability of the Dwarf wedgemussel in the lower Swift Creek watershed.

- A quantitative analysis of the potential indirect and cumulative impacts (ICI) of the Complete 540 project on water quality should be completed following selection of the Least Environmentally Damaging Practicable Alternative (LEDPA)

# 1 INTRODUCTION

In addition to requiring evaluation of potential direct impacts to the environment, the National Environmental Policy Act (NEPA) requires federal agencies to consider 1) how their actions may indirectly affect the human and natural environment, and 2) how their actions, when combined with other actions over time, may cumulatively impact the environment. In a 2011 Practitioner's Handbook, AASHTO's Center for Environmental Excellence further described these two distinct, but often related types of impacts as follows:

- Indirect effects are caused by the project or plan, but are separated from direct effects by time and/or distance. Indirect effects include induced growth and related environmental impacts.

- Cumulative impacts are the aggregate result of incremental direct and indirect effects of a project or plan, the effects of past and present actions, and effects of reasonably foreseeable future actions by others on resources of concern.

Council on Environmental Quality (CEQ) guidance (1997) states that direct effects are "caused by the action and occur at the same time and place." In contrast, indirect effects are "caused by the action and are later in time and farther removed in distance, but are still reasonably foreseeable." For large transportation projects, indirect effects are typically evaluated in terms of the likelihood that the project will change the location, magnitude, or pace of future development in and around the transportation facility (residential, commercial, and/or industrial development), and what environmental impacts may occur as a result of that development. It is important to emphasize that indirect effects considered during the NEPA process must be reasonably foreseeable. In other words, not every conceivable scenario needs to be evaluated.

In a broader sense, an analysis of potential cumulative effects considers both the direct and indirect impacts of past, present, and reasonably foreseeable public and private actions/projects on the environment, regardless of who undertakes that action/project. Individually, each action may have only minor environmental impacts but when looked at collectively over a period of time, those impacts may be substantial.

While "indirect" and "cumulative" effects are often discussed together, they require two distinct methods of analysis as described **Section 3**. The results of these qualitative analyses are presented in the remainder of this report. Direct impacts to the human, natural, and physical environment as a result of project construction and implementation are discussed at length in the Draft Environmental Impact Statement (EIS) by topic area, as well as in separate technical reports that accompany the Draft EIS.

# 2 PROJECT DESCRIPTION AND BACKGROUND

## 2.1 PROPOSED ACTION AND PROJECT PURPOSE

The North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), proposes transportation improvements in the project study area and surrounding region to address transportation needs as defined in the project's *Purpose and Need Statement* (Lochner, 2011). The focus of these improvements is a potential extension of the Triangle Expressway (NC 540) from its current terminus at the NC 55 Bypass in Apex to the US 64/US 264 Bypass in Knightdale. This action is designated as three projects in the NCDOT 2012-2018 STIP: R-2721, R-2828, and R-2829. Together, these STIP projects would combine to complete the 540 Outer Loop around the Raleigh metropolitan area. In some instances, the project is referred to as having two phases: Phase I is the western portion of the study area between NC 55 Bypass in Apex and I-40 near the Wake/Johnston County line; Phase II is the eastern portion of the study area between I-40 and US 64/US 264 Bypass in Knightdale. NCDOT established a protected corridor for the project between NC 55 Bypass and I-40 in 1996 and 1997. For purposes of meeting the requirements of NEPA, both phases are being examined in the current study as a single and complete project. It is likely that the project would be constructed in phases, but depending on the availability of funding, may or may not be consistent with the current phase descriptions noted. **Figure 1** shows the general project vicinity.

The project study area is located south of the City of Raleigh between the towns of Holly Springs to the west and Knightdale to the east. The project study area extends as far south as NC 42 between Fuquay-Varina and Clayton. While most of the project study area is within Wake County, a portion of western Johnston County and a small portion of northern Harnett County are also included. **Figure 2** shows the project study area.

This project, referred to as the Complete 540–Triangle Expressway Southeast Extension, is intended to improve transportation mobility for trips within, or traveling through, the project study area during the peak travel period, and reduce forecast traffic congestion. The proposed action is included in the Capital Area Metropolitan Planning Organization (MPO) and Durham-Chapel Hill-Carrboro MPO joint *2035 Long Range Transportation Plan* (LRTP) (2011), as well as the Capital Area MPO *2012–2018 Metropolitan Transportation Improvement Program* (MTIP) (2011). In addition, the proposed action is included in the State's system of Strategic Highway Corridors (SHC) aimed at providing a safe, reliable, and high-speed network of highways within North Carolina (NCDOT, 2008).

NCDOT developed the *Purpose and Need Statement* (Lochner, 2011) for this project with input from federal and state environmental regulatory and resource agencies and the Capital Area MPO at Turnpike Environmental Agency Coordination (TEAC) meetings and at Capital Area MPO meetings held on June 16, 2010, and September 15, 2010. NCDOT also incorporated public input solicited at public meetings held in September 2010, December 2010, and October 2013.

## 2.2 EXISTING ROADWAY NETWORK

There are several major travel routes through the project study area; these routes are shown in **Figure 1**. I-40 is one of the major east-west routes through North Carolina, connecting Raleigh and its surrounding communities to southeastern North Carolina and I-95 to the east. To the west, I-40 connects the area to Research Triangle Park (RTP), Durham, and other cities in central and western North Carolina. I-440, the Raleigh Beltline, is a partial loop facility around Raleigh, connecting the

suburban areas surrounding the city. Existing I-540/NC 540 currently extends around the north and west sides of the Raleigh area respectively, connecting outlying areas in Apex, Cary, northern Raleigh, and Knightdale. US 64 is another important east-west route through North Carolina; in the project study area, it traverses central Wake County. US 1 connects areas northeast of Raleigh to expanding suburban communities southwest of Raleigh.

Within southern and southeastern Wake County, there are limited alternatives for efficient local and long-distance travel. For residents in rapidly growing areas of southern and southeastern Wake County and northern Johnston County, routes for travel to many of the region's major employment centers consist of unlimited access, primary and secondary roads with lower posted speed limits and frequent traffic signals. Much of I-40, an important transportation corridor for local freight and commuter traffic, and the major corridor for interregional traffic across the area, currently operates at unacceptable levels of service (LOS) E or F. LOS on I-40 and other major routes across the area is forecast to worsen substantially. The proposed project would be a new location, fully controlled-access toll facility.

## 2.3 PROJECT ALTERNATIVES

The project's *Alternatives Development and Analysis Report* (Lochner, 2014) evaluated several possible alternatives associated with this project through a three-tiered screening process. The alternatives remaining under consideration fall into two main categories: No-Build and Build Alternatives.

The No-Build Alternative is the baseline comparative alternative. It assumes that the transportation systems in the project study area will continue to develop as currently planned in the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO joint 2035 LRTP, but without the proposed Complete 540 - Triangle Expressway Southeast Extension project.

The project's Build Alternatives were developed and evaluated as color-coded segments termed Preliminary Corridor Alternatives. Combinations of the various Preliminary Corridor Alternatives comprise end-to-end project alternatives. The end-to-end project alternatives remaining following the screening process outlined in the *Draft Alternatives Development and Analysis Report* are termed Detailed Study Alternatives (DSAs), which will be documented and evaluated in detail in the project's Draft EIS. Ten Preliminary Corridor Alternatives comprise seventeen end-to-end DSAs. **Figure 2** shows the locations of the Preliminary Corridor Alternatives that make up the DSAs for the project. **Table 1** lists the Preliminary Corridor Alternatives that make up each of the DSAs. The Orange Corridor Alternative between NC 55 Bypass and I-40 corresponds to the existing protected corridor, as described in **Section 2.1**.

The DSAs under consideration are proposed to be toll facilities. An open road (highway speed transponder-based system) will likely be used as the primary means of toll collection. This would allow drivers to travel unobstructed through the toll collection points at highway speeds.

**Table 1. Preliminary Corridor Alternatives Comprising Each Detailed Study Alternative**

| DSA | Preliminary Corridor Alternatives |
|---|---|
| **1** | Orange to Green |
| **2** | Orange to Green to Mint Green to Green |
| **3** | Orange to Brown (South) to Tan (North) to Green |
| **4** | Orange to Brown to Green |
| **5** | Orange to Green to Teal to Brown to Green |
| **6** | Orange to Red to Green |
| **7** | Orange to Red to Mint Green to Green |
| **8** | Orange to Purple-Blue-Lilac to Green |
| **9** | Orange to Purple-Blue-Lilac to Green to Mint Green to Green |
| **10** | Orange to Purple-Blue-Lilac to Brown (South) to Tan (North) to Green |
| **11** | Orange to Purple-Blue-Lilac to Brown to Green |
| **12** | Orange to Purple-Blue-Lilac to Teal to Brown to Green |
| **13** | Orange to Lilac (at Sauls Road) to Green |
| **14** | Orange to Lilac (at Sauls Road) to Green to Mint Green to Green |
| **15** | Orange to Lilac (at Sauls Road) to Brown (South) to Tan (North) to Green |
| **16** | Orange to Lilac (at Sauls Road) to Brown to Green |
| **17** | Orange to Lilac (at Sauls Road) to Green to Teal to Brown to Green |

The Capital Area MPO and Durham-Chapel Hill-Carrboro MPO joint LRTP includes completion of the 540 Outer Loop (I-540 and NC 540) as a six-lane, new location toll facility within the project study area as a 2025 horizon year project. The LRTP shows interchanges proposed at the following eleven locations:

- Holly Springs Road (SR 1152)
- Bells Lake Road
- US 401 (Fayetteville Road)
- Old Stage Road (SR 1006)
- NC 50 (Benson Road)
- I-40
- White Oak Road (SR 1209)
- US 70
- Old Baucom Road
- Auburn Knightdale Road (SR 2525)
- Poole Road (SR 1007)

# 3 INDIRECT AND CUMULATIVE EFFECTS (ICE) ANALYSIS METHODS

The methods used for this ICE analysis follow current NCDOT guidance which is based on the *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina Volumes 1 and 2* developed by The Louis Berger Group in 2001 for NCDOT and NCDENR. In addition, AASHTO's 2011 Practitioner's Handbook for *Assessing Indirect Effects and Cumulative Impacts Under NEPA* and CEQ's 1997 guidance were also consulted, as appropriate.

In accordance with NEPA requirements, a study area and time horizon was defined for the ICE analysis, taking into account the potential for future development that could generate indirect effects and the location of notable environmental resources relative to potential cumulative impacts. Consistent with NCDOT guidance, the Indirect Land Use Effects Screening Tool was completed, which indicated a high level of concern for potential indirect and cumulative effects and recommended further evaluation in a Land Use Scenario Assessment (LUSA). The indirect effects analysis took into account such factors as the potential for increased mobility and accessibility in the form of faster travel times or more direct highway access, the potential for induced growth, and the environmental impacts that are likely to occur as a result of that growth. The cumulative impacts analysis considered the effects of past, present, and reasonably foreseeable public and private projects on the Dwarf wedgemussel and Swift Creek watershed in particular.

The ICE analysis is based on the NCDOT-approved functional engineering designs within the project's DSAs as of June 2014.

## 3.1 FUTURE LAND USE STUDY AREA

The Future Land Use Study Area (FLUSA) is the area surrounding a construction project that could reasonably be anticipated to be affected by induced growth as a result of the completion of the proposed project and in combination with other projects. This encompasses all of the areas examined for potential increases in development pressure as a result of proposed project. The FLUSA used for analysis of the project's indirect and cumulative effects is shown on **Figure 3**. The southern FLUSA boundary was determined by reviewing area comprehensive plans to determine where development is anticipated due to continued growth in the Raleigh and Durham employment areas, reflecting a local labor force willing to drive northward from southern Wake County, Johnston County, and Harnett County. While Fuquay-Varina is the southernmost town in the overall project study area, future development in northern Harnett County, including Angier, is influenced by activities/employment opportunities in Wake County and RTP. Therefore, the FLUSA was extended southward into northern Harnett County (including Angier). The project study area was also expanded to include the towns of Clayton to the east and southern Knightdale to the northeast in order to evaluate potential growth-induced indirect effects in these areas from the proposed project. In addition to the towns and cities referenced above, the FLUSA also includes Holly Springs, Garner, and parts of Cary, Apex, and southern Raleigh. The northwestern boundary of the FLUSA follows US 1 because the areas north of US 1 are heavily developed, approaching buildout, and they are unlikely to experience induced development as a result of this project.

The Swift Creek watershed boundary was also critical to establishing the study limits for the ICE analysis. In the vicinity of the proposed project, Swift Creek traverses the study area from the

southern outskirts of Cary southeast to its confluence with the Neuse River near Smithfield. Two large lakes are part of the upper Swift Creek subbasin, Lake Wheeler and Lake Benson, both of which supply drinking water to the area. In order to qualitatively assess potential indirect and cumulative effects to water quality in the reservoirs, the northern boundary of the FLUSA generally follows the upper Swift Creek watershed boundary.

Portions of Swift Creek, particularly in the lower portion of the watershed, have been found to contain the federally endangered Dwarf wedgemussel. Swift Creek also provides spawning and nursery areas for anadromous fish species. Based on coordination with the U.S. Fish and Wildlife Service (USFWS), the FLUSA was extended southeastward to include the southern portion of the Swift Creek watershed between Clayton and Smithfield.

To facilitate discussion of specific areas within the FLUSA that are most likely to experience land use changes as a result of the new location facility, the FLUSA was divided into nine zones. The zone boundaries follow major roadways, political boundaries, and natural features to represent areas facing similar development pressures and influenced by similar local land use policies. The FLUSA zones are shown on **Figure 4** and are described in more detail in **Section 6.2**.

## 3.2 TIME HORIZON

The design year for the Complete 540 project is 2035, in keeping with the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO joint 2035 LRTP planning horizon. In addition, the Capital Area MPO, NCDOT, and FHWA have agreed to use the traffic model from the 2035 LRTP for the purposes of alternatives impact analyses for the project, through preparation of the Draft EIS. The planning horizons for other local planning documents in the FLUSA range from 2025 to 2035. For consistency with the LRTP, the traffic analysis used in the Draft EIS, and with local plans, 2035 is used as the time horizon in this report for evaluating indirect effects. While population projections from the North Carolina Office of State Budget and Management are only available through 2033, it was assumed that the growth trends evident in the 2033 projections would continue through 2035. For purposes of evaluating cumulative effects, which includes consideration of past actions, the timeframe includes trends from 1990, which is roughly when suburban development began to accelerate in the FLUSA, to the present, in addition to projections through 2035.

Following selection of a Preferred Alternative for the project, after the Draft EIS has been published and a public hearing has been held, NCDOT will prepare a revised traffic analysis for the Preferred Alternative based on the then-current traffic model and the then-current LRTP. This information will also be used to reevaluate the indirect and cumulative effects analysis for the Preferred Alternative.

## 3.3 INDIRECT EFFECTS ANALYSIS

Based on current NCDOT and federal guidance and policies, the methods used to assess indirect effects for the proposed project are described below.

Initially, the project scoping process was used to collect baseline information and establish study parameters – i.e., the study area specifically for the ICE analysis, the time horizon, and the notable resources to consider. During scoping, information and feedback were obtained from environmental resource agencies through correspondence and through agency meetings held according to the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Section 6002 (23 U.S.C. § 139) Project Coordination Plan developed for this project. Input from each

municipality within the FLUSA was obtained via individual meetings and routine correspondence with local government officials. The following local governments were interviewed: Wake County, Johnston County, Harnett County, City of Raleigh, Town of Cary, Town of Apex, Town of Holly Springs, Town of Fuquay-Varina, Town of Garner, Town of Knightdale, the Town of Clayton, the Town of Angier, and the Capital Area MPO. For each locality, a questionnaire was used to collect baseline information on several categories including: local transportation plans; planned developments; utilities; growth management regulations, if any; past, present, and future projects; notable environmental features; and other topics related to the ICE analysis. A copy of the questionnaire and summaries of each of the meetings to discuss local responses are provided in **Appendix A**.

All of the local governments indicated above were also contacted in 2014 to obtain updated information on land development and land use plans and also to ensure that the responses they provided during the original interviews were consistent with the 2035 LRTP and the 2035 horizon year. All confirmed that they were consistent. Because future land use plans generally do not change substantially, the local governments also confirmed that their responses would be consistent with the 2040 LRTP and a 2040 horizon year.

To support indirect effects analyses for transportation projects in North Carolina, NCDOT has developed a two-step process for assessing potential induced growth effects (i.e., changes in the location, magnitude, or pace of future development caused by the project). Step 1 is a screening process that looks at a variety of factors to determine the likelihood that the project will need a more detailed Land Use Scenario Assessment (Step 2). To do the screening, NCDOT developed an *Indirect Land Use Effects Screening Tool* (Screening Tool) that qualitatively evaluates nine factors shown by others to influence land development decisions:

1. Scope of the proposed transportation project
2. Change in accessibility (travel time savings)
3. Forecast population growth
4. Forecast employment growth
5. Available land
6. Water/sewer availability
7. Market for development
8. Public policy (relative to land use)
9. Notable environmental features

If the Step 1 screening process determines that a more detailed analysis is needed, a Land Use Scenario Assessment (Step 2) is then completed. Building upon the information collected during the screening process, the Land Use Scenario Assessment process is used to look in more detail at various potential land use development scenarios in the various zones delineated within the FLUSA. These scenarios were created through coordination with local officials and then assessed in terms of how each would develop under the following two general project scenarios:

- The No-Build Alternative, which assumes that the transportation systems in the project study area will continue to develop as currently planned in the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO joint 2035 LRTP, but without the proposed Complete 540 project.

- The Build Alternative, which assumes that the Complete 540 project will be constructed as a controlled-access highway on new location from NC 55 Bypass in Apex to US 64/US 264

Bypass in Knightdale. This scenario also assumes that the transportation systems in the project study area will continue to develop as currently planned in the LRTP. The Build Alternative corresponds to any one of the DSAs under consideration for the project, as described in **Section 2.3**.

Using NCDOT's *Land Use Scenario Assessment Tool* (Assessment Tool), the No-Build and Build scenarios were assessed for each of the nine identified zones relative to the following six factors:

1. Demand for higher impact development
2. Future shift of population growth to those areas
3. Pressure for land development outside regulated areas
4. Pressure for land development outside areas planned for development
5. Type of development pattern likely to occur (strip/sprawl development versus cluster development)
6. Planned/managed land use and impacts (development in areas without coordinated land use and stormwater management goals versus in development areas consistent with land development and stormwater management goals)

The greater the difference between the No-Build and Build scenarios for each factor, the greater the potential for indirect land use impacts.

Given the magnitude and scope of the Complete 540 project and the presence of sensitive environmental resources, NCDOT elected to complete both steps of the process and document them both in this report.

## 3.4 CUMULATIVE EFFECTS ANALYSIS

In looking at cumulative impacts, the Council on Environmental Quality emphasizes in their guidance that the analysis should focus only on "what counts" -- notable environmental resources that are likely to be most substantially affected (both directly and indirectly) by the proposed project. To identify the key resource issues for purposes of the cumulative impacts analysis, input was solicited from resource agencies during the project's scoping process.

Of particular concern to the USFWS is the possibility that the cumulative impact to the federally endangered Dwarf wedgemussel might threaten the viability of the species in the lower portions of Swift Creek watershed. Given the importance of the Swift Creek watershed to other species, and its importance to water supply in the region, concern for potential cumulative impacts to water quality within the watershed was also raised by other resource agencies. Therefore, those two resource issues are the major focus of this cumulative impacts analysis.

## 3.5 OTHER TRANSPORTATION AND INFRASTRUCTURE PROJECTS

### *3.5.1 Transportation Projects*

NCDOT Draft 2013-2023 STIP capacity roadway projects located wholly or partially within the FLUSA are listed below.

- R-2609 (Wake, Harnett, and Cumberland Counties) – This project will increase capacity along about 39 miles of US 401 from north of Fayetteville (outside the FLUSA for Complete 540) to north of Fuquay-Varina. It may include widening and/or new location segments. The project is

currently in the planning and environmental study phase; funding has not yet been programmed for right-of-way acquisition or construction.

- R-2635D (Wake County) – This project will construct a new interchange on the existing Triangle Expressway (NC 540) at Old Holly Springs-Apex Road, along with two miles of auxiliary lanes along the Triangle Expressway between US 1 and NC 55 Bypass. Funding has not yet been programmed for right-of-way acquisition or construction.
- R-3410 (Johnston County) – This project will widen NC 42 from NC 50 to US 70, a distance of about 8 miles. Right-of-way acquisition is not scheduled to begin before 2023.
- R-3825 (Johnston County) - This project will widen NC 42 from US 70 to Buffaloe Road (SR 1003), a distance of approximately 6 miles. Right-of-way acquisition is not scheduled to begin before 2023. This project is currently in the planning and preliminary design phase; funding has not yet been programmed for right-of-way acquisition or construction.
- I-4739 (Johnston County) – This project will improve the I-40/NC 42 interchange with possible new interchanges at Cleveland Road (SR 1010) and Cornwallis Road (SR 1525). The project is currently in the planning and preliminary design phase; funding has not yet been programmed for right-of-way acquisition or construction.
- I-5111 (Wake and Johnston Counties) – This project will widen 11 miles of I-40, from I-440 in southeast Raleigh to NC 42 in Johnston County. The project is currently in the planning and environmental study phase. NCDOT anticipates constructing this project in segments, beginning in 2018 at the northern end of the project, with construction complete in 2022.
- U-2901 (Wake County) – This project will widen 2.8 miles of NC 55, from US 1 to US 64 in Apex. Construction is complete on the northern end of this project. Right-of-way acquisition and construction of the southern end of the project are not scheduled to begin before 2023.
- U-3334 (Johnston County) – This project will extend Booker Dairy Road (SR 1923) 3.7 miles, from US 70 Business West in Smithfield to US 301. Construction is complete on the western end of this project, from US 70 Business West to Buffaloe Road. Funding has not yet been programmed for right-of-way acquisition and construction of the eastern end of the project.
- U-3605 (Johnston County) – This project will extend Front Street in Clayton 0.9 miles from Mill Street to NC 42. Construction of this project is in progress and is expected to be complete in 2014.
- U-5301 (Wake County) – This project will upgrade the 3.0 miles of the US 64 corridor, from Laura Duncan Road (SR 1308) to US 1, to partial control of access, including conversion of two at-grade intersections to interchanges. It will be completed in phases, with construction of the interchange at Laura Duncan Road scheduled to begin in 2022. Right-of-way acquisition and construction of the remaining phases are not yet funded.
- U-5302 (Wake County) – This project will convert about 1 mile of US 401 near Garner, from Legend Road to US 70, to a superstreet. Right-of-way is not programmed to begin before 2020, and construction is not programmed to begin before 2021.
- U-5317 (Wake County) – This project, known as the North Judd Parkway, will extend Judd Parkway around the northwest side of Fuquay-Varina, from NC 55 to NC 42, a distance of about 1.5 miles. The Town of Fuquay-Varina is currently completing the planning and environmental study for this project. Funding has not yet been programmed for right-of-way acquisition or construction.

- U-5318 (Wake County) – This project will extend Main Street in Holly Springs southward from Ralph Stephens Road to Piney Grove Wilbon Road, a distance of approximately 1.7 miles. This is a locally administered project funded in part by NCDOT. The Town of Holly Springs is currently acquiring right-of-way and anticipates completing this project by 2017.
- W-5600 (Johnston County) – This project will convert a portion of US 70, from Sadisco Road (SR 2565) to Turnage Road (SR 1915), to a freeway facility. It is currently under construction.

The Capital Area MPO and Durham-Chapel Hill-Carrboro MPO joint 2035 LRTP includes numerous planned transportation projects in the FLUSA. Some of these projects are minor improvements but others are noted as regionally significant projects. Regionally significant roadway projects in the FLUSA, organized by planning horizon, are listed below:

2015 Horizon

- A380 (Wake County) – Upgrade US 64 from US 1 to Laura Duncan Road (2.49 miles).

2025 Horizon

- A49b (Wake County) – Widen Poole Road from two to four lanes between Barwell Road and I-540 (1.57 miles).
- A72 (Wake County) – Widen Holly Springs Road from two to four lanes between Tryon Road and Southeast Cary Parkway (0.61 miles).
- A118b (Wake and Harnett Counties) – Widen NC 55 from two to four lanes between Jicarilla Road to Rawls Church Road (1.60 miles).
- A157b (Wake County) – Eastern Parkway, a new location four-lane facility between NC 55 and US 401 (1.79 miles).
- A302d (Wake County) – Southern Fuquay-Varina Bypass, a new location four-lane facility between Angier Road and Piney Grove Wilbon Road (2.40 miles).
- F44a/b (Wake County) – Widen I-40 from I-440 to NC 42

2035 Horizon

- A214 (Wake County) – Widen Garner Road from two to three lanes between Tryon Road and Rock Quarry Road (7.16 miles).
- A228a/b (Wake County) – Widen NC 50 from two to four lanes between Timber Drive and NC 42 (6.76 miles).
- A407 (Wake and Johnston Counties) – Widen NC 42 from two to four lanes between NC 401 and I-40 (11.8 miles).
- A426 (Wake County) – Widen NC 55 from two to four lanes between Holly Springs Road and Bobbitt Road (2.96 miles).
- F44c/d (Johnston County) – Widen I-40 from four to six lanes from NC 42 south to the southern boundary of the Capital Area MPO metropolitan area (13.56 miles).
- Jhns2a/2b (Johnston County) – Widen NC 42 from two to four lanes between US 70 Business and I-40 (6.38 miles).

The Town of Holly Springs Capital Improvement Plan for Fiscal Year 2013 also includes a notable planned transportation improvement. This project would construct an interchange on US 1 at

Friendship Road to serve a planned industrial site on the south side of US 1. Funds have not yet been programmed for construction of this project, but the Plan lists this project in the 2018 horizon year.

### 3.5.2 Water and Sewer Infrastructure

The City of Raleigh 2013-2014 Adopted Capital Improvement Program includes several planned expansions of water and sewer infrastructure in the Complete 540 FLUSA. These projects are mainly in the southern Garner area and in the area south of Knightdale. A map of these improvements is shown in **Appendix B**. These include:

Fiscal Year 2015

- Neuse River Wastewater Treatment Plant 15 MGD Expansion – Expansion of capacity at Neuse River Wastewater Treatment Plant from 60 million gallons per day (MGD) to 75 MGD.

- Ten Ten Road Water Tank – Construction of new 1.0 MGD elevated water storage tank in the vicinity of Ten Ten Road and Old Stage Road to support increasing water demand in this area.

Fiscal Year 2016

- DEBWTP Transmission Main – 41,600 linear feet of new 30-inch water transmission line along Walnut Creek from near I-440 to Poole Road/Hodge Road in Knightdale.

Fiscal Years 2019 through 2023

- Oregon Trail Road Transmission Main – 5,670 linear feet of new 24-inch water transmission line from Dempsey E. Benton Water Treatment Plant along Oregon Trail (near NC 50) to New Bethel Church Road.

- Clifford Road Transmission Main – 5,530 linear feet of new 24-inch water transmission line along Clifford Road from New Bethel Church Road to Hebron Church Road.

- Hebron Church Road Transmission Main – 4,510 linear feet of new 24-inch water transmission line along Hebron Church Road from Clifford Road to White Oak Road.

- Rand Road Transmission Line – 12,400 linear feet of new 24-inch water transmission line along Rand Road from NC 50 to Ten Ten Road.

- Ten Ten Road Transmission Main – 5,200 linear feet of new 12-inch water transmission line along Ten Ten Road from Rand Road to Old Stage Road.

The Town of Cary Capital Improvement Plan for Fiscal year 2014 includes an expansion of the Cary/Apex Water Treatment Plant from its current treatment capacity of 40 MGD to 56 MGD. Construction of this expansion is underway and is anticipated to be complete in 2016.

The Town of Holly Springs Capital Improvement Plan for Fiscal Year 2013 also includes several planned expansions of water and sewer infrastructure in the Complete 540 FLUSA. These include:

- A new pump station force main on Avent Ferry Road west of NC 55 Bypass, near the Braxton Village subdivision. This is scheduled for completion in 2016.

- A new 12-inch waterline along Duncan Cook Road to tie to an 8-inch waterline in Harnett County, a distance of about three miles. This is scheduled for completion in 2015.

- A new sewer pump station and two-mile waterline to serve a certified site for new industry on Friendship Road, near US 1. This is scheduled for completion in 2015.

- A new 24-inch force main along Earp Street from Bass Lake Road to Main Street. This is scheduled for completion in 2014.

# 4 TRANSPORTATION IMPACT-CAUSING ACTIVITIES

When analyzing the potential for change in land use/induced development as a result of a transportation project, certain transportation impact causing activities (TICA) are assessed including: change in direct access, change in accessibility/travel time savings, change in travel patterns, change in exposure and whether or not a transportation/land use node is created. For transportation projects, looking at whether the proposed project is on new location and whether the project will change direct access is often the starting point for assessing potential indirect effects. In theory, if access is increased as a result of constructing the project, then the potential for induced growth is also increased. Secondly, changes in accessibility, which reflects travel time savings due to increased access and new travel patterns, are examined and can be measured in a variety of ways. Some geographic areas may experience greater travel-time savings than others, depending on changes in access or changes to existing travel patterns. Changes in access also influence travel patterns, such as how people commute to work. This section describes these changes in relation to the Complete 540 project as well as the likelihood that the proposed project and other projects in the area will create a transportation or land use node.

## 4.1 TRAVEL PATTERNS

The purpose of the Complete 540 project is to improve transportation mobility for trips within, or traveling through, the project study area during the peak travel period, and to reduce traffic congestion in the project area. An additional desirable outcome of the project is to improve system linkage in the area roadway network. Inherent in each of these outcomes is the understanding that the project will have a notable effect on travel patterns and travel times in the project area, helping to provide a more direct route for commuters and regional travelers to reach their destinations and to shorten travel times.

Much of the FLUSA is characterized by lower density residential development, and many residents of the area commute to major employment and activity centers along the 540 Outer Loop and along roadways connecting to the Outer Loop, such as I-40, NC 147, and US 1/64. Existing high-speed controlled-access facilities do not provide a direct route between many key locations and many of these facilities face notable and worsening traffic congestion. Other routes are available but include primary and secondary roads with lower posted speed limits, no control of access, and numerous traffic signals. It is expected that many of those who currently travel between locations in the project area and employment and commercial centers within and outside the project area would use the proposed facility because it would provide a faster, more direct route to these areas.

Traffic traveling between regions south and east of Raleigh and regions west of Raleigh, including interregional truck traffic, is generally limited to I-40/I-440 south of Raleigh. Since these routes serve high volumes of local traffic, interregional traffic limited to these same routes adds additional traffic volumes and also results in inefficient travel across the region. Some interregional traffic, including commercial truck traffic, would also be likely to use the proposed facility as a faster, more direct route to destinations.

## 4.2 TRAVEL TIME

As described in the project's *Alternatives Development and Analysis Report* (Lochner, 2014), a new location build alternative would reduce travel times in 2035 from various project area locations to RTP by an average of about 14 percent as compared to the no-build scenario. It would also reduce travel times from those same area locations to the Brier Creek/Raleigh Durham International Airport area by an average of about 12 percent. By increasing system capacity and providing an alternative route for travelers, the Complete 540 project has the potential to similarly reduce travel times between other major locations and destinations in both the immediate project area and the broader FLUSA.

## 4.3 CHANGE IN ACCESS

As a major new location facility, the Complete 540 project would dramatically increase access both within the FLUSA and between locations in the FLUSA and employment and commercial centers outside the project area. It will permanently alter the existing roadway network, creating numerous new connections to the region's high-speed, controlled access system. As a fully controlled access facility, increased direct access will be most notable at the project's interchange locations, where nearby parcels will become attractive for higher intensity development such as retail and other commercial uses. Local planners fully anticipate that the project will play a major role in influencing the land uses and intensities that will develop across the project area. In light of this anticipated influence on development, local jurisdictions have incorporated the project into local plans, as described in **Section 5.6.1**.

## 4.4 CHANGE IN EXPOSURE

This major new location facility will also create new exposure to the properties along the length of the roadway. Much of the area in the vicinity of the project's DSAs is currently characterized by rural and low-density residential development, so this new exposure from the new roadway will be a notable change from existing conditions.

## 4.5 LAND USE OR TRANSPORTATION NODES

All of the jurisdictions in the project area fully expect the Complete 540 project to influence the development of land use and transportation nodes, or areas of concentrated development, particularly at interchange areas. Many jurisdictions have planned for the development of activity centers at anticipated interchange areas along the protected corridor (described in **Section 2.1**) and have incorporated these anticipated activity centers into their future land use plans, as described in Section 5.5.1. An analysis of the potential locations where concentrated development would be likely to occur is included in **Section 6.2**.

# 5 EXISTING CONDITIONS AND TRENDS

The project area lies south of Raleigh, at the eastern point of the area known as the "Triangle" region of North Carolina. The City of Durham/Durham County and the Town of Chapel Hill/Orange County form the Triangle's other two points. The Research Triangle Park (RTP), one of the oldest and largest research parks in North America, lies at the center of the Triangle and is a major economic engine in the area. RTP is an approximately 7,000 acre development housing more than 170 companies which employ over 42,000 full-time and 10,000 contract employees (RTP, 2011). The area's economy is influenced by State government, numerous universities, and by its proximity to RTP. Within this context, this section summarizes population, development and economic trends within the FLUSA.

## 5.1 POPULATION

**Table 2** presents a summary of the population changes in the region between 1990 and 2010, along with projected population in 2033. Although the time horizon for the ICE analysis is 2035, population projections are available only through 2033. It is assumed that growth trends predicted through 2033 will continue similarly through 2035.

**Table 2. Population Trends and Projections from 1990 to 2030**

| Jurisdiction | Population | | | Growth | | | Annual Growth Rate | Projected Population | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2000 | 2010 | 1990-2000 | 2000-2010 | 1990-2010 | 2000-2010 | 2033 Population | 2010-2033 Growth |
| **North Carolina** | 6,628,637 | 8,049,313 | 9,535,485 | 1,420,676 (21.4%) | 1,486,172 (18.5%) | 2,906,848 (43.9%) | 1.71% | 12,000,560 | 2,465,075 (25.9%) |
| **Wake County** | 423,380 | 627,846 | 900,993 | 204,466 (48.3%) | 273,147 (43.5%) | 477,613 (112.8%) | 3.68% | 1,383,017 | 482,024 (53.5%) |
| **Johnston County** | 81,306 | 121,965 | 168,878 | 40,659 (50.0%) | 46,913 (38.5%) | 87,572 (107.7%) | 3.31% | 219,695 | 50,817 (30.1%) |
| **Harnett County** | 67,833 | 91,029 | 114,678 | 23,196 (34.2%) | 23,649 (26.0%) | 46,845 (69.1%) | 2.34% | 180,502 | 65,824 (57.4%) |

Source: US Census Bureau (2010) Summary File 1 Total Population (100-Percent Data), Summary File 1 (100-Percent Data), Table P1 – TOTAL POPULATION (2000); North Carolina Office of Management and Budget, 2033 Population Projections (September 2013).

All of the areas in the FLUSA have experienced rapid population growth since 1990, with growth outpacing the statewide rate in all three counties. This reflects the rapid population growth that has characterized the broader Raleigh-Cary Metropolitan Statistical Area (MSA) and the Raleigh-Durham-Chapel Hill Combined Statistical Area (CSA). U.S. Census data show that the population of the Raleigh-Cary MSA increased by nearly 108 percent between 1990 and 2010, and that the population of the Raleigh-Durham-Chapel Hill CSA increased by nearly 125 percent over the same time period. The Raleigh-Cary MSA was the nation's second fastest-growing MSA from 2000 to 2010 and the third fastest between 1990 and 2010.

All of the municipalities in the FLUSA, along with Wake, Johnston, and Harnett counties, experienced greater population growth between 1990 and 2010 than North Carolina as a whole. The populations of all of the municipalities in the study area increased over this time period, with the fastest growth in Holly Springs (over 2600 percent), Apex (over 650 percent), and Knightdale (over 500 percent). All three of these municipalities had fairly small populations in 1990, but over the next twenty years they experienced substantial new suburban development and annexations that increased their incorporated

areas. In addition, the larger, more established municipalities in the FLUSA, such as Raleigh and Cary, also experienced continued rapid growth.

According to the North Carolina Office of State Budget and Management, population in all three of the counties in the FLUSA is expected to continue to grow rapidly. All three counties are projected to experience faster growth than the state as a whole. Between 2010 and 2033, population is projected to grow by about 30 percent in Johnston County (1.2 percent average annual growth), by about 53 percent in Wake County (1.9 percent average annual growth), and by about 57 percent (2.0 percent average annual growth) in Harnett County. The projected statewide growth rate for the same period is about 26 percent (1.0 percent average annual growth).

## 5.2 EMPLOYMENT

Home to North Carolina's capital and numerous universities, and adjacent to RTP, Wake County has a robust and diversified economy featuring many of the State's largest employers. State government has always been the foundation of the area's job base, but biotechnology, information technology, higher education, and health care are also important and growing components of the area's employment mix.

In addition to widespread residential development, the Clayton area in Johnston County has also experienced commercial and industrial growth. It has become an important part of the region's high-technology industrial economy, with several major biopharmaceutical companies, including Talecris, Hospira, and Novo Nordisk, locating there. More than ten percent of the State's biopharmaceutical jobs are in Clayton (Town of Clayton, 2013a).

**Table 3**, which compares unemployment rates over time for Wake, Johnston, and Harnett counties and the Raleigh-Cary Metropolitan Statistical Area (MSA) to State unemployment rates, illustrates that the project area maintains a stronger job base than the State as a whole. Unemployment rates in all areas rose in the late 2000s as a result of the nationwide economic recession, but have been steadily decreasing since early 2010, when unemployment rates peaked. Unemployment rates are consistently lower in Wake County, Johnston County, and the Raleigh-Cary MSA than in the State as a whole.

**Table 3. Unemployment Rates**

| Area | 2003 Annual Average | 2013 Annual Average | June 2014 |
|---|---|---|---|
| North Carolina | 6.5% | 8.0% | 6.5% |
| Wake County | 5.3% | 6.2% | 5.1% |
| Johnston County | 5.4% | 6.9% | 5.5% |
| Harnett County | 6.6% | 9.2% | 7.4% |
| Raleigh-Cary MSA | 5.4% | 6.4% | 5.2% |

Source: North Carolina Division of Employment Security.

**Table 4** lists the share of total employment in various supersectors or domains for industries in North Carolina, Wake, Johnston, and Harnett counties, and the Raleigh-Cary MSA. These shares are shown for 2003 and 2013 to illustrate employment trends in each of these areas.

The manufacturing sector continues to decline in Wake, Johnston, and Harnett counties, although it still makes up a larger share of Johnston's employment distribution than the other counties. The education and health sectors make up a growing share of each county's job base. The distribution in other sectors has been fairly consistent between 2003 and 2013 in the three counties, although

**Table 4. Annual Employment Distribution – 2003/2013 (Percent)**

| Employment Industry | 2003 | | | | | 2013 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | North Carolina | Wake County | Johnston County | Harnett County | Raleigh-Cary MSA | North Carolina | Wake County | Johnston County | Harnett County | Raleigh-Cary MSA |
| | **Goods-Producing Domain** | | | | | | | | | |
| Natural Resources/Mining | 0.9 | 0.5 | 2.7 | 1.4 | 0.8 | 0.8 | 0.2 | 1.9 | 1.3 | 0.4 |
| Construction | 5.7 | 6.9 | 8.2 | 8.3 | 7.3 | 4.4 | 5.4 | 7.1 | 6.3 | 5.6 |
| Manufacturing | 16.2 | 5.8 | 18.1 | 11.1 | 5.3 | 11.1 | 4.8 | 15.4 | 5.9 | 5.9 |
| | **Service-Providing Domain** | | | | | | | | | |
| Trade/Transportation/Utilities | 20.1 | 19.8 | 21.3 | 21.0 | 20.5 | 19.7 | 17.9 | 22.2 | 21.8 | 18.3 |
| Information | 2.1 | 4.4 | 1.4 | 2.0 | 4.2 | 1.8 | 3.7 | 0.5 | 1.6 | 3.4 |
| Financial Activities | 5.0 | 5.4 | 2.8 | 3.9 | 5.3 | 5.1 | 5.3 | 2.7 | 3.0 | 4.7 |
| Professional/Business | 11.4 | 17.4 | 7.6 | 7.0 | 16.8 | 13.9 | 21.0 | 7.7 | 6.6 | 19.8 |
| Education and Health | 21.0 | 17.4 | 20.5 | 28.0 | 18.4 | 23.8 | 19.0 | 23.2 | 32.3 | 19.5 |
| Leisure and Hospitality | 9.3 | 10.4 | 9.5 | 7.5 | 9.6 | 11.0 | 11.2 | 11.0 | 11.0 | 11.1 |
| Other Services | 2.6 | 3.2 | 2.3 | 1.8 | 3.2 | 2.5 | 3.1 | 2.4 | 2.0 | 3.1 |
| Public Administration | 5.8 | 8.7 | 5.6 | 8.0 | 8.7 | 6.0 | 8.4 | 6.0 | 8.1 | 8.2 |
| Total Government Sector | 16.7 | 19.2 | 19.3 | 21.8 | 16.2 | 17.2 | 16.0 | 20.8 | 24.9 | 16.2 |
| Total Private Sector | 83.3 | 80.8 | 80.7 | 78.2 | 83.1 | 82.8 | 84.0 | 79.2 | 75.1 | 83.8 |

Source: North Carolina Division of Employment Security.
Notes: Employment numbers are Annual Average Employment for aggregate of all types by Super sector or Domain. Year 2013 most recent year in which annual data available.

Johnston and Harnett counties have experienced declines in the proportion of private sector jobs and increases in the proportion of government jobs. Much of this shift is due to the continued loss of manufacturing jobs, reflecting a larger statewide and nationwide trend. Wake County's lower dependence on manufacturing jobs has helped make its economy somewhat more resilient than in other areas of the State.

The North Carolina Department of Commerce-Division of Employment Security (DES) projects continued job growth in the project area. DES projects that the Capital Area Workforce Development Board (WDB) area, which includes Wake and Johnston counties, will gain 112,810 jobs between 2010 and 2020, for an increase of 21.5 percent (2.0 percent average annual growth). The Triangle South WDB, which includes Harnett, Lee and Sampson counties, is projected to gain 11,940 jobs over that same period, an increase of 13.5 percent (1.3 percent average annual growth). Local planners also anticipate continued job growth in the project area and many jurisdictions anticipate that commercial land uses will make up a growing share of local land uses.

## 5.3 LAND USE PATTERNS

Land use in the FLUSA is of mixed intensity and density, although low-density residential subdivisions and rural land uses are the most prevalent characteristics of the area, as shown in **Figure 5**. Much of the project area was, until recently, characterized by agricultural and rural residential land uses. Many of the communities in the FLUSA have become increasingly popular locations for suburban development as people commuting to jobs in RTP, Raleigh, and other employment centers in the region seek lower-cost housing, open space, and the quality of life offered by southern Wake, Johnston, and Harnett counties.

Low-density residential uses include individual rural single-family residences, single-family subdivisions and mobile home parks, typically at net densities of less than four dwelling units per acre. Interspersed with these land uses are numerous churches, schools, daycare centers, and other similar types of development. A review of Census data shows that much of the residential development within the FLUSA consists of housing built since 1990. Much of the housing in the western part of the FLUSA in particular was built after 2000. Older housing is mainly clustered in the central areas of Garner, Fuquay-Varina, Clayton, and Angier.

### *5.3.1 Wake County*

The western part of the FLUSA includes substantial commercial, industrial, and office development along NC 55 and NC 55 Bypass. There are also commercial shopping centers along Holly Springs Road and Kildaire Farm Road. The Holly Springs/Apex/Cary area includes numerous large planned residential subdivisions with homes on lots smaller than one-third acre. There are a few multi-family residential developments in this part of the study area, generally along Kildaire Farm Road and West Lake Road. Downtown Holly Springs features uses such as small offices, government buildings, and small retail stores.

The southwestern portion of Wake County includes the Fuquay-Varina area. This community's downtown areas also feature retail stores, restaurants, small offices, churches, schools and government buildings. South and west of Fuquay-Varina, land uses become rural, with numerous farms along with rural, large-lot residences and farm-oriented commercial uses. Areas north and northwest of Fuquay-Varina are characterized by a mix of rural and agricultural uses, horse farms and stables, and newer residential subdivisions. Areas along and near US 401, which connects Fuquay-Varina to Garner and Raleigh to the north, include a higher concentration of industrial uses including automotive businesses,

light manufacturing facilities and warehouses, along with commercial uses, restaurants, bars, and small offices.

East of US 401, much of the FLUSA becomes increasingly rural. South of Lake Benson, low-density residential subdivisions and numerous farms and farm-oriented businesses predominate. North of Lake Benson, the central area of Garner is characterized by older, more urban residential development, numerous multi-family residential developments, and substantial commercial development. West and south of central Garner, newer single-family residential developments continue to develop. The US 70 corridor between Garner and Clayton features regional shopping centers and numerous industrial developments, including manufacturing and research and development facilities. Industrial and regional commercial development also characterizes the areas surrounding I-40 east of Garner.

East of I-40 and US 70, southern Wake County is highly rural, with widespread agricultural development and related rural land uses. Suburban residential development is starting to spread into this area, although this type of development is not as common as in the western part of the FLUSA. To the northeast, land uses again include more commercial and industrial developments, particularly near the US 64/US 264 Bypass and along US 64 Business in Knightdale.

### *5.3.2 Johnston County*

Johnston County lies southeast of Wake County. While more rural than Wake County, its location along I-95 midway between New York and Florida helps to promote commercial, transportation and travel-oriented development in parts of the County (Johnston County, 2013). In areas near the Wake County border, residential, commercial and industrial growth is strongly influenced by the area's proximity to employment centers in Raleigh and RTP. Northern Johnston County is characterized by a mix of agricultural, rural residential, and newer suburban residential development. The area surrounding the NC 42 interchange on I-40 includes highway-oriented commercial development, with numerous motels, restaurants, gas stations, convenience stores and other retail uses. The new Johnston Health Clayton medical center is located on NC 42 east of the US 70 Bypass (Clayton Bypass) interchange. Central Clayton features a mix of small-town urban land uses and older residential neighborhoods. US 70 Business through this part of Johnston County features commercial shopping centers, industrial parks, and office uses. South of Cleveland Road, in the Clayton area, Johnston County remains highly rural and agricultural.

### *5.3.3 Harnett County*

South of Wake County, land use in Harnett County is generally rural with low to medium density residential development. The portion of the county within the FLUSA includes the Town of Angier and surrounding medium to low-density residential development.

## 5.4 WATER AND SEWER UTILITY SERVICES

The City of Raleigh is the major provider of water and sewer service in Wake County. Incorporated areas in the eastern and north-central portions of the FLUSA are served by City of Raleigh water and sewer. The City of Raleigh provides water and sewer service to approximately 500,000 customers in Raleigh, Garner, and Knightdale, as well as the Wake Forest, Rolesville, Knightdale, Wendell, and Zebulon areas (City of Raleigh Public Utilities, 2014). Raleigh also is a wholesale seller of bulk water supply to customers including the Town of Fuquay-Varina. Raleigh operates two water treatment plants, with a combined treatment capacity of 106 million gallons per day (MGD) and a current average daily demand of about 70 MGD. One of these, the Dempsey E. Benton Water Treatment

Plant, is within the FLUSA, just west of I-40. Raleigh also operates three wastewater treatment plants (WWTPs), with a combined treatment capacity of 65 MGD and a current average daily demand of about 44 MGD. One of these, the Neuse River WWTP, is in the FLUSA, approximately 12 miles southeast of Raleigh, near the Johnston County line. As described in **Section 3.5.2**, a planned expansion of the Neuse River WWTP would add an additional 15 MGD in treatment capacity to the system.

Incorporated areas in the northwestern part of the FLUSA are served by Cary and Apex water and sewer. The Towns of Cary and Apex jointly own a water treatment plant (WTP) west of the project area. This WTP has a treatment capacity of 40 million gallons per day (MGD), with current average daily demand at about 34 MGD. As described in Section 3.5.2, a expansion of this facility's current capacity to 56 MGD is under construction and anticipated to be complete in 2016. Each of these towns maintains a water distribution system; together these two systems serve over 65,000 customers (Town of Apex Public Works and Utilities Department, 2014, and Town of Cary Public Works and Utilities Department, 2014). Cary and Apex each also provide sewer service to large parts of western Wake County. The Town of Cary currently operates two WWTPs, with a combined capacity of about 25 MGD and current daily demand at about 12 MGD. One of these facilities is just south of the study area in the West Lake Road area. The Town of Apex operates a WWTP near the western terminus of the project. It has a capacity of 3.6 MGD, with current daily demand at about 2.4 MGD.

A new Western Wake Regional WWTP opened in the northwestern corner of the FLUSA in 2014. It will serve Cary, Apex, Holly Springs, and Morrisville (Western Wake Partners, 2011). It will ultimately increase the region's wastewater treatment capacity by 18 MGD.

Holly Springs receives its public water supply from Harnett County and is also able to purchase water supply from the City of Raleigh. Holly Springs operates a wastewater treatment plant and provides wastewater treatment to over 25,000 residents, with the capacity to treat 6 MGD of wastewater (Town of Holly Springs Public Utilities Department, 2014). This WWTP currently treats an average of about 1.5 MGD. The Holly Springs service areas includes the western part of the study area.

The Town of Clayton purchases its water supply from Johnston County (Town of Clayton, 2013a). Clayton provides water distribution and sewer service to areas in the eastern portion of the FLUSA. Johnston County maintains a public water system, but most of its service area is outside the FLUSA (Johnston County, 2013). Clayton operates the Little Creek Water Reclamation Facility, which has a treatment capacity of 2.5 MGD and a current average demand of about 2 MGD. Clayton augments its wastewater treatment capacity through agreeements with the City of Raleigh and Johnston County, bringing the town's total available wastewater treatment capacity to about 4 MGD (Town of Clayton, 2013a). Johnston County owns and operates the Central Johnston County Wastewater Treatment Plant, a 9.5 MGD capacity facility in Smithfield; it has a current average demand of about 5 MGD.

To the south, Harnett County provides water to the Town of Angier and various water purveyors in Wake and Johnston counties. The county owns and operates the Harnett County Regional Water Treatment Plant which uses the Cape Fear River as the system's water source. The raw water intake facility on the Cape Fear River has a current average demand of about 12 MGD and is currently being expanded, which will increase the amount of available capacity from 27 MGD to 42 MGD. Harnett County also owns two active wastewater treatment plants with a combined capacity of 20.6 MGD and a current average demand of about 10 MGD (Harnett County, 2014).

In general, development in unincorporated areas, which comprise large parts of the FLUSA between US 401 and US 64/264 Bypass, is limited to septic systems and well water.

Local government staff interviewed for this project generally indicate that there is ample water and sewer capacity in the FLUSA to support continued growth in the area. **Section 3.5** lists planned infrastructure extensions and expansions of water and sewer service in the FLUSA.

## 5.5 NOTABLE FEATURES

Resources including NC OneMap, NCDOT GIS data, and local GIS resources were used to assemble an inventory of notable features in the FLUSA. These include human environmental features and natural environmental features. Notable features in the FLUSA are shown on **Figure 6**.

### *5.5.1 Human Environment*

#### 5.5.1.1 Communities

The FLUSA includes portions of three counties (Wake, Johnston, and Harnett) and all or part of nine cities and towns: Raleigh, Cary, Apex, Holly Springs, Fuquay-Varina, Garner, and Knightdale in Wake County; Clayton in Johnston County, and Angier in Harnett County. There are hundreds of established neighborhoods located within the FLUSA. These include areas such as residential subdivisions, rural communities near crossroad areas, and communities with strong ties to local churches.

#### 5.5.1.2 Parks and Recreational Resources

There are numerous existing and planned parks and recreational facilities in the FLUSA. A list of these facilities in in **Appendix C**.

### *5.5.2 Natural Environment*

#### 5.5.2.1 Water Resources

Most of the FLUSA lies within the Neuse River basin, with a portion of the western and southern edges of the FLUSA in the Cape Fear River basin. The Neuse River runs roughly north to south through Wake and Johnston counties, extending across the eastern edge of the study area. There are three general watersheds in the Neuse River basin within the FLUSA: Middle Creek and its tributaries, Swift Creek and its tributaries, and the Neuse River and its tributaries. Middle Creek extends across the southwest corner of the study area and includes Sunset Lake near Holly Springs. Swift Creek traverses the study area from the southern outskirts of Cary, southeast to near the intersection of NC 42 and the Clayton Bypass (US 70 Bypass). Two large lakes are part of the Swift Creek watershed, Lake Wheeler and Lake Benson; both of these lakes supply drinking water to the area. White Oak Creek, a tributary of Swift Creek, traverses the study area from north to south, east of I-40.

Middle Creek and Swift Creek within the immediate project area are included on the Draft 2014 North Carolina 303(d) list, in which NCDENR identifies impaired waters as required under Section 303(d) of the Clean Water Act of 1972 (NCDENR, 2014). Middle Creek, which is classified as a Class C watershed with nutrient sensitive waters, is listed as impaired from south of US 1 to the backwaters of Sunset Lake due to fair benthic integrity. From the dam at Sunset Lake to just upstream of US 401, Middle Creek is listed as impaired due to poor fish community. Terrible Creek, a tributary of Middle Creek, is also identified as an impaired water between Johnson Pond and Middle Creek due to fair benthic integrity.

Several other waterways in the Neuse River basin are also included on the North Carolina 303(d) list. Crabtree Creek west of the Neuse River, near US 64/264 Bypass, is listed as impaired due to a fish tissue advisory of potential polychlorinated biphenyl (PCB) contamination. Walnut Creek west of the Neuse River, also near US 64/US 264 Bypass, is listed as impaired due to a fish tissue advisory of potential PCB contamination and fair benthic integrity. Also in this area, Beddingfield Creek from its source to the Neuse River is listed as impaired due to fair benthic integrity. Little Creek in Johnston County is listed as impaired from its source, near Clayton, to Swift Creek, about eleven miles south, due to fair benthic integrity. The Neuse River itself between Crabtree Creek and Auburn Knightdale Road is listed as impaired due to a fish tissue advisory of potential PCB contamination.

Kenneth Creek and Neills Creek, which are within the Cape Fear River basin in Harnett County, are also included on the North Carolina 303(d) list. Kenneth Creek is listed as impaired from the Wake-Harnett county line to Neills Creek, about four miles south, due to fair benthic integrity, low pH, and low dissolved oxygen. Neills Creek is listed as impaired from its source to the southern boundary of the FLUSA, near Angier, due to poor benthic integrity.

Swift Creek is classified as a Water Supply-III watershed with nutrient sensitive waters (WS-III NSW). As described in **Section 5.5.1**, development in the Swift Creek watershed area is limited by watershed protection policies within Wake County's *Swift Creek Land Management* Plan (1990). Between the Lake Wheeler dam and Lake Benson, Swift Creek is listed as impaired due to poor benthic integrity. The twenty mile stretch of Swift Creek from the dam at Lake Benson downstream to Little Creek is listed as impaired due to fair benthic integrity.

The Cape Fear River within the FLUSA in Harnett County is classified as a Water Supply-IV watershed (WS-IV). Harnett County maintains development restrictions in this watershed area.

One of the water bodies in the FLUSA is classified as a High Quality Water (HQW). It is Hector Creek, in Harnett County at the southwestern corner of the FLUSA. None of the water bodies in the FLUSA are classified as Outstanding Resource Waters.

#### 5.5.2.2 Protected Species

There are four federally protected species documented within Wake and Johnston counties: the Red-cockaded woodpecker (*Picoides borealis*), Michaux's sumac (*Rhus michauxii*), the Dwarf wedgemussel (*Alasmidonta heterodon*) and the Tar River spinymussel (*Elliptio steinstansana*). Two additional federally protected species are documented within Harnett County: the Cape Fear shiner (*Notropis mekistocholas*) and the Rough-leaved loosestrife (*Lysimachia asperulaefolia*).

The Dwarf wedgemussel is found throughout Swift Creek in the FLUSA; however, the portion of Swift Creek downstream of the Lake Benson dam has been identified by USFWS as particularly important for the long-term survival of this species in the region (USFWS, 1993). In the small segment of Swift Creek between Lake Wheeler and Lake Benson, Dwarf wedgemussel individuals would be isolated by the Lake Benson dam from the downstream population of the species, limiting the ability of this part of Swift Creek to influence long-term survival of the species in the broader Swift Creek watershed.

#### 5.5.2.3 Natural Heritage Program Natural Areas

There are several sites in the FLUSA that are designated by the North Carolina Natural Heritage Program (NHP) as NHP Natural Areas (North Carolina NHP, 2003a and 2003b). While NHP Natural

Area designation doesn't afford any special protection, it does indicate that the designated site is unique from an ecological perspective. NHP Natural Areas include the following:

Blue Pond Salamander Site – In the Sunset Lake area in Holly Springs, this is one of Wake County's most important amphibian breeding sites.

Middle Creek Aquatic Habitat – This designation covers Middle Creek from the area near Sunset Lake Road in Holly Springs to Smithfield in Johnston County. It is significant because it supports several rare aquatic species.

Middle Creek Bluffs and Floodplain – This is a segment of the Middle Creek system in the area between Holly Springs and Fuquay-Varina. It features a wide floodplain and slopes supporting an extensive mesic mixed hardwood forest natural community and good quality alluvial forest communities.

Shearon Harris Longleaf Pine Forest – This area near Harris Lake in western Wake County is the only remaining example of Piedmont Longleaf Pine Forest in the region.

Utley Creek Slopes – This area is also near Harris Lake in western Wake County. It contains an extensive Dry Oak-Hickory Forest natural community, rock outcrops with caves along Utley Creek, and occurrences of the rare plant species Virginia spiderwort.

Hollemans Crossroads Salamander Pools – In southwestern Wake County near Fuquay-Varina, this area consists of two small vernal pools that serve as breeding habitat for several species of amphibians, including four-toed salamander.

Hollemans Crossroads Slopes – Near Harris Lake in southwestern Wake County, this area consists of narrow ridges and ravines containing mature hardwood forests over slightly acidic to nearly circumneutral soils in the Triassic Basin. It contains a rare Wake County example of Basic Oak-Hickory Forest.

Jim Branch/Buckhorn Creek Forests – Near Harris Lake in southwestern Wake County, these areas feature fairly rich hardwood slopes and a moderate-size nesting colony of great blue herons.

Yates Millpond – On Lake Wheeler Road, this is an old millpond with a floodplain above it. A large population of the rare plant species Carolina least trillium is found here.

Middle Creek Amphibolite Slope – This is an area along Middle Creek in Johnston County featuring an outcropping of amphibolite, a metamorphic rock rare in Johnston County.

Middle Creek Floodplain Knolls – This site is comprised of two knolls featuring an unusual Mesic Mixed Hardwood Forest community, with an abundance of Silky camellia in one area. The slopes of the knolls contain notable plant species such as Smallflower PawPaw, Mountain holly, and Bigleaf Snowbell.

Swift Creek Magnolia Slopes – This is an area along Swift Creek near Cleveland Road in Johnston County featuring magnolia trees.

Neuse River (Clayton) Forests – This is an area along the Neuse River south of the US 64/US 264 Bypass. It contains several types of forested natural communities.

Swift Creek Aquatic Habitat – This designation covers Swift Creek from downstream of Lake Benson to Smithfield in Johnston County. It is significant because it supports several rare mussel species, including the federally protected Dwarf wedgemussel.

Walnut Creek Sumac Site – Near Barwell Road in southeastern Raleigh, this area supports one of North Carolina's best known populations of the federally protected Michaux's sumac.

Walnut Creek Bottomland Forests – In southeastern Raleigh, this area contains a number of moderate to large beaver ponds.

Marks Creek Floodplain – Near Wendell, this area consists of beaver ponds, with a portion dammed to form Lake Myra. The State Species of Special Concern least brook lamprey had been found in Marks Creek. The federally protected Michaux's sumac occurs within this site and a series of granite flatrocks have been found within the upland areas of the site.

## 5.6 DEVELOPMENT REGULATIONS AND LOCAL PLANS

### *5.6.1 Land Use Plans and Regulations*

The following sections include a summary discussion of relevant planning documents and initiatives for each jurisdiction in the FLUSA.

**Wake County**. The *Wake County Land Use Plan*, last updated in March of 2004, establishes policies designed to influence the timing, type, location, and quality of future development in Wake County's planning jurisdiction. These policies are intended to accommodate growth of urbanized areas within or adjoining the County consistent with the Plan's goals and strategies. Much of unincorporated Wake County is within the extraterritorial jurisdictions (ETJs) or the urban service areas (USAs) of area municipalities (including Fuquay-Varina, Holly Springs, Garner, and Knightdale), and for that reason those areas are not covered by Wake County future land use planning. The Land Use Classifications and General Classifications maps in the Wake County Land Use Plan, which show the limits of municipal ETJs and USAs, are shown in **Appendix D**. The *Wake County Land Use Plan* does, however, cover areas outside these municipal ETJs and USAs. The Plan includes several small area land use plans.

Three small area land use plans cover areas within the Complete 540 FLUSA. Maps showing planned land uses designated in each of these are shown in **Appendix D**. The East Raleigh-Knightdale Area Land Use Plan (ALUP) identifies a Special Transportation Corridor along a representative corridor for Phase II of the Complete 540 project, east of I-40. Activity Centers, intended for mixed and higher density land uses, are designated along this corridor at the Rock Quarry Road/Auburn-Knightdale Road area and near Battle Bridge Road. The Fuquay-Varina–Garner ALUP identifies areas along the protected corridor for Phase I, west of I-40, and a representative corridor for Phase II as a Special Highway Overlay District. Mixed land uses, including higher density residential, commercial, and industrial, are encouraged at activity centers near potential interchanges along these corridors. The remainder of the area is mainly planned for lower density residential uses. The Southwest ALUP designates mainly low-density residential land uses in the FLUSA, with areas closer to Harris Lake designated for preservation and very limited development. The *Wake County Land Use Plan* also includes a special Land Management Plan for Swift Creek. The *Swift Creek Land Management Plan*, adopted in 1990, identifies the Swift Creek basin's Water Supply Watershed Critical Area and

watershed buffer areas, within which development activities are limited, and appropriate low-density land use categories for the surrounding areas. A copy of the Land Use Management Plan map is in **Appendix D**. The Plan also sets impervious surface limits of 6 percent in critical areas and 12 percent in non-critical areas. Critical areas are those closest to the water supply source.

Wake County also maintains a *Unified Development Ordinance* (UDO), adopted in 2006. Most of the area under Wake County's jurisdiction within the FLUSA is zoned for low-density residential uses, with a special watershed residential designation corresponding to the Swift Creek Critical Watershed Area. Only very low-density residential development of no more than one dwelling unit per two acres is permitted in the Critical Watershed Area and of no more than one dwelling unit per acre in the Non-Critical Watershed Area. Development in these areas is required to include stormwater best management practices (BMPs) and to limit impervious surface coverage. There is also a separate Water Supply Watershed Non-Critical Area zoning designation for areas between Rand Road and White Oak Road in southern Garner. Densities and impervious surface coverage are similarly limited by this designation.

The UDO also sets standards for riparian buffers along surface waters in the Neuse River and Cape Fear River basins. These standards require undisturbed vegetative buffers of 100 feet on each side of intermittent and perennial streams and of 30 feet around other water bodies. The UDO also designates flood hazard areas based on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. Development within flood hazard areas is limited accordingly with respect to site planning, construction methods and materials, and drainage.

As part of the mitigation process associated with the Clayton Bypass project, completed in 2008, Wake County entered into a Memorandum of Understanding (MOU) with NCDOT and USFWS. In the MOU, Wake County agreed to prohibit fill and new development in floodways or floodway fringes on lots created after May 19, 2003, in the Swift Creek area. The MOU also limits nitrogen export load from new developments to 3.6 pounds per acre per year. Residential development exceeding a nitrogen export load of 6 pounds per acre per year and other development exceeding a load of 10 pounds per acre per year must implement stormwater control measures to achieve the threshold loads. The MOU also generally limits peak stormwater runoff from new development to no greater than the 1-year, 24-hour storm event. As part of the mitigation measures, Wake County also created a resource conservation overlay zoning district in the Swift Creek area where 100-foot buffers are established along perennial streams.

**Raleigh.** The City of Raleigh adopted a new *2030 Comprehensive Plan* in November of 2009. The Plan is the City's key policy document shaping all aspects of the community's physical development and influencing related economic and social issues. One of the goals of the Plan is to enhance land use and transportation coordination. The Complete 540 project is not specifically mentioned in the Plan, although the Plan does identify an objective of coordinating transportation planning and funding with neighboring jurisdictions and local transportation agencies so that sufficient right-of-way for future transportation corridors may be preserved. The Plan includes a Future Land Use Map; a copy of the map is in **Appendix D**. Along the northern edge of the FLUSA, west of I-40, future land use designations are a mix of institutional, commercial, residential, and rural categories. Along the east side of I-40, the map designates commercial and industrial uses. Directly south of US 64/264 Bypass, the map designates commercial uses. The remainder of the area under Raleigh's planning jurisdiction within the FLUSA is designated mainly for low-density and rural residential uses and public facilities.

A 428-acre tract known as Randleigh Farm, on Battle Bridge Road, south of the Neuse River, is jointly owned by the City of Raleigh and Wake County. The City and County are developing plans to create

a mixed-use community on this site, with planned uses including parkland, two public schools, private development, and an environmental education center.

The City of Raleigh adopted a new *Unified Development Ordinance* (UDO) in 2013. Along major thoroughfares under Raleigh's jurisdiction within the FLUSA, zoned uses include industrial and commercial development. The remainder of the area between I-40 and the Town of Garner is zoned mainly for residential uses. East of I-40, low-density residential is the most common zoned use.

The UDO also sets standards for riparian buffers along surface waters in the Neuse River basin, which follow State-mandated riparian buffer rules, described in **Section 5.6.2.2**. In addition, any development greater than 12,000 square feet in area requires submittal of a sediment and erosion control plan. The UDO also designates flood hazard areas based on FEMA Flood Insurance Rate Maps. Development within flood hazard areas is limited accordingly with respect to site planning, construction methods and materials, and drainage.

**Cary.** The Town of Cary is currently preparing a new comprehensive plan; if the new plan is adopted before the Draft EIS for the Complete 540 project is published, it will be documented in the Draft EIS. The Town's existing *Comprehensive Plan* is a compilation of several separate plans and elements that together describe the Town's official vision for Cary's future. The plan addresses issues including growth, land use, transportation, and housing. The Town of Cary *Land Use Plan*, adopted in 1996 and last amended in 2009, is the land use component of the Comprehensive Plan. The Land Use Plan presents the Town's official policy regarding the form and pattern of future development. One of its functions is to direct provision of public infrastructure. The Land Use Plan Map identifies the protected corridor for Phase I of the Complete 540 project as "Planned Outer Loop Right of Way."

Much of the area in Cary's planning jurisdiction within the Complete 540 FLUSA is already developed, and much of the remaining area is already platted for development. Development in this part of Cary consists mainly of large, low-density residential subdivisions, with commercial and office land uses concentrated near US 1. A neighborhood activity center is planned for the area near a potential interchange between the protected corridor and Bells Lake Road; neighborhood-oriented retail development would be located here. A copy of Cary's Land Use Plan Map is in **Appendix D.**

Cary adopted its *Land Development Ordinance* in 2003. The small area inside Cary's municipal limits within the Complete 540 FLUSA is zoned according to its current uses (mainly residential, with recreation designated for the park area). The *Land Development Ordinance* also requires 100-foot vegetative buffers on all perennial and intermittent streams. The *Land Development Ordinance* also designates Special Flood Hazard Areas based on FEMA Flood Insurance Rate Maps. Development within these areas is limited accordingly with respect to site planning, construction methods and materials, and drainage.

**Apex**. The Town of Apex adopted *Peak Plan 2030: The Apex Comprehensive Plan* in 2013 with a goal of presenting a vision of the community's future to inform development decisions. The Plan includes a map illustrating proposed land uses in the Town in 2030; a copy of this map is in **Appendix D**. The map designates several activity centers—key areas to accommodate higher-density, mixed-use growth. One of the proposed activity centers is just north of the western terminus of the Complete 540 project at NC 55, corresponding to the Veridea development, a very large planned and approved mixed-use project. It is anticipated to include 10 million square feet of office development, 3.5 million square feet of commercial space, and 8,000 residential units. The Plan designates additional office and industrial uses for the areas south of US 1, west of existing NC 540, with low-density residential development designated closer to Harris Lake.

Apex adopted its *Unified Development Ordinance* in 2000 and has updated it regularly since then. The Veridea area is zoned for Sustainable Development, which permits a mix of uses subject to the requirements of a Sustainable Development Plan prepared for the development. Surrounding areas are zoned for light industrial, commercial, and other similar uses. The Town's UDO also designates all of its municipal area within the Complete 540 FLUSA as a Secondary Watershed Protection Overlay District. Proposed developments in this area must submit a development plan that complies with a range of requirements, including impervious surface area standards, structural BMPs for stormwater, and vegetative buffers of an average width of at least 100 feet along perennial streams and of at least 50 feet along intermittent streams. The UDO also designates a Flood Damage Prevention Overlay District for flood hazard areas as designated by FEMA Flood Insurance Rate Maps. Development within flood hazard areas is limited accordingly with respect to site planning, construction methods and materials, and drainage.

**Fuquay-Varina.** The Town has a *Comprehensive Land Use Plan*, adopted in 2005 and amended regularly as needed. The Plan seeks to guide future development within the Town's Urban Services Area (USA). The plan includes a Land Use Map, which designates desired future land uses in the USA; a copy of this map is in **Appendix D**. Higher density residential uses, along with commercial and industrial uses, are designated for areas closer to US 401 and NC 55. Other areas are generally designated for low-density residential uses. The alignment of the protected corridor for the Complete 540 project is shown as a recommended major thoroughfare on the Land Use Map. As part of its future land use planning, Fuquay-Varina has identified seven Preferred Growth Areas (PGAs), where the Town has made or intends to make investments in infrastructure in support of nonresidential mixed-use growth or residential growth. Most of the area within the Town's planning jurisdiction along or west of US 401 is within a PGA. A copy of the PGA map is also in **Appendix D**.

The Official Zoning Map for Fuquay-Varina shows that much of the area within the existing municipal limits is zoned for residential uses, with lower densities northeast and south of central Fuquay-Varina. Commercially-zoned land is mainly concentrated downtown and along US 401 and NC 55. Fuquay-Varina does not have its own stormwater regulations, but State-mandated riparian buffer rules requiring 50-foot buffers along each side of perennial and intermittent streams (**Section 5.5.2.2**) apply to development in the town.

**Garner**. Garner's *Comprehensive Growth Plan* (2006) is intended to provide a long-range vision for land development and redevelopment opportunities, community infrastructure decisions and community image. Water quality issues in the Lake Benson area are especially prominent. A map of designated future land uses is in **Appendix D.** The Plan is organized around several activity centers, where commercial, higher density residential, and mixed uses can be located. Farther away from the central part of each activity center, lower density residential development is the planned future land use. The Plan also prioritizes growth areas for targeted infrastructure investment. The highest priority growth area is the White Oak area, east of NC 50, south of US 70, and west of White Oak Road. Downtown Garner is also a priority area for investment for redevelopment and revitalization. The Plan identifies future activity centers at the potential interchanges along the protected corridor for Complete 540 at US 401 and Old Stage Road. The area south of Lake Benson is identified as part of the Wake County Land Management Plan for Swift Creek.

Garner adopted its *Unified Development Ordinance* in 2003. The Official Zoning Map concentrates much of the town's commercial and industrial zoning near US 70 and I-40. This area has a fairly large concentration of industrial and more intense commercial development as compared to the rest of the FLUSA for Complete 540. The area between US 70 and Timber Drive is mainly zoned for higher

density residential development. West and south of Timber Drive, lower density residential zoning is more prevalent. The UDO identifies Lake Benson Conservation Overlay District along the north side of Lake Benson and a Swift Creek Conservation Overlay District below Lake Benson. These two districts limit uses, densities, and impervious surface coverage. The UDO also includes stormwater management regulations, which establish buffer setbacks from Lake Benson and 50-foot buffers along streams, measured from the edge of the 100-year floodplain. The UDO also includes floodplain management regulations that limit development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage.

As a conservation measure associated with the Clayton Bypass project, completed in 2008, Garner also entered into an MOU with NCDOT and USFWS. In addition to affirming existing regulations, the MOU established limits for nitrogen export load from new developments to 3.6 pounds per acre per year. Residential development exceeding a nitrogen export load of 6 pounds per acre per year and other development exceeding a load of 10 pounds per acre per year must implement stormwater control measures to achieve the threshold loads. Garner was a signatory of the 1990 *Swift Creek Land Management Plan* and adheres to the rules it established, including the impervious cover limits of 6 percent and 12 percent for critical and non-critical areas, respectively.

**Holly Springs**. *Vision Holly Springs* is the Town of Holly Springs comprehensive plan. It was last revised in 2008. The Plan seeks to establish and enhance a town-wide identity, encourage economic development, and promote livability. It establishes a future land use strategy, including a map of planned future land uses. A map of designated future land uses is in **Appendix D.** The Plan identifies regional centers, called Community Growth Areas, for mixed use development at higher densities along major transportation routes through the town to ensure the best possible access while minimizing negative impacts on area residential development. One of these regional centers, surrounding the intersection of Kildaire Farm Road and Holly Springs Road, includes the potential Holly Springs Road interchange on the protected corridor for Phase I of the Complete 540 project. Other regional centers include central Holly Springs, areas on Avent Ferry Road and NC 55 in southern Holly Springs, and the area near a planned future interchange on US 1 at Friendship Road in northwestern Holly Springs. Outside of these regional centers, planned future land uses are mainly residential, with office and commercial uses designated along the south side of US 1 and along Green Oaks Parkway, east of NC 55 Bypass.

Holly Springs adopted its *Unified Development Ordinance* in 2002 and has updated it regularly. The Town's Zoning Map designates commercial and office zoning categories at the intersection of Holly Springs Road and Kildaire Farm Road, and also at the anticipated location of the Holly Springs Road interchange on the protected corridor for Complete 540. Commercial, office, and industrial zoning is also concentrated along NC 55 Bypass and along NC 55. Existing and platted residential subdivisions, which are mainly east of NC 55 and north of Bass Lake Road, and along Avent Ferry Road, are zoned for low to medium residential development. Most of the remaining rural land, mainly in southern Holly Springs, is zoned for low-density residential development.

Holly Springs maintains stormwater management controls under the NPDES Phase II program. Beyond State-mandated riparian buffer rules in the Neuse River basin (**Section 5.6.2.2**), the Town's stormwater controls also include required 100-foot undisturbed buffers around Bass Lake. Developers are required to implement stormwater BMPs and to demonstrate that proposed developments will not increase nutrient loading. Holly Springs adopted its *Flood Damage Prevention Ordinance* in 2006, limiting development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage.

**Knightdale.** The Town of Knightdale's *2027 Comprehensive Plan*, adopted in 2003 and revised in 2011, is a direct response to the community's rapid growth, creating the building blocks for the Town's future development. It includes a section outlining the Town's vision for its future and sections addressing individual topics including land use and transportation. Knightdale's plan is oriented around design features, rather than land use types. Maps showing the planned design districts and the locations of planned activity centers are shown in **Appendix D**. The portion of Knightdale within the Complete 540 FLUSA is mainly designated as either part of the Countryside Design District, which is rural in character, or the Neighborhood Design District, which is suburban residential in character. Urban Village Design Districts, which are more urban and mixed-use in character, are designated near the interchange on the US 64/US 264 Bypass at Hodge Road and near the intersection of Smithfield Road and Poole Road.

Knightdale adopted its *Unified Development Ordinance* in 2005. The Town's Zoning Map designates most of the area within the Complete 540 FLUSA for low-density residential uses, with mixed use, commercial and industrial uses designated in the area surrounding the intersection of Hodge Road and Poole Road. Beyond State-mandated riparian buffer rules in the Neuse River basin (**Section 5.6.2.2**), the Town's UDO also requires development to include stormwater best management practices (BMPs) and to limit impervious surface coverage. The UDO also includes floodplain management regulations which limit development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage.

**Wendell.** The Town of Wendell's comprehensive plan, called *The Town Plan of Wendell*, was adopted in 2007. A map of designated future land uses included in the Plan is in **Appendix D.** A very small portion of Wendell's planning jurisdiction is within the Complete 540 FLUSA. It corresponds to a part of the planned Wendell Falls development. Wendell Falls is an approved mixed-use development intended to include 4,000 residential units and 100 acres of retail space. It also includes a school and designated open space along Lake Myra and Marks Creek. The Town's *Unified Development Ordinance*, adopted in 2010, assigns a low-density residential zoning category to all of the area in Wendell's planning jurisdiction that is within the Complete 540 FLUSA. The UDO identifies Riparian Buffer Zones and Flood Protection Zones. These designations limit development, require minimization of impervious cover, and require stormwater BMPs.

**Johnston County.** The *Johnston County 2030 Comprehensive Plan*, adopted in March 2009, is organized around seven goals for County growth including managing growth and infrastructure, expanding economic opportunities, providing housing and protecting neighborhoods, preserving farmland and rural character, protecting environment and cultural sites, enhancing mobility, and intergovernmental coordination. The Plan indicates that the County's growth patterns have typically been driven by the location of major transportation facilities and that the County will continue to support key roadway improvements. While promoting future growth, the County also seeks to protect area farming operations, both for community character and economic benefits. A copy of the map included in the Plan is in **Appendix D**. The Plan designates most of the area within the FLUSA for Complete 540 as a Primary Growth Area. The exceptions are the area west of Smithfield and south of Swift Creek and the far western corner of the County. Within the Primary Growth Area, the Plan identifies commercial activity nodes at interchanges on I-40 and on major east-west roadways near I-40, such as NC 42 and NC 210. The Plan also anticipates that the County will eventually provide water and sewer service to much of the Primary Growth Area, but the County's policy is to extend water and sewer service only to planned unit developments (PUDs) or to commercial/industrial areas.

The Johnston County *Land Development Code*, adopted in 2000, designates most of the area in the FLUSA for low-density residential or rural land uses. The County developed an Environmentally Sensitive Area (ESA) zoning designation that limits impervious cover and nitrogen loading rates near water bodies. The ESA was first established around Little Creek from US 70 Bypass to Swift Creek. As part of the mitigation process associated with the Clayton Bypass project, completed in 2008, Johnston County also entered into an MOU with NCDOT and USFWS. In this MOU, the county agreed to expand the boundaries of its ESA; the ESA now includes the Swift Creek watershed area. Stormwater restrictions within the ESA limit impervious coverage to 12 percent in residential areas and 50 percent in non-residential (versus 15 percent and 60 percent, respectively, outside of the ESA). The MOU also established limits for nitrogen export load from new developments to 3.6 pounds per acre per year. Based on the MOU, the County also prohibits development within flood hazard areas. A 100-foot undisturbed riparian buffer is required along perennial streams in the ESA, which Johnston County has defined as the main stem channels of Swift Creek, White Oak Creek, Little Creek (from US 70 to Swift Creek) and Little River (from county line to NC 39). All other streams in the ESA do not require the increased 100-foot buffer, but do fall under Neuse River buffer requirements.

**Clayton.** The Town of Clayton adopted a *Strategic Growth Plan* in March 2008 to prepare for increasing population growth and its effects on transportation, open space, and other community features. The Plan addresses the incorporated town as well as its extraterritorial jurisdiction, which extends approximately two miles around the town limits. The Plan indicates that much local traffic congestion is attributable to the many Clayton residents that commute to jobs in Raleigh and other surrounding areas. The Plan includes a map designating proposed land uses within the town and its extraterritorial jurisdiction; a copy of this map is in **Appendix D**. The Complete 540 project is shown as a Proposed Freeway on this map. The map designates commercial and industrial uses along US 70 and along NC 42 on the west side of town. Clayton has also developed a small area plan for the area around the interchange on the Clayton Bypass at NC 42. The new Johnston Health Clayton medical center is located just east of this interchange, and the County anticipates further development of this area as a major mixed use center, including higher density residential uses, offices, hotels, and retail developments. Clayton also plans to prepare a small area plan for the interchange area between the Clayton Bypass and US 70 Business, south of downtown Clayton. The Town envisions this area developing as a commercial/research area as an extension of the biopharmaceutical companies currently present there. Clayton is developing concepts and plans for extension of water and sewer service to both of these interchange areas along the Clayton Bypass.

Clayton adopted a *Unified Development Code* in 2005. The Official Zoning Map designates commercial and office zoning along US 70 and NC 42, industrial zoning along US 70 south of downtown, and residential zoning in much of the rest of the town. It also designates planned mixed-use developments at the northern end of town (Riverwood area) and the area north of NC 42 and east of I-40. Clayton maintains stormwater management controls under the NPDES Phase II program; developers are required to implement stormwater BMPs and to demonstrate that proposed developments will not increase nutrient loading. State-mandated Neuse River buffer requirements are also applicable (**Section 5.5.2.2**). Clayton adopted its *Flood Damage Prevention Ordinance* in 2005, limiting development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage.

**Harnett County.** Harnett County last updated its *Land Use Plan* in 1999. This plan guides future land use decisions in the County, and it includes a map designating general future land use categories, as shown in **Appendix D**. Within the Complete 540 FLUSA, the County designates the area west of US 401 for agriculture and low-density residential uses. A rural development node is designated

around the intersection of US 401 and NC 210, with compact mixed use designated along US 401 north of this area. The plan designates the area east of US 401 for medium density residential uses.

Zoning designations in the part of Harnett County within the Complete 540 FLUSA are generally low-density residential categories. The County's *Unified Development Ordinance*, adopted in 2011, also designates conservation zones along major waterways. For the creeks in the FLUSA, the required conservation zones are designated as 200 feet from each side of the main channel. Within these conservation zones, development requires 100-foot setbacks from the creeks. Within the Cape Fear River Water Supply-IV Watershed, 100-foot minimum stream buffers are also required. Harnett County also maintains stormwater management controls under the NPDES Phase II program; developers are required to implement stormwater BMPs. The UDO also limits development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage.

**Angier.** Harnett County assists Angier in its planning and zoning functions. The Town of Angier *Land Use Plan* was last updated in 2007. A copy of the Plan's future land use map is in **Appendix D**. The Plan designates low-density residential uses for most areas within the town's jurisdiction, with medium density residential and commercial uses in central Angier and near the Wake County border. The Town's Zoning Map, as codified in the *Unified Development Ordinance* (2010), includes commercial and office designations in central Angier and along US 401, with medium density residential designations closer to US 401, and low-density residential designations farther from US 401. The UDO limits development within special flood hazard areas as designated by FEMA Flood Insurance Rate Maps, with respect to site planning, construction methods and materials, and drainage. Development in Angier is subject to stormwater management controls under the Harnett County NPDES Phase II program.

### *5.6.2 Environmental Regulations*

#### 5.6.2.1 NPDES Regulations

In 1972, the NPDES program was established under the authority of the Clean Water Act. Phase I of the NPDES stormwater program was established in 1990. It requires NPDES permit coverage for large or medium municipalities with populations of 100,000 or more. In North Carolina, there are six Phase I communities, including the City of Raleigh. As a Phase I community, Raleigh was required to develop and implement a citywide stormwater management program.

The Phase II program under NPDES extends permit coverage to smaller communities (with populations under 100,000) and public entities that own or operate a muncipal separate stormwater sewer system (MS4). This program requires these communities to apply for and obtain a NPDES permit for stormwater discharge. To obtain the permit, the community must meet one of two conditions:

1) The MS4 is located in an urbanized area as determined by the latest decennial United States Census. If the MS4 is not located entirely within an urbanized area, only the portion that is within the urbanized area is regulated.

2) The MS4 is located in an urbanized area as determined by the latest decennial United States Census. If the MS4 is not located entirely within an urbanized area, only the portion that is within the urbanized area is regulated.

The following jurisdictions are Phase II stormwater permittees: Apex, Cary, Clayton, Fuquay-Varina, Garner, Knightdale, Holly Springs, Wendell, Wake County, Johnston County, and Harnett County.

#### 5.6.2.2 Watershed Regulations

Development within the Neuse River basin is subject to the Neuse River Buffer Rules, administered by the North Carolina Division of Water Resources. These rules require development within the Neuse River basin to maintain minimum 50-foot buffers along each side of perennial and intermittent streams; as described in **Section 5.6.1**, several jurisdictions in the FLUSA have more stringent buffer requirements. These more stringent buffer requirements also apply in the Cape Fear basin for Holly Springs and Wake County.

As of 1998, all waters in the Neuse River basin have been subject to the Neuse Nutrient Sensitive Waters rules, a set of permanent rules designed to address eutrophication in the Neuse River basin (North Carolina Environmental Management Commission, 1998). These rules include the Neuse Agriculture Rule, which requires agricultural uses to implement BMPs such that a collective nitrogen loading reduction goal can be achieved. The Neuse Nutrient Strategy also includes the Neuse Stormwater Rule, which required certain local governments, including Cary, Garner, Raleigh, Wake County and Johnston County to adopt local stormwater programs, which set specific nutrient export goals for new development projects. Under this rule, new development cannot exceed nitrogen loads of 3.6 pounds per acre per year and post-development peak flow rates cannot be any greater than flows from pre-development conditions for the 1-year 24-hour storm.

The Swift Creek Water Supply Watershed Critical Area is located in the northern part of the FLUSA; it is a water supply watershed encompassing Lake Wheeler, Lake Benson, and Swift Creek between these two lakes. As described in **Section 5.6.1**, development in the Swift Creek watershed area is limited by watershed protection policies within Wake County's *Swift Creek Land Management Plan* (1990). This Plan identifies the Swift Creek basin's Watershed Critical Area and watershed buffer areas, within which development activities are limited to appropriate low-density land use categories for the surrounding areas.

Hector Creek, in Harnett County at the southwestern corner of the FLUSA, is classified as a High Quality Water (HQW). The Cape Fear River within the FLUSA in Harnett County is classified as a WS-IV Watershed; Harnett County maintains development restrictions in this watershed area. Harnett County also maintains required conservation zones for streams in the FLUSA.

None of the streams in the FLUSA on the 303(d) list are impaired due to sedimentation or turbidity. For this reason, NCDOT Design Standards for Sensitive Watersheds are not required to be implemented during project construction for these streams or their tributaries.

## 5.7 AVAILABLE LAND

The FLUSA for the Complete 540 project is approximately 450 square miles (nearly 300,000 acres). Since much of the FLUSA has only begun to develop within the last 10 to 20 years, a large proportion of this 450-square mile area is still available for new development and redevelopment at higher densities and intensities, particularly in southern Wake County, northern Harnett County, and Johnston County. While the recession of 2007-2009 somewhat slowed the pace of residential development in the FLUSA, development activities have resumed in recent years, and local planners expect the pace of development to continue to accelerate as the region's economy continues to improve. There is sufficient available land in the FLUSA to accommodate a continuation of the rapid growth experienced in the Raleigh area over the last three decades.

### *5.7.1 Wake County*

The western part of the FLUSA in Wake County is already fairly developed, with larger parcels of land available for development or redevelopment at higher densities or intensities generally limited to areas west of NC 55 Bypass in the Apex and Holly Springs areas, and areas surrounding central Fuquay-Varina. Near US 1, there is a substantial amount of land zoned for commercial, office, and industrial development. Southwest of central Holly Springs, and in Fuquay-Varina, land near NC 55 and US 401 is also zoned for these higher-intensity uses, with surrounding areas generally zoned for low-density residential development.

Much of the northern part of the FLUSA in Wake County is extensively developed. This area includes parts of Cary, southern Raleigh, Garner, and unincorporated areas between them. Development in these areas would generally be limited to smaller infill parcels and redevelopment of commercial land uses along major roadways.

East of US 401 and south of Lake Benson, there are larger areas of available land. However, development near Lake Benson is limited by the Swift Creek Water Supply Watershed Critical Area development regulations. Development in parts of this area is also somewhat limited by the current lack of water and sewer infrastructure.

Far southern Wake County, near NC 42, is characterized by rural land uses on large parcels. Much of this land could be available for development, but the current lack of water and sewer infrastructure through most of this area is a limiting factor to development.

East of I-40 and US 70, southern Wake County is highly rural, with widespread agricultural and related rural land uses. There is a large amount of available land in this area, although there is fairly limited water and sewer infrastructure currently available in areas farther from existing major roadways.

### *5.7.2 Johnston County*

There is a large amount of available land in the portion of Johnston County in the FLUSA. Along and surrounding major roadways around Clayton, such as NC 42 and US 70, there is a notable amount of developable land that is zoned for mixed land uses, including higher density residential uses, offices, hotels, and retail development. There is also a notable amount of available land near the interchanges on I-40 at NC 42 and NC 210, and near the intersections on NC 50 at NC 42 and NC 210. The Town of Clayton will extend water and sewer infrastructure to planned unit developments (PUDs) in these areas. Most of the southern half of the Johnston County portion of the FLUSA is highly rural, with

widespread agricultural and related land uses. While much of this land could be available to development, the current lack of water and sewer infrastructure through much of this area is a limiting factor to development.

### *5.7.3 Harnett County*

Most of the portion of Harnett County in the FLUSA is characterized by rural land uses, with large parcels that could be available for development. Access to water and sewer infrastructure is generally limited to areas near Angier, but Harnett County utility systems have ample capacity to support potential extension of infrastructure.

## 5.8 MARKET FOR DEVELOPMENT

As shown in Sections 5.1 and 5.2, and as confirmed by discussions with local officials, most of the FLUSA has been experiencing rapid growth, particularly in residential development, and the area is expected to see continued rapid residential growth and increasing non-residential growth. This is because the FLUSA lies within the broader Triangle Region, which has been and continues to be one of the fastest growing metropolitan areas in the nation.

In particular, the western part of the project area (Holly Springs, Fuquay-Varina, Apex, and Cary) has grown rapidly in recent years due to the area's proximity to employment centers in RTP and Raleigh and the availability of developable land. The opening of the existing Triangle Expressway (NC 540) is also influencing the pace of growth in this area. U.S. Census data show that Holly Springs and Fuquay-Varina more than doubled their populations between 2000 and 2010 and local planners report continued brisk growth. Apex also experienced rapid growth during that period, and the portions of incorporated Cary within the FLUSA have also grown rapidly. The Clayton area in Johnston County has also grown rapidly, with Census data showing that the town's population more than doubled between 2000 and 2010. According to Clayton town officials, the opening of the Clayton Bypass in 2008 has influenced growth trends in the Clayton area, creating a land use node at the interchange at NC 42 and stimulating development in the surrounding area.

Population projections point to continued rapid population growth in the area, suggesting that there will continue to be a high demand for development in the FLUSA. As described in Section 5.1, the populations of both Wake and Harnett counties are projected to grow by over 50 percent by 2030, and Johnston County's population is projected to grow by over 30 percent. The Triangle Region is considered to have one of the nation's strongest job markets (Bloomburg Businessweek, 2014; Forbes, 2014; NerdWallet, 2014). Much of the FLUSA is within easy commuting distance of major employment centers in the Triangle Region, suggesting that the area will continue to be attractive for residential development. As residential development within the FLUSA continues, more commercial and office development is likely.

# 6 INDIRECT EFFECTS SCREENING

## 6.1 ICE SCREENING TOOL

The categories listed on the Indirect Land Use Effects Screening Tool, shown in **Table 5**, have been shown to influence land development decisions in numerous areas statewide and nationally. Each characteristic is assessed individually and the results of the table are looked at comprehensively to determine the indirect effects potential of the proposed project. The scope of the project and change in accessibility categories are given extra weight to determine if future growth in the area is related to the project modifications.

**Table 5. Indirect Land Use Effects Screening Tool**

| Rating | Scope of Project | Change in Accessibility | Forecast Population Growth | Forecast Employment Growth | Available Land | Water/ Sewer Availability | Market for Development | Public Policy | Notable Environmental Features | Result |
|---|---|---|---|---|---|---|---|---|---|---|
| **More Concern** | Major New Location | >10 minute travel time savings | >3% annual population growth | Substantial # of new jobs expected | 5000+ acres of land | All services existing / available | Development activity abundant | Less stringent; no growth management | Targeted or threatened resource | |
| ⬆ | X | X | X | | X | | X | | | Indirect Scenario Assessment Recommended |
| ↑ | | | | X | | | | | X | |
| ↔ | | | | | | X | | | | |
| ↓ | | | | | | | | X | | |
| ⬇ | | | | | | | | | | |
| **Less Concern** | Very Limited Scope | No travel time savings | No population growth or decline | No new jobs or job losses | Limited land available | No service available now or in future | Development activity lacking | More stringent; growth management | Features incorporated in local protection | |

**Scope of Project** – The Complete 540 project would be a major new location project, so there is a high potential for indirect land use effects based on this factor.

**Change in Accessibility** – By introducing a new controlled-access facility, the Complete 540 project will dramatically change accessibility within the FLUSA and between the FLUSA and employment and retail centers outside the FLUSA. This will lead to varied but notable travel time savings for those traveling within and through the FLUSA, reducing some travel times by as much as or more than ten minutes. There is a high potential for indirect land use effects based on this factor.

**Forecast Population Growth** – As described in **Section 5.1**, rapid population growth is expected to continue in the Complete 540 FLUSA and in the broader Triangle Region. There is a high potential for indirect land use effects based on this factor.

**Forecast Employment Growth** – As described in **Section 5.2**, reasonably high employment growth is forecast to occur in the FLUSA over the next two decades. There is a moderately high potential for indirect land use effects based on this factor.

**Available Land** – Due to the substantial size of the FLUSA, a detailed calculation of the amount of available land was not performed. As much of the 450-square mile FLUSA is still fairly rural, there is a very large amount of land available to future development and to redevelopment at higher densities and intensities. Well over 5,000 acres of land is available for development, the highest threshold value for this factor. There is a high potential for indirect land use effects based on this factor.

**Water/Sewer Availability** – Water and sewer are generally available in and near the incorporated municipalities in the FLUSA, and there is substantial water and sewer capacity available to support continued population growth in those areas. However, there are also large areas of the FLUSA with no existing water or sewer infrastructure, and local governments with jurisdiction over these areas generally do not anticipate extending infrastructure outside planned growth areas. There is a moderate potential for indirect land use effects based on this factor.

**Market for Development** – As described in **Section 5.8**, the Complete 540 FLUSA has been characterized by rapid population growth in recent decades, which has corresponded with rapid development activity. Population is expected to continue to grow rapidly and accompanying abundant development activity is expected to continue in the next decades. There is a high potential for indirect land use effects based on this factor.

**Public Policy** – Most areas within the FLUSA are subject to fairly stringent comprehensive growth management and development regulations and most of the jurisdictions within the FLUSA indicate that their elected officials support continued adherence to these policies. It is also important to note that most of the jurisdictions in the FLUSA have anticipated the Complete 540 project for many years, tailoring their expectations and plans for future growth around the assumption that the project will eventually be constructed, with the specific expectation that the road's alignment will follow the existing protected corridor between NC 55 Bypass and I-40. There is a moderately-low level of concern about indirect land use effects from the perspective of public policy.

**Notable Environmental Features** – As described in **Section 5.5**, there are numerous notable environmental features in the FLUSA. However, as described in **Section 5.6**, there are also a number of state and local regulations in place to mitigate the effects of development on those features. There is a moderately-high potential for indirect land use effects based on this factor.

Based on this range of factors, the matrix shown in **Table 5** indicates a high level of concern for potential indirect and cumulative effects, warranting further evaluation of indirect and cumulative effects in a Land Use Scenario Assessment, as described in **Section 6.2**. Jurisdictions in the project area agree that this project will be a major driver of development patterns in the coming years, but generally indicate that the project will have greater influence on the timing, location, and intensity of development, rather than the amount of development itself. In other words, there is already a notable market for development in the area and continued growth is anticipated with or without the Complete 540 project.

## 6.2 INDIRECT LAND USE SCENARIO ASSESSMENT

The Indirect Land Use Scenario Assessment evaluates in greater detail the potential for notable indirect and cumulative effects, both with and without the project. It also examines more closely the potential for these effects in specific areas, noting locations where future development is expected to be influenced by the project.

As described in **Section 3.1**, the FLUSA was divided into nine zones to facilitate discussion of specific probable development areas that are most likely to experience land use changes as a result of the Complete 540 project. The discussion below is organized according to these zones. For each zone, the analysis included examination of several factors that will influence the location and intensity of development, including development pressures and regulations, proposed future land use, proximity to transportation infrastructure, availability of water and sewer infrastructure, and proximity to population and employment centers. This included examining how those factors would influence the densities of residential development, characterizing anticipated development as low density (net density of less than four dwelling units per acre), medium density (four to six dwelling units per acre), or high density (greater than six dwelling units per acre). The analysis then evaluated the potential effects of various project alternatives, including the No-Build Alternative (described in **Section 3.3**) in light of these factors. For simplicity, discussion of the analysis groups some of the project's Preliminary Corridor Alternatives together based on location. These groups include:

- Orange and Lilac Corridor Alternatives
- Red Corridor Alternative
- Purple to Blue Corridor Alternative
- Corridor Alternatives east of I-40 (Green, Mint Green, Brown, Tan and Teal) – grouped as "Eastern Alternatives"

It is important to note that the Orange Corridor Alternative between NC 55 Bypass and I-40 generally corresponds to the protected corridor established for the project, described in **Section 2.1**.

The predictions for potential land use change in each zone are the basis for determining the likelihood and potential magnitude of impacts to notable features in the FLUSA.

Potenial effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to. For this reason, the discussion below does not specifically address them in the Zones west of I-40 (Zones 1 through 6).

### *6.2.1 Zone 1*

This zone includes the area north of Ten Ten Road, south of US 1, and west of Lake Wheeler Road. The northeastern boundary is the Swift Creek watershed boundary. This area includes incorporated portions of Cary and Apex and unincorporated areas of Wake County. Much of this area is extensively developed with low-density suburban development and notable commercial development along Tryon Road and the US 1/64 corridor. Swift Creek and its surrounding Watershed Water Supply Critical Area are the key notable natural features in Zone 1.

This area's proximity to Raleigh and to I-40/I-440 and US 1/64 are the major factors influencing the demand for development in this area. All of the land in Zone 1 is addressed by local land use plans

and development regulations established by Wake County, the Town of Apex, and the Town of Cary. Most of the area in Zone 1 is included in the *Swift Creek Land Management Plan*, which is described in **Section 5.6.1**. This plan designates most of the area between Holly Springs Road and Lake Wheeler Road to remain in rural land use, limited to agricultural and low-density residential uses. Under this plan, the Watershed Critical Area around Swift Creek is subject to even more stringent development regulations. There is also a substantial amount of land at the northeastern corner of Zone 1, near Lake Wheeler Road and Tryon Road, owned by North Carolina State University and maintained under rural use for agricultural research. Development in much of Zone 1 east of Holly Springs Road is also limited by lack of water and sewer infrastructure, with no plans for extension of these services. West of Holly Springs Road, virtually all of the land has already been developed or platted for low-density suburban development. Future land use plans for Wake County and the Town of Apex assume that the Complete 540 project will be constructed along the protected corridor, which is congruent with the Orange Corridor Alternative, with interchanges at Bells Lake Road and US 401, just south of Zone 1.

The potential indirect effects on land use in Zone 1 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.1.1 No-Build Alternative

Large parts of Zone 1 are already fully developed, particularly areas west of Holly Springs Road and areas along Tryon Road. Between Holly Springs Road and Lake Wheeler Road, development densities and intensities are notably limited by the *Swift Creek Land Management Plan* and by the lack of water and sewer infrastructure. The proximity of this area to Raleigh and to I-40/I-440 and US 1/64 has driven the demand for development in Zone 1. Under the No-Build Alternative, which would not include construction of the Complete 540 project, these factors will continue to drive demand for development, with remaining developable land along Ten Ten Road and near the Tryon Road and US 1/64 corridors approaching buildout. Overall demand for development will likely be similar under the No-Build Alternative as under a build scenario, given these factors.

Because there is limited developable land in Zone 1 and because this area's proximity to I-40/I-440 and US 1/64 will continue to have a strong influence over its development patterns, future land use patterns under the No-Build Alternative may not differ much from the build scenarios. One exception may be the Ten Ten Road corridor, which could develop slightly differently under the No-Build Alternative than under a build scenario. There is a growing population near the Ten Ten Road corridor, which will lead to more demand for nearby commercial development. Commercial development that would otherwise concentrate near Complete 540 interchanges to the south of Zone 1 on Bells Lake Road and US 401, as envisioned in local plans, may instead develop in a less concentrated, more piecemeal fashion along Ten Ten Road, differing slightly with local visions for future land use.

#### 6.2.1.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative will improve access to the southern end of Zone 1, near Ten Ten Road; DSAs using the Lilac Corridor Alternative would follow the Orange Corridor Alternative in this area and therefore result in the same effect. However, overall demand in Zone 1 is likely to be influenced more by the area's existing proximity to Raleigh and access to I-40/I-440 and US 1/64, so the overall demand for development in Zone 1 is not likely to differ much from the No-Build Alternative. There is also somewhat limited developable land in Zone 1 as much of the area is already developed, protected from more intense development by the Swift Creek Land Management Plan, or by the lack of water and sewer infrastructure. The Ten Ten Road corridor, at the southern end

of Zone 1, is the primary area where development patterns could be influenced by the various scenarios under consideration for the Complete 540 project.

Although the Orange and Lilac Corridor Alternatives would not include any interchanges in Zone 1, DSAs using either of these corridors would create new interchange areas just to the south, on Bells Lake Road and US 401. There would also be an interchange about two miles south of Zone 1, on Holly Springs Road. These factors suggest potential increased demand for development and land use change at the southern end of Zone 1, along Ten Ten Road between West Lake Road and Lake Wheeler Road. The intersection of Ten Ten Road and Bells Lake Road, in particular, could face more demand for commercial development due to its close proximity to the Complete 540 interchange just to the south, on Bells Lake Road.

Wake County and Town of Apex land use plans assume construction of the Complete 540 along the protected corridor (Orange Corridor Alternative) and anticipate that this will help concentrate development near interchanges along the new road. For this reason, the Orange and Lilac Corridor Alternatives may have somewhat more potential to support the land use goals specified in local plans than the No-Build Alternative, which could lead to more commercial development pressure along Ten Ten Road. The Orange and Lilac Corridor Alternatives may also have more potential to support these goals than the Purple to Blue Corridor Alternative, which would shift farther south the demand for higher density residential development and more intense development, characterized by more commercial and industrial uses. Although local land use goals could be modified to adapt to a different scenario, it is important to note that the current land use goals reflect long-established local visions for future land use patterns.

#### 6.2.1.3 Red Corridor Alternative

Because the Red Corridor Alternative would connect to the Orange Corridor Alternative near the southern edge of Zone 1, the Red Corridor Alternative would be likely to have similar effects on development in Zone 1 as the Orange Corridor Alternative, resulting in a similar build scenario. The Red Corridor Alternative, however, would cross Lake Wheeler Road and would interchange with US 401 north of the locations on the protected corridor (Orange Corridor Alternative) anticipated by local land use plans. This may lead to slight differences in the development pressures in the Lake Wheeler Road/Ten Ten Road area. However, as for the other scenarios, local land use plans, including the *Swift Creek Land Management Plan*, and the lack of water and sewer infrastructure in much of this area, will limit future development in Zone 1 beyond that which is already planned.

#### 6.2.1.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative would result in a Complete 540 alignment that would take a sharp southern turn just east of Holly Springs Road, south of Zone 1. In this way, it would direct traffic farther away from Zone 1 and could lead to slightly decreased demand for development in Zone 1 compared to the other scenarios, because it could pull more high-intensity development that is likely to occur in the FLUSA farther to the south. However, by shifting the project's anticipated interchange at Bells Lake Road to a different facility farther south and shifting the interchange on US 401 farther to the south, the Purple to Blue Corridor Alternative may be somewhat less likely to support the development patterns in Zone 1 envisioned by local land use plans. However, as for the other scenarios, local land use plans, including the Swift Creek Land Management Plan, and the lack of water and sewer infrastructure in much of this area, will limit future development in Zone 1 beyond that which is already planned.

### 6.2.1.5 Eastern Alternatives

As described above, potential effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the DSAs they connect to west of I-40 and the resulting build scenario would be similar.

### 6.2.1.6 Zone 1 Conclusions

**Table 6** displays the relative concern for potential effects on land use change in Zone 1 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Table 6. Land Use Scenario Analysis Matrix for Zone 1**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ↑ | | | | | | |
| ↑ | | | | | | |
| ↔ | **Orange/Lilac Red No-Build Scenario** | **Orange/Lilac Red No-Build Scenario** | | | | **Red Purple/Blue No-Build Scenario** |
| ↓ | **Purple/Blue** | **Purple/Blue** | | | **Red Purple/Blue No-Build Scenario** | |
| ↓ | | | **All Scenarios*** | **All Scenarios*** | **Orange/Lilac** | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 1 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Demand for Development and Population Growth –** Demand for development and population growth in Zone 1 is likely to continue to be influenced mainly by existing factors. These include: the area's proximity to Raleigh and to I-40/I-440 and US 1/64, which make the area attractive to development; the relatively small amount of developable land in Zone 1; the development limitations established by the *Swift Creek Land Management Plan;* and, the lack of water and sewer service in some areas. For these reasons, population growth and the demand for denser and more intense development are not likely to vary much between the build and no-build scenarios and among the different build scenarios. It is possible that the Purple to Blue Corridor Alternative could slightly reduce population growth and the demand for more intense development in Zone 1, as compared to the

other build scenarios, since this option would take the Complete 540 alignment much farther south of Zone 1.

**Pressure for Development Outside Regulated/Planned Areas –** All of the land in Zone 1 is addressed in local land development regulations and local future land use plans.

**Development Pattern –** Development patterns in Zone 1 are likely to be influenced mainly by existing factors, as described above. For this reason, development patterns under the no-build and the various build scenarios are not likely to vary widely. Steady development is likely to continue and will be shaped by local land use regulations and future land use plans. Under all scenarios except the Purple to Blue Corridor Alternative, more commercial development is likely to occur along the Ten Ten Road corridor, with the other build scenarios possibly leading to more concentrated commercial development at its intersection with Bells Lake Road. Under the no-build scenario, commercial development may occur along the Ten Ten Road corridor in a less concentrated, more piecemeal fashion.

**Planned/Managed Land Use Impacts –** Local land use plans assume that the Complete 540 project will be constructed along the protected corridor (Orange Corridor Alternative), helping to concentrate development near potential interchanges along the proposed road. Two of these interchanges are just to the south of Zone 1. As a result, the Orange and Lilac Corridor Alternatives may have more potential to support growth in accordance with local plans than the other options. Under the other build scenarios, and under the no-build scenario, land development patterns could be slightly different than those envisioned in local plans.

The build scenarios for the Complete 540 project are not likely to affect Swift Creek and its surrounding Watershed Critical Area differently than the No-Build Alternative because, as described above, overall demand for development in Zone 1 is likely to be influenced mainly by existing factors. In addition, the *Swift Creek Land Management Plan* and other local land development regulations will limit development density and intensity in much of this area, and will also mitigate the stormwater effects of development in this area.

### *6.2.2 Zone 2*

Zone 2 follows NC 55 and the NC 55 Bypass through Holly Springs, US 401 from Fuquay-Varina to Ten Ten Road, and Ten Ten Road to US 1. In addition to parts of Holly Springs and Fuquay-Varina, Zone 2 includes portions of incorporated Apex and Cary. There are numerous existing and platted large residential developments in Zone 2, and this area continues to develop relatively rapidly. While the southern end of Zone 2, just outside central Fuquay-Varina, is still somewhat rural, with a few remaining small farms, residential development is spreading into this area. Local land use plans envision continued suburban growth in this area, with more commercial development along US 401. There are several notable environmental features in Zone 2, such as the Middle Creek Aquatic Habitat and the Middle Creek Bluffs and Floodplain. Local land use plans designate areas along Middle Creek for protection, emphasizing limits to development along this water body.

All of the build scenarios under consideration for Complete 540 would notably improve access to Zone 2, providing a direct, high-speed, controlled-access connection to employment centers in the Triangle Region. Future land use plans for Holly Springs, Fuquay-Varina, and Wake County assume that the Complete 540 project will be constructed along the protected corridor (Orange Corridor Alternative), with mixed land uses and higher densities and intensities at potential interchanges at Holly Springs Road, Bells Lake Road and US 401. All three of these areas are located in Zone 2.

The potential indirect effects on land use in Zone 2 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.2.1 No-Build Alternative

Without the Complete 540 project, development in Zone 2 will continue, but it will likely continue at a somewhat slower pace and at lower densities and intensities than if the project is constructed. Much of Zone 2 has experienced rapid development over the past ten to fifteen years, even without a high-speed, controlled-access roadway to provide more direct connections to regional employment and commercial centers. Zone 2 is likely to continue to develop in a similar pattern on the remaining available land in the southern portion of this zone, particularly near existing facilties including US 401, Sunset Lake Road, and Hilltop Needmore Road. Future land use plans for Holly Springs, Fuquay-Varina, and Wake County anticipate higher densities and intensities and more mixed land use types at the potential interchanges along Complete 540. Because this land use pattern is more dependent on access to high-speed, controlled-access roadways, the No-Build Alternative may not support development of these areas into regional activity centers that include larger-scale retail and other commercial land uses. Existing intersections of major roadways may not provide sufficient capacity and regional access to support these uses. The area may then remain more uniformly characterized by low-density residential development and smaller-scale commercial development, and area residents would likely continue to travel to existing retail and commercial centers farther away. It is therefore possible that the No-Build Alternative could promote future development patterns that differ from the local land use vision of promoting more mixed land use types, including more commercial development at planned regional activity centers.

#### 6.2.2.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative would notably improve access to Zone 2; DSAs using the Lilac Corridor Alternative would follow the Orange Corridor Alternative in this area and therefore result in the same effect. These options would introduce a high-speed, controlled-access facility into this growing area, providing faster and more direct routes to employment and commercial centers in the Triangle Region. These options would also introduce three new interchanges into this area—at Holly Springs Road, Bells Lake Road, and US 401. Zone 2 has experienced rapid growth over the past fifteen years and area planners anticipate that this growth will continue. While this growth is not dependent on the Orange and Lilac Corridor Alternatives, construction of a DSA using one or both of these options would influence the timing, location, and intensity of the development in this area. Zone 2 would likely develop faster, with higher densities and intensities more likely than in the no-build scenario. The more rural areas in Zone 2, including the areas along Hilltop Needmore Road and Johnson Pond Road, are areas likely to see continuing development of new residential subdivisions. Developers in these areas can generally pay the corresponding jurisdiction to extend water and sewer service in these areas, so the current lack of infrastructure is not likely to be a major limiting factor for growth.

The three interchange areas in Zone 2 would experience the most notable land use changes in Zone 2. The US 401 interchange area includes Wake Tech, high-density residential development, and nearby commercial development. US 401 is already a busy north-south regional thoroughfare. Introducing a new interchange in this area, along with the presence of Wake Tech's busy campus in this area, would promote rapid commercial development on the available land and more intense development on existing developed land near this potential interchange area. This interchange would also likely spur continued commercial and industrial development surrounding the existing intersection at Ten Ten Road, just to the north. The local land use plans covering this area assume that the interchange area on

US 401 will continue to develop as a regional activity center and the area is well served by infrastructure to support this development.

The Holly Springs Road interchange area on the Orange Corridor Alternative is located in close proximity to numerous large residential developments. The presence of this interchange would make the nearby area even more attractive for new residents, likely causing the nearby area to reach build-out. Much of the land in the immediate vicinity of the potential interchange is still available for development and is zoned for commercial and higher density residential land uses. Construction of this interchange would promote development of these uses. Holly Springs envisions this interchange area as a major regional activity center and the town's plans will promote mixed land uses, urban village commercial development, and high-density residential development in this area. Holly Springs planners indicate that achieving this vision is dependent upon construction of the Complete 540 interchange in this location. In this way, a DSA following the Orange Corridor Alternative in this location would support local planning goals to a greater extent than the no-build scenario or other build scenarios.

The Bells Lake Road interchange area is currently surrounded by residential subdivisions and rural, developable land. The increased access that Complete 540 would provide to this area would promote further residential development, along with new commercial development in this area. Future land use plans for the Town of Cary and Wake County both show this area developing as a neighborhood activity center, which would include retail development. A DSA following the Orange Corridor Alternative in this location would support this vision to a greater extent than the no-build scenario or other build scenarios.

#### 6.2.2.3 Red Corridor Alternative

The Red Corridor Alternative would connect to the Orange Corridor Alternative at the northeast corner of Zone 2, near Lake Wheeler Road, so the Red Corridor Alternative would be likely to have similar effects on development as the Orange Corridor Alternative. The Red Corridor Alternative, however, would interchange with US 401 north of the location anticipated by local land use plans, likely shifting the focus of future development to the north. This development pattern could differ slightly from local future land use plans. The interchange location on the Red Corridor Alternative would likely be close enough to Ten Ten Road and Wake Tech that it would still promote increased development of the regional commercial activity center in this area, which would support the local future land use vision for that area.

#### 6.2.2.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative would result in a Complete 540 alignment that would take a sharp southern turn just east of Holly Springs Road. Compared to the Orange Corridor Alternative, it would retain the potential interchange on Holly Springs Road, but would eliminate the anticipated interchange at Bells Lake Road and instead incorporate an interchange on Hilltop Needmore Road. It would also shift the interchange on US 401 over two miles to the south of the area anticipated by local governments. The Purple to Blue Corridor Alternative would cross Middle Creek, an impaired waterway, in Zone 2.

Like the Orange Corridor Alternative, the Purple to Blue Corridor Alternative would increase access between Zone 2 and area commercial and employment centers. It will likely lead to similar faster growth and development at higher densities and intensities than the no-build scenario. The Purple to Blue Corridor Alternative crosses the more rural areas in Zone 2, including the areas along Hilltop Needmore Road and Johnson Pond Road. This could lead to greater development pressure, mainly for

residential development, than with the Orange Corridor Alternative, resulting in faster growth in this part of Zone 2. Developers in these areas can generally pay the corresponding jurisdiction to extend water and sewer service in these areas, so the current lack of infrastructure is not likely to be a major limiting factor for growth.

The potential interchange area on the Purple to Blue Corridor Alternative at Hilltop Needmore Road would likely experience pressure to develop with commercial and higher density residential uses. This would conflict with local land use plans. By eliminating the interchange at the planned activity center on Holly Springs Road, the Purple to Blue Corridor Alternative would also lead to reduced demand for commercial and higher density residential development in that area, resulting in additional conflict with local land use plans.

### 6.2.2.5 Eastern Alternatives

As described above, potential effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

### 6.2.2.6 Zone 2 Conclusions

**Table 7** displays the relative concern for potential effects on land use change in Zone 2 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Table 7. Land Use Scenario Analysis Matrix for Zone 2**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ↑ | | **Orange/Lilac<br>Red<br>Purple/Blue** | | | | **Purple/Blue** |
| ↑ | **Orange/Lilac<br>Red<br>Purple/Blue** | **No-Build Scenario** | | | | |
| ↔ | **No-Build Scenario** | | | | **No-Build Scenario** | **No-Build Scenario** |
| ↓ | | | | | **Red<br>Purple/Blue** | **Red** |
| ↓ | | | **All Scenarios*** | **All Scenarios*** | **Orange/Lilac** | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 2 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Demand for Development and Population Growth** – Demand for development and population growth in Zone 2 will be relatively strong under the no-build scenario, due to this area's already robust growth and development, existing access to transportation facilities including NC 55 and US 401, and the fairly widespread availability of water and sewer service. Any of the build scenarios would introduce a high-speed, controlled-access facility into the area, notably increasing access to employment and commercial centers in the Triangle Region. This would make population growth and the demand for denser and more intense development even stronger. Because all of the build scenarios would cross Zone 2 and would introduce new interchanges into the area, there would not likely be a notable difference in overall demand for development among the different build scenarios.

**Pressure for Development Outside Regulated/Planned Areas** – All of the land in Zone 2 is addressed in local land development regulations and local future land use plans.

**Development Pattern** – All of the build scenarios are likely to affect the timing, location and intensity of future development, encouraging faster growth and more commercial development, particularly around interchange areas. Zone 2 will experience land use change and growth under the No-Build Alternative, but growth likely will be slower. In addition, land uses would be less likely to include the large-scale commercial uses, higher density residential uses, and mixed use developments envisioned by local plans for the interchange areas along the Orange Corridor Alternative. The locations of some of the interchange areas would differ with the other build scenarios, resulting in some interchange areas in locations less able to support the denser, more intense development envisioned for the interchange areas.

**Planned/Managed Land Use Impacts** – The assumption in local land use plans that the Complete 540 project will be constructed along the protected corridor (Orange Corridor Alternative), helping to concentrate development near interchanges along the new road, means that the Orange and Lilac Corridor Alternatives have more potential to support land use goals in accordance with local plans than other options. DSAs using the Red Corridor Alternative would differ only slightly from the Orange Corridor Alternative in Zone 2, so this option would lead to land use patterns only slightly different from those envisioned by local plans.

DSAs using the Purple to Blue Corridor Alternative would differ notably from the Orange Corridor Alternative, leading to pressure for denser, more intense development in interchange locations not planned for these uses. While future land use plans could be modified according to this different pattern, it is important to note that current development patterns, including existing residential development,may make it difficult to shift planned activity centers to these interchange locations.

There are several notable environmental features in Zone 2, such as the Middle Creek Aquatic Habitat and the Middle Creek Bluffs and Floodplain. While additional development near these features has the potential to negatively affect water quality, development regulations including the Neuse River Buffer Rules, the more stringent riparian buffer requirements in Apex and Holly Springs, and NPDES Phase II requirements, would help to minimize these effects.

### *6.2.3 Zone 3*

Zone 3 lies between NC 55 and the NC 55 Bypass and Harris Lake in southwestern Wake County, west of the western terminus of the Complete 540 project, and west of NC 55/NC 55 Bypass. The existing Triangle Expressway extends across the northern end of Zone 3, and STIP project R-2635D will add a new interchange on this part of the Triangle Expressway at Old Holly Springs-Apex Road,

serving the planned Veridea development. Holly Springs has also identified a planned future interchange in this area, on US 1 at Friendship Road.

Zone 3 is predominantly rural. The exceptions are just west of central Holly Springs, where there is new commercial and light industrial development along with residential development; along Avent Ferry Road, where there are numerous existing and planned residential subdivisions; and at the southeast corner of Zone 3, which is part of central Fuquay-Varina. The South Wake Landfill is located in this area, west of NC 55 Bypass and south of the existing Triangle Expressway. The Apex 2030 Land Use Map envisions the Veridea area at the northeast corner of Zone 3 becoming a major employment and commercial center serving a large region. The Holly Springs Future Land Use Plan Map envisions that the area just to the south of Veridea and the existing Triangle Expressway will also develop with industrial and commercial uses. Holly Springs also envisions future light industrial/business park development along US 1 and along Holly Springs New Hill Road, with residential development filling in the areas between these locations. Development in the western portion of Zone 3 is constrained by the fact that Duke Power owns and regulates much of the land surrounding Harris Lake. Fuquay-Varina envisions the southern portion of Zone 3 developing with mainly low-density residential uses.

The potential indirect effects on land use in Zone 3 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.3.1 No-Build Alternative

Without the Complete 540 project, development in the northeast corner and along the northern edge of Zone 3, near US 1/64 and the existing Triangle Expressway, would continue according to local land use plans, with more commercial and industrial development occurring. However, this development may proceed at a somewhat slower pace and at a slightly lower intensity than if the project is constructed. The development plans for the Veridea area are based on the assumption that a new interchange is built at NC 540 and Old Holly Springs-Apex Road under STIP R-2635D and that the Complete 540 project will connect this area to I-40 south of Raleigh, providing a continuous controlled-access facility to I-40 near RTP. Without the interchange and this link in the 540 Outer Loop, the businesses local governments hope to attract to Veridea and nearby areas may be somewhat less likely to locate there. Planned commercial and industrial development along Holly Springs New Hill Road and US 1 may also proceed more slowly without completion of the Complete 540 project, but these areas would nonetheless likely develop according to local plans.

The remainder of Zone 3 is likely to continue to develop with low-density residential uses under either the no-build or build scenario, with the pace of development likely slower in the no-build scenario. Future land use plans in Holly Springs are dependent on construction of the Complete 540 project to concentrate development along an alignment following the Orange Corridor Alternative. Under the No-Build Alternative, the development that would otherwise concentrate near interchanges along a build scenario could develop in a less concentrated, more piecemeal fashion, and this pattern could extend into Zone 3.

#### 6.2.3.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative would improve access to Zone 3, particularly to the northeastern corner of Zone 3, near US 1/64 and the existing Triangle Expressway. DSAs using the Lilac Corridor Alternative would follow the Orange Corridor Alternative in this area and therefore result in the same effect. These options would also create a new interchange area at Holly Springs Road, about two miles away from Zone 3. These factors suggest potential increased demand for

development and land use change at the northeastern corner of Zone 3. Local plans anticipate that this area and the area along US 1 will develop with higher intensity commercial and industrial uses. By providing the link in the 540 Outer Loop that would connect the facility to I-40 south of Raleigh, all of the build options under consideration would make these areas of Zone 3 more attractive to these uses.

Overall demand in the rest of Zone 3 will continue to be influenced by the area's existing proximity to Raleigh and access to the existing Triangle Expressway, so the effect of the Orange Corridor Alternative on overall demand for development in Zone 3 as compared to the No-Build Alternative is likely to be fairly small. It is important to note, though, that Wake County and Town of Apex land use plans assume construction of the Complete 540 project along the protected corridor (Orange Corridor Alternative) and anticipate that this will help concentrate development around the planned interchanges along the Orange Corridor Alternative. For this reason, the Orange and Lilac Corridor Alternatives may have more potential to support future land use patterns envisioned in local plans than the No-Build Alternative or the Purple to Blue Corridor Alternative.

The improved access provided by the build options would likely stimulate moderate residential development spreading from the existing residential areas along the eastern side of Zone 3, particularly along Avent Ferry Road. Development in the western portion of Zone 3 is constrained by the fact that Duke Power owns and regulates much of the land surrounding Harris Lake. This ownership pattern is not expected to change.

#### 6.2.3.3 Red Corridor Alternative

The Red Corridor Alternative would connect to the Orange Corridor Alternative well to the east of Zone 3, so the Red Corridor Alternative would be likely to have similar effects on development in Zone 3 as the Orange Corridor Alternative.

#### 6.2.3.4 Purple to Blue Corridor Alternative

Like the Orange Corridor Alternative, the Purple to Blue Corridor Alternative would increase access between Zone 3 and area commercial and employment centers. This would likely lead to slightly faster growth and development than the no-build scenario. Growth would likely follow local planned uses of commercial and industrial develoment at the northeast corner and along the northern edge of Zone 3, with lower density residential uses throughout most of the rest of the area. In contrast to the Orange Corridor Alternative, the Purple to Blue Corridor Alternative would result in a Complete 540 alignment that would take a sharp southern turn just east of Holly Springs Road, bringing this alignment somewhat closer to Zone 3. Also, in addition to the interchange at Holly Springs Road, this option would create interchanges on Hilltop Needmore Road and US 401 closer to Zone 3 than the analogous interchanges on the Orange Corridor Alternative at Bells Lake Road and US 401. These factors could result in slightly greater residential development pressure in Zone 3, as the southern part of Zone 3 could have faster access to the new facility and to regional commercial and employment centers.

#### 6.2.3.5 Eastern Alternatives

As described above, potential effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

### 6.2.3.6 Zone 3 Conclusions

**Table 8** displays the relative concern for potential effects on land use change in Zone 3 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each scenario is discussed below.

**Table 8. Land Use Scenario Analysis Matrix for Zone 3**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
|  | | | | | | |
|  | | | | | | |
|  | **Orange/Lilac Red Purple/Blue** | **Orange/Lilac Red Purple/Blue** | | | | **Purple/Blue** |
|  | **No-Build Scenario** | **No-Build Scenario** | | | **No-Build Scenario** | **Red No-Build Scenario** |
|  | | | **All Scenarios*** | **All Scenarios*** | **Orange/Lilac Red Purple/Blue** | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 3 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Demand for Development and Population Growth** – Population growth and demand for development in Zone 3 would be higher under any of the build scenarios than under the no-build scenario. Access to the existing Triangle Expressway and NC 55 Bypass would ensure continued growth in this area under the no-build scenario. However, any of the build scenarios would make the northern part of Zone 3 more attractive to development because they would provide the link in the 540 Outer Loop to connect the facility to I-40 south of Raleigh. By connecting the Triangle Expressway east to I-40, the build scenarios would make the northeast portion of Zone 3 particularly attractive to future development.

**Pressure for Development Outside Regulated/Planned Areas** – All of the land in Zone 3 is either addressed in local land development regulations and future land use plans or is owned and regulated by Duke Power.

**Development Pattern** – Under either a build or no-build scenario, the northeast corner of Zone 3, near Veridea, and the area near US 1 will continue to develop with more commercial, industrial, and mixed land uses, according to local plans. Any of the build scenarios would similarly affect the timing and

intensity of this development, making the area more attractive to the intense, regional commercial and office development envisioned by local plans and leading to more rapid development.

Along the eastern side and southern sides of Zone 3, low-density residential development will likely continue under the build and no-build scenarios. The build scenarios will all improve overall access to Zone 3, creating additional nearby interchanges on a controlled access facility, and so could result in slightly faster development in these areas. Compared to the other build options, the Purple to Blue Corridor Alternative could result in slightly greater residential development pressure in Zone 3 as this option would include more interchanges closer to Zone 3, leading to improved access to the new facility and to regional commercial and employment centers. Development in the western portion of Zone 3 is constrained by the fact that Duke Power owns much of the land surrounding Harris Lake, so this area is likely to remain undeveloped.

**Planned/Managed Land Use Impacts** – The assumption in local land use plans that the Complete 540 project will be constructed along the protected corridor (Orange Corridor Alternative), helping to concentrate development near interchanges along the new road, means that the Orange and Lilac Corridor Alternatives have slightly more potential to support the future land use patterns envisioned in local plans than the Purple to Blue Corridor Alternative or the No-Build Alternative.

There are several notable environmental features in Zone 3, such as Utley Creek Slopes, Hollemans Crossroads Slopes and Pools, the Shearon Harris Longleaf Pine Forest, and Harris Lake. While additional development near these features has the potential to negatively affect water quality, development regulations including the Neuse River Buffer Rules, the more stringent riparian buffer requirements in Apex and Holly Springs, and NPDES Phase II requirements, will help to minimize these effects.

### *6.2.4 Zone 4*

Zone 4 encompasses Garner and portions of southeast Raleigh between Lake Wheeler Road and I-40. This zone includes older urban development in central Garner and along the major transportation facilities in this area, including US 70, US 401, and I-40. Near US 70 and I-40, there is a substantial amount of intense commercial and industrial development. The northern half of Zone 4 is the most densely and intensely developed part of the Complete 540 FLUSA. Zone 4 also includes Lake Benson and the less developed areas south of Lake Benson.

This area's proximity to Raleigh and to I-40/I-440 is the major factor influencing the demand for development in this area. All of the land in Zone 4 is addressed by local land use plans and development regulations. A portion of Zone 4, near Lake Benson, is included in the *Swift Creek Land Management Plan*, which is described in **Section 5.6.1**. Under this plan, the Swift Creek Water Supply Watershed Critical Area, including Lake Benson, is subject to stringent development regulations. The northwestern corner of Zone 4 includes a notable amount of land owned by North Carolina State University and maintained under rural use for agricultural research. Development in Zone 4 west of US 401 is somewhat limited by lack of water and sewer infrastructure, with no plans for extension of these services.

In Zone 4, relatively little of the developable land (unconstrained by existing land use regulations or current public ownership) is not already developed with urban or suburban uses or platted for development of these uses. Most of the remaining available land is at the southeast corner of Zone 4, near the intersection of Ten Ten Road and NC 50. The City of Raleigh 2013-2014 Adopted Capital Improvement Plan includes projects that would expand infrastructure through this area from the

Dempsey E. Benton Water Treatment Plant, west across Zone 4 to Ten Ten Road near Rand Road (**Section 3.5.2**). Future land use plans for the Town of Garner and Wake County assume that the Complete 540 project will be constructed along the protected corridor, with interchanges at US 401, Old Stage Road, and NC 50, just south of Zone 4.

The potential indirect effects on land use in Zone 4 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.4.1 No-Build Alternative

Much of the northern half of Zone 4, north of Lake Benson, is already fully developed or platted for future development. In areas near Lake Benson, development activity is limited by local plans and regulations including the *Swift Creek Land Management Plan*. For these reasons, there is a fairly small amount of developable land north of Lake Benson. The proximity of this area to Raleigh and to major transportation facilities, including I-40/I-440, US 401, and US 70, have driven the demand for development in much of this area. If the Complete 540 project is not constructed, there would continue to be moderate demand for future development of remaining developable parcels. Demand for future commercial development would likely be concentrated near existing facilties, such as I-40 and US 70. There is also developable land along the US 401 corridor; this area is likely to continue to develop with commercial uses, driven by this area's proximity to Raleigh and to I-40/I-440, and by the planned widening of US 401 under STIP R-2609.

The southeastern portion of Zone 4, near Ten Ten Road and NC 50, contains most of the developable land in this area. Under the no-build scenario, this area may develop more slowly than under a build scenario. Local land use plans assume construction of Complete 540 along the protected corridor (Orange Corridor Alternative), and anticipate that this will help concentrate development near interchanges along the new road—several of these planned interchanges are close to the southern boundary of Zone 4. It is possible that the No-Build Alternative could promote future development patterns that differ somewhat from this future land use vision.

#### 6.2.4.2 Orange and Lilac Corridor Alternatives

Construction of the Orange or Lilac Corridor Alternative would improve access to Zone 4, particularly to the southern edge of Zone 4. Because these two options follow a similar alignment, their effects on development are likely to be similar. These options would also create new interchange areas just to the south of Zone 4, on US 401, Old Stage Road, and NC 50. These factors suggest potential increased demand for development and land use change at the southern end of Zone 4, near Ten Ten Road. Most of the remaining available land is at the southeast corner of Zone 4, near the intersection of Ten Ten Road and NC 50. This area would likely continue to develop with low-density residential uses and may also experience some commercial development. However, overall demand in Zone 4, particularly north of Lake Benson, is likely to continue to be influenced by the area's existing proximity to Raleigh and access to I-40/I-440, US 401, and US 70, so the overall demand for development in Zone 4 is not likely to differ much from the No-Build Alternative. Development regulations in the Swift Creek Watershed Critical Area will strictly limit development within a roughly half-mile radius around Lake Benson.

Future land use plans for Garner and Wake County assume construction of Complete 540 along the protected corridor (Orange Corridor Alternative), and anticipate that this will help concentrate development near interchanges along the new road, just to the south of Zone 4. For this reason, the Orange and Lilac Corridor Alternatives may have more potential to support the land use patterns envisioned in local plans than the No-Build Alternative or the other build scenarios.

#### 6.2.4.3 Red Corridor Alternative

The Red Corridor Alternative would extend through the southern portion of Garner, leading to a dramatic change from this area's existing low-density suburban development. While much of this part of Garner is already developed with residential uses, introduction of a new, high-speed facility in this area would encourage shifts to higher densities and more commercial development, particularly near the interchange areas. The Red Corridor Alternative would also cross the Swift Creek Water Supply Watershed Critical Area.

There is a large amount of vacant land in the vicnity of the potential interchange on US 401, which is just north of Ten Ten Road. The current intersection on Ten Ten Road and US 401 is developed with commercial land uses, is served by City of Raleigh water and sewer infrastructure, and development is spreading from that node. A new interchange just to the north would notably accelerate the commercial development along US 401 in this area. While local governments do anticipate continued mixed use development on this part of US 401, near Wake Tech, the Red Corridor Alternative would shift the focus of this continued development slightly north of the planned location on the protected corridor.

There is also a large amount of vacant land in the vicinity of the potential interchange on Old Stage Road, and this area is currently served by City of Raleigh water and sewer infrastructure. This area overlaps the current intersection of Old Stage Road and Vandora Springs Road, and the Town of Garner anticipates that this area will develop as a small, neighborhood-oriented commercial area. Introducing a Complete 540 interchange in this area would make this area much more attractive to larger scale commercial development, which conflicts with Garner's vision for this area. East of Old Stage Road, there is widespread low-density residential development. This area would continue to develop without the project, due to proximity to Raleigh and existing transportation facilities, but with a new interchange in this area, the pace of development would be much faster, and would possibly include higher density uses. Open space would remain in the several parks located in this area, and in the areas closer to Lake Benson, which are protected by Swift Creek Water Supply Watershed Critical Area regulations.

The area surrounding the potential interchange on NC 50 also includes a large amount of vacant and rural land and is generally served by City of Raleigh water and sewer infrastructure. There is existing residential development on the east side of NC 50 and to the north, closer to Timber Drive. The existing intersection of Timber Drive and NC 50 includes commercial development and Garner anticipates that this intersection will continue to experience commercial development, becoming a regional commercial center. A new interchange just to the south would accelerate commercial development at the intersection of Timber Drive and NC 50 and would also encourage it to spread south to the area surrounding the Complete 540 interchange. The section of NC 50 between Timber Drive and Complete 540 has the potential to become a commercial corridor. North of Complete 540, this would comply with Garner's future land use plans, but south of Complete 540, commercial development would differ from the future land use patterns envisioned by local plans, which call for more residential uses near this part of NC 50.

Most of the area around the Red Corridor Alternative interchange at I-40 is planned and zoned for commercial and industrial development. There is a notable amount of existing commercial and industrial development in this area, and Garner is actively seeking to attract more commercial and industrial development there. Introduction of a new interchange in this area on I-40 would make the area even more attractive to large-scale commercial and industrial development, likely spurring faster development than under other scenarios. However, it is important to note that the Town of Garner is

concerned about the direct impacts that the Red Corridor Alternative would have on several commercial parcels in this area. This is described in more detail in **Section 6.2.7.3**.

#### 6.2.4.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative would result in a Complete 540 alignment that would take a sharp southern turn just east of Holly Springs Road, southwest of Zone 4. In this way, it would direct traffic farther away from Zone 4 and could lead to somewhat decreased demand for development in the western portion of Zone 4 compared to the other scenarios. The Purple to Blue Corridor Alternative would shift the project's anticipated interchanges at US 401 and Old Stage Road much farther to the south than the corresponding interchanges along the Orange Corridor Alternative, which could also shift the focus of future development farther to the south.

Unlike the western portion of Zone 4, which could experience decreased demand for development as compared to other scenarios, the area near the intersection of Ten Ten Road and NC 50 would likely experience increased demand for development. This is because the Purple to Blue Corridor Alternative would connect to the Lilac Corridor Alternative at an interchange on NC 50 just south of Zone 4. As with the Orange or Lilac Corridor Alternatives, the nearby interchange would likely promote somewhat faster development in this area. Development would likely be characterized by low-density residential and some commercial uses.

#### 6.2.4.5 Eastern Alternatives

As described above, potenial effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

#### 6.2.4.6 Zone 4 Conclusions

**Table 9** displays the relative concern for potential effects on land use change in Zone 4 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Demand for Development and Population Growth** – In the no-build scenario, there would be moderate demand for development and population growth in Zone 4, influenced by the area's proximity to Raleigh and to I-40/440, US 401, and US 70. There may be a greater demand for development and population growth with the Orange and Lilac Corridor Alternatives, particularly near NC 50 and I-40, where these options would include interchanges just south of Zone 4. This area has available land not constrained by development regulations or lack of access to water and sewer infrastructure. The Purple to Blue Corridor Alternative would lead to somewhat decreased growth and development in Zone 4 except for near NC 50 and I-40. Under the Red Corridor Alternative, there would likely be a notable increase in population growth and demand for development as this option would directly cross Zone 4 and would introduce several new interchanges into this area.

**Pressure for Development Outside Regulated/Planned Areas** – All of the land in Zone 4 is addressed in local land development regulations and local future land use plans.

**Table 9. Land Use Scenario Analysis Matrix for Zone 4**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
|  | **Red** | **Red** | | | | **Red** |
|  | **Orange/Lilac** | **Orange/Lilac** | | | | **Purple/Blue** |
|  | **No-Build Scenario** | **No-Build Scenario** | | | **Purple/Blue No-Build Scenario** | **Purple/Blue No-Build Scenario** |
|  | **Purple/Blue** | **Purple/Blue** | | | **Orange/Lilac Red** | |
|  | | | **All Scenarios*** | **All Scenarios*** | | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 4 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Development Pattern** – Overall development patterns in Zone 4 are likely to continue to be influenced by existing factors, including the area's proximity to Raleigh and to I-40/I-440 and US 70, which make the area attractive to development. In the southeast corner of Zone 4, the various build scenarios would have notable effects, because all of the build scenarios would improve access and there is available land not constrained by development regulations or lack of access to water and sewer infrastructure. This area will likely experience faster development under any of the build scenarios; development would likely include low-density residential and small-scale commercial uses. The Red Corridor Alternative would have notable effects at its interchange areas in Zone 4, which would experience more and faster development under this scenario, with land use patterns shifting to include more commercial development.

In the southwest corner of Zone 4, the Purple/Blue Corridor Alternative is more likely to result in sprawling development patterns due to its distance from existing development.

**Planned/Managed Land Use Impacts** – Garner's land use plans include a series of Community and Neighborhood Cores that are intended to produce an integrated land use pattern with a fully connected pedestrian and vehicular network. Several of these cores are along the proposed Red Corridor. Introducing a restricted access road in these areas would interrupt the network connections between different land uses and be contrary to the desired development pattern. Local land use plans assume construction of Complete 540 along the protected corridor (Orange Corridor Alternative), and in anticipation have designated activity centers with concentrated development near proposed

interchanges, just to the south of Zone 4. For these reasons, the Orange and Lilac Corridor Alternatives may have more potential to support the land use patterns envisioned in local plans than the Red Corridor Alternative or the Purple to Blue Corridor Alternative.

The most notable natural features in Zone 4 are Swift Creek, Lake Benson and the surrounding Swift Creek Water Supply Watershed Critical Area. While the *Swift Creek Land Management Plan* and other local land development regulations will limit development densities near the Critical Area, it is important to note that the Red Corridor Alternative is the only option that crosses the Critical Area. The Red Corridor Alternative would also include an interchange at Old Stage Road less than half a mile away from the Critical Area, promoting more intense development in this nearby area.

### *6.2.5 Zone 5*

Zone 5 is bounded by US 401 in the west, Ten Ten Road in the north, I-40 in the east, and NC 42 in the south. Much of Zone 5 is rural, particularly the areas closer to NC 42, where there is widespread agricultural land and related rural residential uses. Closer to Ten Ten Road, there are low-density residential subdivisions. Along US 401, there are commercial and industrial uses, and Wake Tech is located at the northwest corner of Zone 5, on US 401. There are small commercial activity centers at major intersections along NC 42 along the southern edge of Zone 5. The southeast corner of Zone 5, at the NC 42 interchange on I-40, is a major commercial activity center.

All of the build scenarios under consideration for Complete 540, except the Red Corridor Alternative, would notably improve access to Zone 5, providing a direct, high-speed, controlled-access connection to employment centers in the Triangle Region by connecting the area to the existing Triangle Expressway to the northwest and to I-40 to the east. Most of Zone 5 is covered by Wake County's Area Land Use Plan for the Fuquay-Varina–Garner area (**Section 5.6.1**), which envisions much of the area continuing to develop with low-density residential uses. This Plan assumes that the Complete 540 project will be constructed along the protected corridor (Orange Corridor Alternative), with mixed-use, higher density activity centers around the potential interchange at US 401 and on the north sides of the potential interchanges at Old Stage Road and NC 50. These areas are located in Zone 5. Most of Zone 5 is not currently served by public water and sewer service, but the City of Raleigh 2013-2014 Adopted Capital Improvement Plan includes projects that would expand infrastructure westward from the Dempsey E. Benton Water Treatment Plant to Ten Ten Road near Rand Road, in Zone 5 (**Section 3.5.2**).

Johnston County's Land Use Plan envisions its portion of Zone 5 as supporting low-density residential growth, with a regional commercial node at the interchange on I-40 at NC 42, and a smaller commercial node at the intersection of NC 50 and NC 42. Johnston County's policy is to only extend water and sewer service to planned unit developments (PUDs) or to commercial/industrial areas, so this will limit the pace of development farther away from these commercial nodes.

The potential indirect effects on land use in Zone 5 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.5.1 No-Build Alternative

Without the Complete 540 project, most of Zone 5 would continue to slowly develop with low-density residential uses; the pace of development would be notably slower than under the build scenarios. Access to regional transportation facilities such as I-40, NC 50, and US 401, which provide routes to employment centers to the north and south, have driven past development in this area and this will

continue to be the main factor influencing development under the No-Build Alternative. In general, development would likely remain closer to existing transportation facilities, such as US 401, NC 42, NC 50 and I-40. Development in much of Zone 5 is currently constrained by lack of public water and sewer infrastructure, and this will continue to constrain development density and intensity, particularly in the southern half of Zone 5. This means that development in much of Zone 5 would be limited to large-lot rural residential subdivisions. Notable exceptions are the northeast corner of Zone 5, where planned water infrastructure could facilitate higher densities and intensities, and the commercial areas on NC 42 in Johnston County, where local policy seeks to extend service to new commercial development.

The higher densities and more mixed land use types that are anticipated by local land use plans at the potential interchanges along Complete 540 are more dependent on high-speed, controlled-access roadway access, and on available public water and sewer infrastructure. Without the Complete 540 project, these areas are not as likely to develop into regional activity centers that include retail and other commercial land uses. These areas may then remain more uniformly characterized by low-density residential development, and area residents may need to travel to existing retail and commercial centers farther away. It is therefore possible that the No-Build Alternative could promote future development patterns in this part of Zone 5 that differ from local land use goals of promoting more mixed land use types, including more commercial development at planned regional activity centers.

#### 6.2.5.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative or the Lilac Corridor Alternative would notably improve access to Zone 5. Because these two options follow a similar alignment, their effects on development are likely to be similar. These options would introduce a high-speed, controlled-access facility into this area, providing faster and more direct routes to employment and commercial centers in the Triangle Region. These options would also introduce two new interchanges into this area—at Old Stage Road and NC 50—and would also be near a third new interchange, at US 401. Zone 5 has experienced moderate low-density residential development. Continued low-density residential growth is not dependent on the Orange and Lilac Corridor Alternatives, but construction of a DSA using one or both of these options would influence the timing, location, and intensity of the development in this area. Zone 5 would likely develop faster than in the no-build scenario, and would likely include higher densities and intensities in some locations.

The new interchange areas in Zone 5 would experience the most notable land use changes. The Old Stage Road interchange area, which would be in the same location with either the Orange or Lilac Corridor Alternative, is currently rural with a few small residential subdivisions nearby. This interchange area is less than a mile south of Ten Ten Road, so access to this area would improve dramatically. There is a large amount of land in this area that is currently in agricultural use. This land would become attractive for commercial and higher density residential development. Water and sewer service are generally not currently available in this area, but it is likely that infrastructure could be extended from locations north of Ten Ten Road. The NC 50 interchange area would be slightly further north with the Lilac Corridor Alternative than with the Orange Corridor Alternative, but the characteristics of the two locations are similar. The effects are also likely to be similar. The large amount of land in this area currently in agricultural use would become attractive for commercial and higher density residential development. In addition, planned expansion of water infrastructure near Ten Ten Road in this area will facilitate development with higher densities and intensities. Wake County land use plans anticipate the development of the NC 50 and Old Stage Road interchange areas on the Orange Corridor Alternative as regional activity centers, with higher densities and intensities.

The US 401 interchange is just west of Zone 5 and is likely to influence land use change in the northwest corner of Zone 5. This area includes Wake Technical Community College (Wake Tech), high density residential development, and nearby commercial development. US 401 is already a busy north-south regional thoroughfare. Introducing a new interchange in this area, along with the presence of Wake Tech's busy campus in this area, would promote rapid commercial development on the available land and more intense development on existing developed land near this potential interchange area. Wake County land use plans assume that the interchange area on US 401 will continue to develop as a regional activity center and the area is well served by infrastructure to support this development.

The pace of commercial and higher density residential development at the southeast corner of Zone 5, near I-40 and NC 42 in Johnston County, could accelerate if either the Orange or Lilac Corridor Alternatives are constructed. These build scenarios would provide faster access between this existing regional activity center and the existing Triangle Expressway, making it easier to travel between Clayton and points south to points west of Raleigh, including RTP, which could make the area more attractive to development.

#### 6.2.5.3 Red Corridor Alternative

Compared to the Orange and Lilac Corridor Alternatives, the Red Corridor Alternative would have a more modest effect on land development in Zone 5. The Red Corridor Alternative would improve overall access in the broader area, but because it would follow an alignment several miles north of Zone 5, this improvement would not be as notable as with the Orange or Lilac Corridor Alternatives.

The Red Corridor Alternative, however, would cross US 401 at a potential interchange north of the location anticipated by local land use plans. For this reason, it is possible that it could promote future development patterns that would differ slightly from local land use plans. The interchange location on the Red Corridor Alternative would likely be close enough to Ten Ten Road and Wake Tech that it would still promote increased development of the regional commercial activity center in this area.

#### 6.2.5.4 Purple to Blue Corridor Alternative

Like the Orange and Lilac Corridor Alternatives, the Purple to Blue Corridor Alternative would notably improve access to Zone 5. It would introduce a high-speed, controlled-access facility into this area, providing a faster and more direct route to employment and commercial centers in the Triangle Region. It would introduce two new interchanges into this area—at Old Stage Road and NC 50—and would include an interchange on US 401 well to the south of the location used by the other build scenarios. While continued low-density residential growth in Zone 5 is not dependent on the Complete 540 project, construction of a DSA using the Purple to Blue Corridor would influence the timing, location, and intensity of the development in this area. Zone 5 would likely develop faster than in the no-build scenario, and would likely include higher densities and intensities in some locations. Some of these effects would also differ from the future development patterns envisioned in local plans.

By shifting the US 401 interchange several miles south toward Fuquay-Varina, the Purple to Blue Corridor Alternative would also shift the increased demand for commercial development on US 401 to this area. While additional commercial development along US 401 is envisioned by local plans, Wake County plans envision the major commercial center in this area to take shape where the Orange Corridor Alternative crosses US 401, near Wake Tech. In this way, the Purple to Blue Corridor Alternative differs from the local vision for this area. Shifting the US 401 interchange to the south

would also dramatically improve access to regional employment and commercial centers for the areas along US 401 and NC 42 near Fuquay-Varina. Developers in these areas may be able to fund the extension of water and sewer service to proposed developments, so infrastructure availability is not a major limiting factor for growth in this part of Zone 5. With the Purple to Blue Corridor Alternative, this area is likely to experience notably increased demand for residential development. The NC 42 corridor is also likely to experience notably increased demand for commercial development near intersections and for nearby residential development.

The other interchange areas in Zone 5 would also experience notable land use changes. The Old Stage Road interchange area is currently mostly rural, with a large amount of nearby land in agricultural use. This land surrounding the interchange would become attractive for commercial development and nearby residential development. Water and sewer service are not widely available in this area, but could potentially be extended from areas along US 401. The Purple to Blue Corridor Alternative connects to an NC 50 interchange on the Lilac Corridor Alternative. The large amount of land in this area currently in agricultural use would become attractive for commercial and higher density residential development. In addition, planned expansion of water infrastructure near Ten Ten Road in this area will facilitate development with higher densities and intensities. Wake County plans anticipate the development of the NC 50 and Old Stage Road interchange areas as regional activity centers, with higher densities and intensities.

The pace of commercial and higher density residential development at the southeast corner of Zone 5, near I-40 and NC 42 in Johnston County, could accelerate with the Purple to Blue Corridor Alternative, connecting to the Lilac Corridor Alternative. This build scenario would provide faster access between this existing regional activity center and the existing Triangle Expressway, making it easier to travel between Clayton and points south to points west of Raleigh, including RTP, which could make the area more attractive to development.

#### 6.2.5.5 Eastern Alternatives

As described above, potenial effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

#### 6.2.5.6 Zone 5 Conclusions

**Table 10** displays the relative concern for potential effects on land use change in Zone 5 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Demand for Development and Population Growth** – While overall growth trends suggest moderate population growth and development demand would likely occur in Zone 5 without the Complete 540 project, the build scenarios have the potential to notably increase population growth and development demand. All the build scenarios would improve access between Zone 5 and major transportation facilities such as I-40 and US 401 and notably shorten travel times to major employment centers such as RTP. Due to its greater distance away from Zone 5, the Red Corridor Alternative would have a smaller effect on development demand than the other build alternatives.

**Pressure for Development Outside Regulated/Planned Areas** – All of the land in Zone 5 is addressed in local land development regulations and local future land use plans.

**Development Pattern** – All of the build alternatives west of I-40 except the Red Corridor Alternative would introduce interchanges into Zone 5. These areas would face particularly strong commercial development pressure, and nearby areas would become more attractive for residential development. These development patterns would be dependent on a nearby high-speed, controlled-access roadway. For this reason, these areas may remain more uniformly characterized by low-density residential development under the no-build scenario.

**Table 10. Land Use Scenario Analysis Matrix for Zone 5**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ↑ | | **Orange/Lilac Purple/Blue** | | | | **Purple/Blue** |
| ↑ | **Orange/Lilac** | **Red** | | | **No-Build Scenario** | |
| ↔ | **Purple/Blue** | **No-Build Scenario** | | | **Purple/Blue** | **No-Build Scenario** |
| ↓ | **Red No-Build Scenario** | | | | **Red** | **Red** |
| ↓ | | | **All Scenarios*** | **All Scenarios*** | **Orange/Lilac** | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 5 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Planned/Managed Land Use Impacts** – Local land use plans anticipate that the Complete 540 project will be constructed along the protected corridor, helping to concentrate denser, higher intensity, and mixed use development near interchanges along the new road in Zone 5. This means that the Orange and Lilac Corridor Alternatives would have notably more potential to support future land use patterns in accordance with local plans than the other options, particularly the Purple to Blue Corridor Alternative. West of NC 50, the Purple to Blue Corridor would shift the planned interchange areas and the demand for development in Zone 5 well to the south into areas without underlying plans in place or planned infrastructure to support the mixed use activity centers envisioned in local plans. These interchange areas may instead develop with more conventional strip commercial development in less concentrated, more scattered patterns

The higher densities and greater mix of land uses that are anticipated by local land use plans at the potential interchanges along Complete 540 are dependent on high-speed, controlled-access roadway access. With the Red Corridor Alternative or the No-Build Alternative, these areas may remain more uniformly characterized by low-density residential development, promoting future development

patterns in Zone 5 that differ from local land use goals of promoting mixed land use, including more commercial development at planned regional activity centers.

The most notable natural feature in Zone 5 is Middle Creek and its associated aquatic habitat. While additional development near Middle Creek has the potential to negatively affect water quality, development regulations including the Neuse River Buffer Rules and NPDES Phase II requirements will help to minimize these effects.

### 6.2.6 Zone 6

Zone 6 lies along the southwestern edge of the FLUSA, south of NC 42 and west of I-40. This area includes Fuquay-Varina, Angier, northeastern Harnett County, and northwestern Johnston County. It also includes the southwest quadrant of the developing area between NC 50 and I-40 in Johnston County—this area is experiencing commercial development near the I-40 interchange at NC 42 and residential development along NC 50 and Old Drug Store Road. There is a small amount of commercial development near the I-40 interchange at NC 210. Most of the rest of Zone 6 is very rural, with numerous farms and scattered low-density residential development. The most active areas for current development are near Fuquay-Varina and near I-40. Access to water and sewer infrastructure in Zone 6 is generally limited to areas near Fuquay-Varina, Angier, and I-40.

None of the build scenarios cross into Zone 6, although the Purple to Blue Corridor Alternative would be relatively close to the northern edge of Zone 6 and could result in more induced development than the other build scenarios. However, by improving overall access to the regional high-speed, controlled-access roadway network, all of the build scenarios have varied potential to influence land use patterns in Zone 6. Much of Zone 6 is covered by Wake County's Area Land Use Plan for the Fuquay-Varina–Garner area (**Section 5.6.1**), which envisions much of the area continuing to develop with low-density residential uses, with growth generally spreading outward from Fuquay-Varina. This Plan assumes that the Complete 540 project will be constructed along the protected corridor, with mixed-use, higher density activity centers around the potential interchange at US 401 and on the north sides of the potential interchanges at Old Stage Road and NC 50, which are each several miles north of Zone 6.

Johnston County's Land Use Plan envisions its portion of Zone 6 as supporting low-density residential growth, with regional commercial node at the interchanges on I-40 at NC 42 and NC 210, and smaller commercial nodes at the intersections on NC 50 at NC 42 and NC 210. Johnston County's policy is to extend water and sewer service only to planned unit developments (PUDs) or to commercial/industrial areas, so this will limit the pace of development farther away from these commercial nodes.

Harnett County's Land Use Plan envisions its portion of Zone 6 as supporting agriculture and low-density residential uses west of US 401, and somewhat higher density residential uses east of US 401. A rural development node is designated around the intersection of US 401 and NC 210, with compact mixed use designated along US 401 north of this area. Public water and sewer infrastructure is generally limited to the areas near Angier, but Harnett County utility systems have ample capacity to support potential extension of infrastructure.

The potential indirect effects on land use in Zone 6 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.6.1 No-Build Alternative

Without the Complete 540 project, development surrounding Fuquay-Varina, at the northwestern corner of Zone 6, and between NC 50 and I-40 in Johnston County, at the eastern edge of Zone 6, is expected to continue according to local land use plans. In the Fuquay-Varina area, this development would be mainly residential. Between NC 50 and I-40 in Johnston County, commercial development would continue near the interchanges and major intersections, with residential development extending along the major roads. Development in these areas is likely to be mainly influenced by existing factors including access to existing roadways, overall development trends, and local land use and infrastructure policy.

With the No-Build Alternative, development in the more rural parts of Zone 6, in the central and southern parts of this area, would likely proceed very slowly. Most of these areas are distant enough from major transportation facilities and employment centers that there would be only modest demand for new development.

#### 6.2.6.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative or the Lilac Corridor Alternative would introduce a high-speed, controlled-access facility several miles north of Zone 6. Because these two options follow a similar alignment, their effects on development are likely to be similar. These options would improve overall access to the surrounding roadway network, but the most notable effects in Zone 6 are likely to be near US 401 in Fuquay-Varina and the northeastern corner of Harnett County and in the area between NC 50 and I-40 in Johnston County. This is because these areas have easy access to roadways that would connect to the Complete 540 project, which would then offer a travel time savings over existing routes to employment and commercial centers in the Triangle Region, and to the commercial centers that are anticipated to develop at the Complete 540 interchanges in Zones 2 and 5. Improved access would encourage increased residential development in these areas of Zone 6. This pattern would be congruent with the land uses and development envisioned by Wake County's Area Land Use Plan for the Fuquay-Varina–Garner area and by Johnston County's Land Use Plan.

Farther away from existing major roadways, the effects of the Orange and Lilac Corridor Alternatives on land development is likely to be more modest. While the overall improved access in the project study area would make the central and southern parts of Zone 6 somewhat more attractive for small-scale residential development, these areas would be too far away from Complete 540 and from other major roadways to experience large changes in access or travel times.

#### 6.2.6.3 Red Corridor Alternative

The Red Corridor Alternative would be at least six miles north of Zone 6, so its effect on development in Zone 6 is not likely to differ much from the No-Build Alternative. The I-40 interchange on the Red Corridor Alternative is well to the north of the I-40/NC 42 interchange area in Johnston County, such that the Complete 540 project would be unlikely to offer much travel time savings between Johnston County and points east or west of Raleigh. For this reason, the effects of the Red Corridor Alternative on this growing area in Johnston County are not likely to differ notably from the No-Build Alternative. The Red Corridor Alternative is unlikely to have a notable effect on land development in the central and southern parts of Zone 6 as these areas are too far away to experience notable changes in access or travel times.

#### 6.2.6.4 Purple to Blue Corridor Alternative

Compared to the other build scenarios, the Purple to Blue Corridor Alternative has greater potential to induce land use changes in Zone 6. This option would follow an alignment much closer to Zone 6

than the other build options. For the area between US 401 and Rock Service Station, this alignment is a mile or less away from the northern boundary of Zone 6. This segment includes two interchanges—one at US 401 and another at Old Stage Road. These factors would much more notably improve access to Zone 6 as compared to the other build options, stimulating development pressure near US 401 and NC 42. The areas along US 401 and NC 42 would likely experience notably increased demand for commercial development near intersections and for nearby residential development.

The effects of the Purple to Blue Corridor Alternative would be similar to the Orange and Lilac Corridor Alternatives in the area around NC 42 between NC 50 and I-40 in Johnston County, because this option connects to the Lilac Corridor Alternative near NC 50. This area would have somewhat improved access to roadways that would connect to the Complete 540 project, which would then offer a travel time savings over existing routes to employment and commercial centers in the Triangle Region, and to the commercial centers that are anticipated to develop at the Complete 540 interchanges in Zones 2 and 5. Improved access would encourage increased residential development in these areas of Zone 6.

Along the southern portion of Zone 6, near Angier in Harnett County, the Purple to Blue Corridor Alternative has a notably greater potential for inducing development and land use change than other project scenarios. While this alignment would still be several miles away from the Angier area, it would provide easy access to NC 55 south of Fuquay-Varina, via an interchange on US 401. Areas near the NC 55 corridor in northern Harnett County could become more attractive for low-density residential development and small-scale commercial development.

#### 6.2.6.5 Eastern Alternatives

As described above, potential effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

#### 6.2.6.6 Zone 6 Conclusions

**Table 11** displays the relative concern for potential effects on land use change in Zone 6 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Demand for Development and Population Growth** – Development in Zone 6 areas is likely to continue to be influenced by existing factors including access to existing roadways, overall development trends, and local land use and infrastructure policy. For these reasons, there will be continued demand for development and accompanying population growth under either the build or no-build scenario. The Purple to Blue Corridor Alternative would likely have the most notable effect on population growth and demand for development, as it would be much closer to Zone 6 than the other build scenarios.

**Pressure for Development Outside Regulated/Planned Areas –** The land in Zone 6 is addressed in local land development regulations and local future land use plans.

**Development Pattern** – Under the No-Build Alternative, moderate residential development would likely continue in the areas surrounding Fuquay-Varina, with more modest development to the south and east. Because it is several miles away from Zone 6, the effects of the Red Corridor Alternative are not likely to be notably different than with the No-Build Alternative. The other build scenarios would improve overall access to the surrounding roadway network, but the most notable effects in Zone 6 are

likely to be near US 401 in Fuquay-Varina and the northeastern corner of Harnett County and in the area between NC 50 and I-40 in Johnston County. These areas have easy access to roadways that will connect to the Complete 540 project, offering travel time savings to employment and commercial centers in the Triangle Region. Near US 401 in Fuquay-Varina and the northeastern corner of Harnett County, this effect would be notably greater under the Purple to Blue Corridor Alternative.

**Table 11. Land Use Scenario Analysis Matrix for Zone 6**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ↑ | | | | | | |
| ↑ | **Purple/Blue** | **Purple/Blue** | | | **Purple/Blue No-Build Scenario** | **Purple/Blue** |
| ↔ | **Orange/Lilac** | **Orange/Lilac** | | | **Orange/Lilac Red** | |
| ↓ | **Red No-Build Scenario** | **Red No-Build Scenario** | | | | **Red No-Build Scenario** |
| ↓ | | | **All Scenarios*** | **All Scenarios*** | | **Orange/Lilac** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 5 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Planned/Managed Land Use Impacts –** The Orange and Lilac Corridor Alternatives would likely support development in Zone 6 in accordance with the land uses and development envisioned by local land use plans. The Purple to Blue Corridor Alternative has greater potential to induce land use changes in Zone 6 than the other build scenarios because it would follow an alignment and introduce new interchanges much closer to Zone 6. The development patterns encouraged by the Purple to Blue Corridor Alternative may therefore differ from the future land use visions in the local plans.

The most notable natural features in Zone 6 are Middle Creek and its associated aquatic habitat, Hector Creek, a High Quality Water (HQW), and the Cape Fear River Water Supply Watershed in Harnett County at the southwestern corner of the FLUSA. While additional development near these features has the potential to negatively affect water quality, development regulations including the Neuse River Buffer Rules (in the portion of Zone 6 in the Neuse basin) and NPDES Phase II requirements, will help to minimize these effects. Harnett County also maintains required conservation zones for streams in the FLUSA

### *6.2.7 Zone 7*

Zone 7 includes the area in Wake County between I-40 and the US 64/US 264 Bypass, including the southern portion of Knightdale, the eastern portion of Garner, and portions of southeast Raleigh. It also includes a small portion of western Wendell. The northwest corner and western edge of Zone 7 are the two parts of Zone 7 with widespread development, with commercial and industrial development near I-40 and I-440 and residential development along Rock Quarry Road, New Hope Road, and Barwell Road. The Greenfield South Business Park, a partially-developed industrial park, is located on the east side of I-40 at the US 70 interchange. The northeast corner of Zone 7 includes a portion of the approved Wendell Falls mixed use development, which is intended to include 4,000 residential units and 100 acres of retail space. Residential development in this area is mainly along the zone's western and northern edges, with much of the rest of the zone fairly rural.

All of the build scenarios under consideration for Complete 540 would improve access to Zone 7, providing a direct, high-speed, controlled-access connection to employment centers in the Triangle Region by connecting the area to the existing Triangle Expressway, I-40, and the US 64/264 Bypass. Zone 7 is covered by future land use plans for Knightdale, Wendell, Garner, Raleigh, and Wake County (**Section 5.6.1**). Wake County's East Raleigh-Knightdale ALUP and Fuquay-Varina-Garner ALUP identify areas along a representative corridor for Phase II of the Complete 540 project, east of I-40, with a Special Transportation Corridor designation. It also identifies planned mixed use and higher density activity centers at the Rock Quarry Road/Auburn-Knightdale Road area and near Battle Bridge Road. Randleigh Farm, a 428-acre tract on Battle Bridge Road jointly owned by the City of Raleigh and Wake County is planned for future mixed use development.

The potential indirect effects on land use in Zone 7 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.7.1 No-Build Alternative

Without the Complete 540 project, development in Zone 7 would continue at a moderate pace, influenced by the area's existing proximity to US 64/264 Bypass, I-40, and I-440. Future development would likely concentrate closer to these existing facilities, spreading to the south and east at a moderate pace. Although it is unknown if the Randleigh Farm project will begin development in the absence of plans to construct the Complete 540 project, this project would also act as a catalyst for mixed use growth and development. Development of the Wendell Falls project would also act as a catalyst for development at the northeast corner of Zone 7. The southeast corner of Zone 7 would likely remain fairly rural in this scenario. The Walnut Hill Historic District, a small rural historic district along Mial Plantation Road in this area, will also limit the spread of suburban development.

#### 6.2.7.2 Orange and Lilac Corridor Alternatives

The Orange and Lilac Corridor Alternatives would connect to the Eastern Alternatives near I-40, connecting Zone 7 to the existing Triangle Expressway to the west. This would improve access to points west of Raleigh to some extent, and would also improve access to regional north-south facilities including US 401 and NC 50. The Orange and Lilac Corridor Alternatives would include interchanges in slightly different locations on I-40. Each potential interchange area has the potential to promote denser and more intense development, particularly commercial land uses. With the Lilac Corridor Alternative, this effect could be shifted slightly to the north as compared to the Orange Corridor Alternative. In general, though, the most notable effects on Zone 7 would result from the Eastern Alternatives (Section 6.2.7.5).

#### 6.2.7.3 Red Corridor Alternative

As described in **Section 6.2.4.4**, most of the area around the Red Corridor Alternative interchange at I-40 is planned and zoned for commercial and industrial development. There is a notable amount of existing commercial and industrial development in this area, and Garner is actively seeking to attract more commercial and industrial development there. Introduction of a new interchange in this area on I-40 would make the area even more attractive to large-scale commercial and industrial development, likely spurring faster development than under other scenarios. However, it is important to note that the Town of Garner is concerned about the direct impacts that the Red Corridor Alternative would have on commercial parcels in the Greenfield South Business Park. Construction of the Red Corridor Alternative would require NCDOT to acquire parcels within the Greenfield South Business Park, removing a notable portion of Garner's prime commercially-zoned land from the local tax and employment base.

The Red Corridor Alternative would connect to the Green or Mint Green Corridor Alternatives east of I-40 near the interchange at Rock Quarry Road. These interchange areas would be the focus of more intense commercial development, so the Red Corridor Alternative would shift this effect closer to Garner and Raleigh and farther away from Johnston County and Clayton as compared to the other build scenarios under consideration.

#### 6.2.7.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative connects to the Lilac Corridor Alternative well to the west of Zone 7, so the effect of this option on Zone 7 would be the same as those anticipated with the Lilac Corridor Alternative (**Section 6.2.7.2**).

#### 6.2.7.5 Eastern Alternatives

Construction of any of the Eastern Alternatives would improve access to Zone 7. Because there is not a large difference in the locations of the Eastern Alternatives, the overall effects on Zone 7 would likely be similar. The notable difference between the Eastern Alternatives would be the effects on interchange areas.

Any of the Eastern Alternatives would introduce a high-speed, controlled-access facility into this area, providing faster and more direct routes between US 64/264 Bypass and I-40. By connecting to I-40 and a Complete 540 alignment west of I-40, these options would also provide another route to access the existing Triangle Expressway and points west and north of Raleigh. Areas in Zone 7 near existing major transportation facilities have experienced moderate growth over the past fifteen years, and this moderate growth is likely to continue. While this growth is not dependent on the Eastern Alternatives, construction of a DSA including one of these options would influence the timing, location, and intensity of the development in this area. Zone 7 would likely develop faster, with higher densities and intensities more likely than in the no-build scenario. The more rural areas in Zone 7, at the zone's southeastern corner would likely remain fairly rural, even if one of the Eastern Alternatives is constructed, due to this area's distance from the alignments and other existing major roadways and the general lack of water and sewer infrastructure in this area.

The interchange areas in Zone 7 would experience this area's most notable land use changes. All of the Eastern Alternatives would include an interchange on White Oak Road in the same general location, near the Johnston County line. This area currently has a mix of rural and low-density residential uses, and a new interchange in this area would likely cause more demand for commercial and higher density residential uses. Wake County land use plans assume that the Complete 540 project interchange in this area will support development of a commercial and retail activity center and

these plans anticipate the denser and more intense land uses that would likely develop surrounding the interchange.

The US 70 Business interchange areas already contain some commercial development, particularly near the Johnston County line and closer to Clayton. The Eastern Alternatives each use one of two interchange locations on US 70 Business. The Brown Corridor Alternative (and by extension, the Tan Corridor Alternative) interchange would be near the Johnston County line, while the Green Corridor Alternative (and by extension, the Mint Green and Teal Corridor Alternatives) would be about a mile to the northwest, closer to Garner. Wake County land use plans assume that the Complete 540 project interchange in this area will be at the Green Corridor Alternative location, where a commercial and retail activity center is anticipated to develop. Constructing an interchange in this area would support that vision. Constructing an interchange in the Brown Corridor Alternative location would shift the demand for this type of development to the southwest, but this area would also likely support orderly commercial and retail development without notably dampening the demand for this type of development in the planned area to the northwest. In either scenario, this stretch of US 70 Business would be bounded by two major transportation facilities—I-40 and Complete 540—and it is likely that the entire stretch would develop with commercial and retail uses.

The next interchange along the Eastern Alternatives would be in the Old Baucom Road/Rock Quarry Road area. Local plans envision the Complete 540 alignment following the Green Corridor Alternative in this area. The Green and Mint Green Corridor Alternatives would include an interchange in the area anticipated by local plans. The other Eastern Alternatives would include an interchange to the east on Old Baucom Road. Most of the land in these areas is rural land available for denser and more intense development. Commercial development would likely occur in the immediate interchange areas, with residential development surrounding these areas. The Green and Mint Green would focus this effect closer to planned growth areas and to existing developed areas. The other Eastern Alternatives would likely shift this effect slightly farther to the east, into areas that local plans assume will remain rural. Any of these options would likely stimulate development of the planned Randleigh Farm project. There is a notable amount of land in this area that is in public ownership and used for public services, including the Neuse River WWTP and a Wake County/City of Raleigh police training facility. These areas will remain in public ownership and would therefore not be subject to redevelopment at higher densities or intensities.

All of the Eastern Alternatives would include an interchange in the same general location on Auburn Knightdale Road. Wake County plans assume a project alignment similar to this location. Each of these options would stimulate commercial development in the immediate interchange area and residential development in the surrounding area. Any of these options would likely stimulate development of the planned Randleigh Farm project. Nearby areas in public ownership will remain in their current states.

All of the Eastern Alternatives would use the same interchange on Poole Road. Town of Knightdale and Wake County future land use plans envision that the area south of Poole Road will continue to be characterized by rural and low-density residential uses, with activity centers along Poole Road and surrounding the interchange area that would be formed by completion of the 540 Outer Loop at the US 64/264 Bypass. Construction of any of the Eastern Alternatives would generally support these visions, and could increase the demand for nearby residential development. Lack of existing water and sewer infrastructure generally limits development in the rural areas near Poole Road, but this may not be a major limiting factor to future development as developers could extend these services from nearby developed areas.

### 6.2.7.6 Zone 7 Conclusions

**Table 12** displays the relative concern for potential effects on land use change in Zone 7 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Table 12. Land Use Scenario Analysis Matrix for Zone 7**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ⬆ | | | | | | |
| ↑ | | | | | | |
| ↔ | **Orange/Lilac<br>Red<br>Purple/Blue<br>Eastern Alternatives** | **Orange/Lilac<br>Red<br>Purple/Blue<br>Eastern Alternatives** | | | **No-Build Scenario** | **No-Build Scenario** |
| ↓ | **No-Build Scenario** | **No-Build Scenario** | | | **Orange/Lilac<br>Red<br>Purple/Blue<br>Eastern Alternatives** | **Orange/Lilac<br>Red<br>Purple/Blue<br>Eastern Alternatives** |
| ⬇ | | | **All Scenarios*** | **All Scenarios*** | | |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Demand for Development and Population Growth** – Zone 7 has been characterized by fairly modest growth, with development activity mainly concentrated near existing transportation facilities, such as US 64/264 Bypass, I-40 and I-440. Without the Complete 540 project, this moderate population growth and demand for development would likely continue. Constructing the project would improve access between Zone 7 and activity centers in the Triangle Region, and all the build scenarios have the potential to increase the demand for development, particularly close to the proposed interchange areas. There would be relatively little difference among the build scenarios in their effects on growth and development.

**Pressure for Development Outside Regulated/Planned Areas –** The land in Zone 7 is addressed in local land development regulations and local future land use plans.

**Development Pattern –** Under the No-Build Alternative, moderate development would continue near existing transportation facilities in Zone 7, such as US 64/264 Bypass, I-40, and I-440. Future commercial development would likely concentrate closer to these existing facilities, and scattered low-density residential development would continue near these areas. Two planned development projects, Randleigh Farm and Wendell Falls, would be catalysts for expanded mixed-use development, although

development of the Randleigh Farm project is likely to be somewhat dependent on the Complete 540 project.

All the build scenarios would have the potential to affect the location, densities and intensities of new development. All of the build alternatives east of I-40 will introduce interchanges into Zone 7. These areas would experience stronger pressure for commercial and higher density residential devopment, and nearby areas would also become more attractive for residential development. The more rural areas in Zone 7, at the zone's southeastern corner would likely remain fairly rural under either a build or no-build scenario, due to this area's distance from the DSAs and other existing major roadways and the general lack of water and sewer infrastructure in this area.

**Planned/Managed Land Use Impacts –** Local land use plans generally assume that the Complete 540 project interchanges east of I-40 will be in the locations on Green Corridor Alternative location, where more commercial and retail development is anticipated. Constructing interchanges in these area would support that vision. Without the Complete 540 project, these potential interchange areas may remain more uniformly characterized by low-density residential development and scattered, small-scale commercial development, promoting future development patterns in Zone 7 that differ from local land use goals of promoting more mixed land use types, including more concentrated commercial development at planned regional activity centers.

The most notable natural features in Zone 7 are the Neuse River and its tributaries and their associated aquatic habitat. While additional development near these features has the potential to negatively affect water quality, development regulations including the Neuse River Buffer Rules and NPDES Phase II requirements will help to minimize these effects.

### *6.2.8 Zone 8*

Zone 8 includes the Clayton area in Johnston County. It is bounded by the Clayton Bypass in the south, and the Neuse River, NC 42, and the boundary of the Swift Creek watershed in the east. Zone 8 has developed fairly rapidly in the last two decades and is anticipated to continue to grow, as the area has existing easy access to three major transportation facilities: I-40, the Clayton Bypass, and US 70 Business. Central Clayton has a compact central core, surrounded by strip commercial development, low-density residential developments, and rural areas. The western corner of Zone 8, in the area between I-40, NC 42, and the Clayton Bypass, is a major commercial activity center. The Town of Clayton envisions this area continuing to develop as a regional commercial and employment center. There are also a number of light industrial developments on US 70 Business south of Clayton, reflecting this area's growing presence of biopharmaceutical jobs. The Town of Clayton also envisions this area continuing to develop as a major employment center.

All of the build scenarios under consideration for Complete 540 would improve access to Zone 8, providing a direct, high-speed, controlled-access connection to employment centers in the Triangle Region by connecting the area to the existing Triangle Expressway to the northwest and US 64/264 Bypass to the east. Zone 8 is covered by Clayton's Strategic Growth Plan and Johnston County's Land Use Plan (**Section 5.6.1**). These plans envision orderly development spreading outward from denser and more mixed uses along major roadways including NC 42 and US 70. NC 42 is a particular focus, as Clayton and Johnston County envision the new Johnston Health Clayton medical center as a catalyst for further development of this area, surrounding the NC 42 interchange on the Clayton Bypass, as a major mixed-use center. This would include higher density residential uses, offices, hotels, and retail developments. Clayton anticipates continuing to expand water and sewer service to this area and to the area surrounding the US 70 Business interchange on the Clayton Bypass. Local

policy is to only extend water and sewer service to planned unit developments (PUDs) or to commercial/industrial areas, so this will limit the pace of development farther away from these commercial nodes.

The potential indirect effects on land use in Zone 8 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.8.1 No-Build Alternative

Without the Complete 540 project, Zone 8 would continue to develop, with commercial and mixed use development expanding along the NC 42 corridor and along the Clayton Bypass, in accordance with Johnston County and Town of Clayton plans to promote these areas as regional commercial and employment centers. There is a notable amount of developable land remaining across Zone 8, and the area's existing access to major regional transportation facilities suggests that planned residential communities would also continue to develop across Zone 8.

#### 6.2.8.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative or the Lilac Corridor Alternative would introduce a high-speed, controlled-access facility at the western edge of Zone 8. In general, because these two options follow a similar alignment, their effects on Zone 8 would likely be similar. The notable exception is at the I-40 interchange area, where the Lilac Corridor Alternative crosses I-40 slightly to the north of the Orange Corridor Alternative.

While this area currently has easy access to regional facilites including I-40, the Clayton Bypass, and US 70 Business, introducing an additional high-speed, controlled-access facility will notably shorten travel times from this area to commercial and employment centers such as RTP, such that the Orange and Lilac Corridor Alternatives would likely cause the Clayton area to develop faster than with the No-Build Alternative. These options could also make the NC 42 corridor area more attractive for larger-scale commercial and office development and could also help spur continued commercial and industrial development at the NC 42 interchange on the Clayton Bypass, supporting the local future land use vision for these two areas.

Because the Lilac Corridor Alternative crosses I-40 slightly to the north of the Orange Corridor Alternative, its effects would be slightly different at the western edge of Zone 8. The option would shift the I-40 interchange slightly farther to the north of NC 42, which could slightly moderate the project's development pressure on the NC 42 corridor. However, local plans aim to support denser and more intense development along NC 42, so this effect would differ slightly from these plans.

#### 6.2.8.3 Red Corridor Alternative

Compared to the Orange and Lilac Corridor Alternatives, the Red Corridor Alternative would have a more modest effect on land development in Zone 8. The Red Corridor Alternative would improve overall access in the broader area, but because it would follow an alignment several miles north of Zone 8, this improvement would not be as notable as with the Orange or Lilac Corridor Alternatives. This option could shift more of the focus on commercial and industrial development anticipated near I-40 in Johnston County farther to the north, closer to Garner.

#### 6.2.8.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative connects to the Lilac Corridor Alternative, which crosses I-40 slightly to the north of the Orange Corridor Alternative. Therefore, the effects would be the same as those described above for the Lilac Corridor Alternative.

### 6.2.8.5 Eastern Alternatives

Similar to the Orange and Lilac Corridor Alternatives, any of the Eastern Alternatives would introduce a high-speed, controlled-access facility near the western edge of Zone 8. The Eastern Alternatives would all have the effect of shortening the travel time between this area and the US 64/264 Bypass, improving access to the Knightdale area and to the existing eastern terminus of I-540 and points along the north side of Raleigh. This could also contribute to slightly faster development in the Clayton area than with the No-Build Alternative. These options could also contribute to continued commercial and industrial development in the area between I-40, the Clayton Bypass and NC 42. This development would likely follow local visions for future land uses.

All of the Eastern Alternatives would include an interchange at US 70 Business, just northwest of Clayton. This interchange would also contribute to more commercial development pressure along US 70 Business and increased pressure for nearby residential development. The interchange on the Brown Corridor Alternative would be slightly closer to Clayton, leading to slightly greater development pressure in this area than the other Eastern Alternatives.

### 6.2.8.6 Zone 8 Conclusions

**Table 13** displays the relative concern for potential effects on land use change in Zone 8 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each scenario is discussed below.

**Table 13. Land Use Scenario Analysis Matrix for Zone 8**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ↑ | | | | | | |
| ↑ | **Orange/Lilac<br>Purple/Blue<br>Eastern Alternatives** | **Orange/Lilac<br>Purple/Blue<br>Eastern Alternatives** | | | | |
| ↔ | **Red** | **Red** | | | | |
| ↓ | **No-Build Scenario** | **No-Build Scenario** | | | **Red<br>No-Build Scenario** | **Red<br>Brown<br>No-Build Scenario** |
| ↓ | | | **All Scenarios*** | **All Scenarios*** | **Orange/Lilac<br>Purple/Blue<br>Eastern Alternatives** | **Orange/Lilac<br>Purple/Blue<br>Eastern Alternatives<br>(except Brown)** |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

**Demand for Development and Population Growth** – Overall development in Zone 8 would likely continue to be influenced by existing factors, including the area's proximity to three major

transportation facilities: I-40, the Clayton Bypass, and US 70 Business. Without the Complete 540 project, fairly rapid population growth and demand for development would likely continue, reflecting existing growth and development trends. All of the build scenarios will improve access and shorten travel times between Zone 8 and commercial and employment centers such as RTP and also points east and north of Raleigh. For this reason, the build scenarios would stimulate slightly faster population growth and demand for development. The Red Corridor Alternative would have a more moderate effect compared to the other build scenarios because this option is farther away from Zone 8.

**Pressure for Development Outside Regulated/Planned Areas** – The land in Zone 8 is addressed in local land development regulations and local future land use plans.

**Development Pattern** – The improved access and shorter travel times between Zone 8 and commercial and employment centers would likely lead to moderately faster residential and commercial development in the Clayton area under any of the build scenarios except for the Red Corridor Alternative. The effect on commercial development along corridors such as NC 42 and US 70 Business may be particularly notable. The Red Corridor Alternative would have a weaker effect than the other build options, as this potential interchange area is far enough north that the Complete 540 project would be unlikely to offer much travel time savings between Johnston County and points east or west of Raleigh. Among the Eastern Alternatives, the Brown Corridor Alternative could lead to slightly greater commercial development pressure on US 70 Business closer to Clayton.

**Planned/Managed Land Use Impacts** – In general, development patterns anticipated under any of the build scenarios except the Red Corridor Alternative or the Brown Corridor Alternative would be consistent with local land use plans. By shifting northward some of the more concentrated commercial and industrial development anticipated in local plans near the Complete 540 interchange with I-40, the Red Corridor Alternative could lead to somewhat different development patterns than those envisioned in local land use plans. By shifting development pressure on 70 Business slightly closer to Clayton than under the other build scenarios, the Brown Corridor Alternative could also lead to somewhat different development patterns than those envisioned in local plans. The No-Build Alternative could lead to slightly less concentrated, less intense development near I-40, a pattern that would also differ slightly from that envisioned in local plans.

The most notable natural features in Zone 8 are Swift Creek and its associated aquatic habitat and natural features. Johnston County maintains an Environmentally Sensitive Area (ESA) zoning designation that limits impervious cover and nitrogen loading rates in the Swift Creek watershed area and also along White Oak Creek, Little Creek, and Little River. Neuse River buffer requirements also apply to streams in this area.

### *6.2.9 Zone 9*

Zone 9 is bounded by the Clayton Bypass and NC 42 in the north, I-40 in the east, and the Swift Creek watershed boundary in the south and east. In this zone, suburban development is generally limited to the areas near I-40, along Cleveland Road, where there are a number of planned residential developments. Additional residential development is spreading slowly southeastward from this area. Johnston County's policy is to only extend water and sewer service to planned unit developments (PUDs), which limits the spread of smaller, piecemeal developments. There is also existing commercial development on NC 42 near the I-40 interchange, and Johnston County is actively supporting futher mixed use development along NC 42. The rest of Zone 9 is rural, with many active farms and related rural land uses. Johnston County's Land Use Plan envisions suburban development

slowly spreading north and south of Cleveland Road, with the southeastern part of Zone 9 remaining rural.

The potential indirect effects on land use in Zone 9 under the no-build scenario and the various build scenarios are discussed below.

#### 6.2.9.1 No-Build Alternative

Without the Complete 540 project, the northwest corner of Zone 9 would continue its moderate development, with commercial and mixed use development expanding along the NC 42 corridor, in accordance with Johnston County and Town of Clayton plans to promote this area as a regional commercial and employment center. Planned residential communities would also continue to develop along Cleveland Road, east of I-40. South and east of these areas, development would proceed at a slower pace. Additional commercial uses may develop near the I-40 interchange at NC 210, but much of the rest of Zone 9 is expected to remain fairly rural.

#### 6.2.9.2 Orange and Lilac Corridor Alternatives

Construction of the Orange Corridor Alternative or the Lilac Corridor Alternative would introduce a high-speed, controlled-access facility several miles just to the north of the northwest corner of Zone 9. Because these two options follow a similar alignment, their effects on Zone 9 would likely be similar. While this area currently has easy access to regional facilites including I-40 and the Clayton Bypass, introducing an additional high-speed, controlled-access facility would notably shorten travel times from this area to commercial and employment centers such as RTP. While the distance between Zone 9 and locations like RTP would limit induced development to some extent, these shorter travel times will make the northwest corner of Zone 9 more appealing for both residential and commercial development. In this way, the Orange and Lilac Corridor Alternatives would likely cause this part of Johnston County to develop faster than with the No-Build Alternative. This development would be in accordance with Johnston County's future land use plans. These options could also make the NC 42 corridor area more attractive for larger-scale commercial and office development and could help spur commercial development at the NC 210 interchange on I-40. This would help achieve Johnston County's desired future land use vision for these two areas.

For the southern and eastern parts of Zone 9, Effects of the Orange and Lilac Corridor Alternatives are not likely to differ notably from the No-Build Alternative. These areas are likely too far away for the potential travel time savings to offset the longer distances from RTP and other similar destinations on the west side of Raleigh.

#### 6.2.9.3 Red Corridor Alternative

The Red Corridor Alternative would be about six miles north of Zone 9, so its effect on development in Zone 9 is not likely to differ much from the No-Build Alternative. The I-40 interchange on the Red Corridor Alternative is well to the north of the I-40/NC 42 interchange area in Johnston County, such that the Complete 540 project would be unlikely to offer much travel time savings between Johnston County and points east or west of Raleigh. For this reason, the effects of the Red Corridor Alternative on this growing area in Johnston County would be much less pronounced than with the Orange or Lilac Corridor Alternatives. The Red Corridor Alternative is also unlikely to have a notable effect on land development in the central and southern parts of Zone 9 as these areas are too far away to experience notable changes in access or travel times.

#### 6.2.9.4 Purple to Blue Corridor Alternative

The Purple to Blue Corridor Alternative connects to the Lilac Corridor well to the northwest of Zone 9, and the two interchanges nearest to Zone 9 on this alignment (NC 50 and I-40) are in the same area as the interchanges using the Lilac Corridor Alternative. For this reason, the effects of the Purple to Blue Corridor Alternative alignment on Zone 9 development patterns would likely be the same as effects of the Lilac Corridor Alternative, described in **Section 6.2.9.2**.

#### 6.2.9.5 Eastern Alternatives

As described above, potential effects of the Eastern Alternatives (Preliminary Corridor Alternatives east of I-40—Green, Mint Green, Brown, Tan and Teal) on land use change are dependent on the alignments west of I-40 that the Eastern Alternatives connect to.

#### 6.2.9.6 Zone 9 Conclusions

**Table 14** displays the relative concern for potential effects on land use change in Zone 9 under the no-build scenario and the various build scenarios, based on the factors that will influence the location and intensity of development. Each factor is discussed below.

**Demand for Development and Population Growth –** Population growth and demand for development are likely to continue at a moderate pace in Zone 9, but proximity to existing major transportation facilties and other existing factors are likely to have more influence on this pace than the various scenarios for Complete 540. The one part of Zone 9 where population growth and demand for development could accelerate due to the project is its northwestern corner, near I-40 and US 70. The Orange, Lilac, or Purple to Blue Corridor Alternatives would somewhat improve access to these areas, leading to slightly greater development demand there.

**Pressure for Development Outside Regulated/Planned Areas** – The land in Zone 9 is addressed in local land development regulations and local future land use plans.

**Development Pattern** – Overall development patterns in Zone 9 are likely to continue to be influenced by existing factors, with or without Complete 540. The area's proximity to I-40 and the Clayton Bypass make the northwestern corner of Zone 9 area attractive to development. DSAs following the Orange or Lilac Corridor Alternatives would improve access and shorten travel times between this part of Zone 9 and commercial and employment centers such as RTP. This would likely lead to moderately faster residential and commercial development in this part of Johnston County under these scenarios. DSAs crossing I-40 on the Red Corridor Alternative would be less likely to influence development, as this potential interchange area is far enough north that the Complete 540 project would be unlikely to offer much travel time savings between Johnston County and points east or west of Raleigh. None of the build scenarios would likely have a notable influence on development in the southern and eastern parts of Zone 9, due to the longer distances between these areas and the Complete 540 project and the lack of public water and sewer infrastructure in these areas.

**Planned/Managed Land Use Impacts** – All scenarios would likely support development in Zone 9 in accordance with the land uses and development envisioned by local land use plans. The most notable natural features in Zone 9 are Swift Creek and its associated aquatic habitat and natural features. Johnston County maintains an Environmentally Sensitive Area (ESA) zoning designation that limits impervious cover and nitrogen loading rates in the Swift Creek watershed area and also along White Oak Creek, Little Creek, and Little River. Neuse River buffer requirements also apply to streams in this area.

**Table 14. Land Use Scenario Analysis Matrix for Zone 9**

| Rating | Pressure / Demand for Typically Higher Impact Development | Future Shift of Regional Population Growth to the Growth Area | Pressure for Land Development Outside Regulated Areas | Pressure for Land Development Outside Planned Areas | Development Pattern | Planned / Managed Land Use and Impacts |
|---|---|---|---|---|---|---|
| **More Concern** | Commercial / industrial development with large parking lots likely | Strong attraction for development in this area | Large number of acres in the Probable Development Areas are outside regulated areas | Large number of acres in the Probable Development Areas are outside planned areas | Strip or sprawling development likely | Land development and stormwater goals not set |
| ⬆ | | | | | | |
| ↑ | | | | | | |
| ↔ | **Orange/Lilac Purple/Blue** | **Orange/Lilac Purple/Blue** | | | **Red No-Build Scenario** | |
| ↓ | **Red No-Build Scenario** | **Red No-Build Scenario** | | | **Orange/Lilac Purple/Blue** | **All Scenarios*** |
| ⬇ | | | **All Scenarios*** | **All Scenarios*** | | |
| **Less Concern** | Commercial / development and/or large residential developments not likely | No population shift likely | All Probable Development Areas in a regulated area | All Probable Development Areas in a planned area | Likely to support clustered development | Development areas are consistent with land development and stormwater management goals |

Notes: Potential effects of the "Eastern Alternatives," the corridor alternatives east of I-40, on land use and development in Zone 5 are dependent on the corridor alternatives west of I-40 that the Eastern Alternatives connect to; for this reason they are not included in the above table.

* The potential effects of all scenarios are expected to be influenced to the same extent by this factor.

# 7 CUMULATIVE EFFECTS

As described in **Section 3.4**, the key resource issues for purposes of the cumulative effects analysis were identified using the input from resource agencies during the project's scoping process. The two major resource issues raised were the potential for cumulative effects on the viability of the federally endangered Dwarf wedgemussel in the lower portions of Swift Creek watershed, below the Lake Benson dam, and on water quality within the entire Swift Creek watershed. There is also concern about the potential for cumulative effects on terrestrial communities and the potential for habitat loss and/or fragmentation in the project area.

## 7.1 NOTABLE PAST ACTIONS

Overall development trends in the FLUSA for the Complete 540 project have been largely influenced and shaped by the area's proximity to the robust employment centers of the Triangle Region, particularly to RTP. Until the early 1990s, much of the FLUSA was rural, with the exception of the central Garner area. Large residential projects including Sunset Ridge in Holly Springs, Ballentine in Fuquay-Varina, Eagle Ridge in Garner, and River Ridge in southeast Raleigh began to develop in the FLUSA in the early and mid-1990s. More residential development followed these projects, and commercial development also began to spread in parts of the FLUSA. Some of the notable commercial projects included New Hill Place in Holly Springs and White Oak Crossing in Garner. Greenfield Business Park and White Oak Business Park, two commercial and industrial parks near I-40 and US 70 in Garner, also began development in the mid-1990s. A more recent major industrial development was the Novartis vaccine production facility, which broke ground in 2007 in Holly Springs west of NC 55 Bypass. Johnston Health Clayton, another major employer in the area, opened in 2010 on NC 42 in Clayton. On the southeast side of Clayton, biopharmaceutical company Novo Nordisk opened a manufacturing plant in 1996 and an existing Talecris Biotherapeutics plant underwent a major expansion in 2010.

Several past infrastructure projects have also influenced development in recent decades in the FLUSA for Complete 540. The NC 55 Bypass, which extends around the west side of Holly Springs, opened in 2002. It has spurred both general residential development in Holly Springs and Fuquay-Varina and commercial development along the west side of the bypass. The Clayton Bypass (US 70 Bypass), a controlled access facility that carries US 70 through traffic around Clayton, opened in 2008. It has influenced development throughout the Clayton area, particularly along the NC 42 corridor.

The Dempsey E. Benton Water Treatment Plant, with a maximum capacity of 20 MGD opened in 2010 along NC 50, near I-40 in the Garner area. The Neuse River WWTP, on Battle Bridge Road in southeast Raleigh, originally opened in 1989 and has been expanded several times since, now treating 44 MGD. The South Cary Water Reclamation Facility, west of Bells Lake Road along Middle Creek in Cary, opened in 1990 and now treats 12 MGD.

## 7.2 PLANNED FUTURE ACTIONS

**Section 3.5** describes the transportation and other infrastructure projects planned for the reasonably foreseeable future. There are also planned residential and commercial projects across the FLUSA. Most of these are small and are continuations of existing development trends, but there are several notable large planned projects in the area. These include:

- The Veridea development, a large planned and approved mixed-use project in Apex, west of NC 55 and south of US 1. It is anticipated to include 10 million square feet of office development, 3.5 million square feet of commercial space, and 8,000 residential units. Development of this project has not yet begun, but Apex planners report that development is anticipated to begin soon.
- A new Western Wake Regional WWTP is under construction and nearing completion west of the project area. It will serve Cary, Apex, Holly Springs, and Morrisville, and will ultimately increase the region's wastewater treatment capacity by 18 MGD.
- A major retail development, with up to 800,000 square feet of commercial space, is being planned at the northwest corner of the intersection of US 70 and White Oak Road in Garner, beginning around 2015. This will be adjacent to the existing White Oak Crossing commercial development.
- The Randleigh Farm project, a planned multi-use development on a 417-acre tract on Battle Bridge Road in southeast Raleigh. The property is jointly owned by the City of Raleigh and Wake County and its planned uses include residences, commercial development, and recreational uses. It is unknown when this project will begin development.
- The Wendell Falls project, an approved mixed-use development at the far northeastern corner of the FLUSA. It is intended to include 4,000 residential units and 100 acres of retail space. It also includes a school and designated open space along Lake Myra and Marks Creek.

## 7.3 NOTABLE ENVIRONMENTAL RESOURCES

### *7.3.1 Water Quality and Aquatic Habitat*

#### 7.3.1.1 Affected Environment

Aquatic resources in the FLUSA are part of the Neuse River and Cape Fear River basins. The Neuse River basin portion of the FLUSA is within subbasin 03-04-02. As described in **Section 5.4.2.1**, there are three general watersheds in the Neuse basin within the FLUSA: Middle Creek and its tributaries, Swift Creek and its tributaries, and the Neuse River and its tributaries. The Swift Creek watershed includes two large lakes, Lake Wheeler and Lake Benson. The Neuse River Basinwide Water Quality Plan (NCDENR, 2009) indicates that rapid development in this subbasin and its accompanying rapid increases in the amount of impervious area have contributed to notable increases in stream flow after rainfall event, leading to stream bank erosion and sedimentation, which in turn leads to aquatic habitat degradation. Increased stormwater runoff also contributes high nutrient and bacterial loads, which lead to low dissolved oxygen levels and poor biological integrity.

Middle Creek and Swift Creek within the immediate project area are listed as impaired on the North Carolina 303(d) list (NCDENR, 2014). Middle Creek is listed as impaired from south of US 1 to US 401. Terrible Creek, a tributary of Middle Creek, is also identified as an impaired water in this area. Swift Creek is listed as impaired from Lake Wheeler to Little Creek. A portion of the Neuse River in the FLUSA is listed as impaired, as are several tributaries to the Neuse River.

Swift Creek is also a water supply watershed, with a designated Critical Area surrounding the area between and including Lake Wheeler and Lake Benson. As described in **Section 5.6.1**, development in the Swift Creek watershed area is limited by watershed protection policies within Wake County's *Swift Creek Land Management Plan* (1990). This Plan identifies the Swift Creek Water Supply Watershed Critical Area and buffer areas, within which development activities are limited, and appropriate low-density land use categories for the surrounding areas.

Kenneth Creek and Neills Creek, which are within the Cape Fear basin in Harnett County, are also included on the North Carolina Draft 2014 303(d) list. Hector Creek, also in the Cape Fear basin in Harnett County, is classified as a High Quality Water (HQW). The Cape Fear Basinwide Water Quality Plan (NCDENR, 2005) also indicates that development, increases in impervious surface, and increased stormwater runoff threaten water quality and aquatic habitat.

#### 7.3.1.2 Potential for Cumulative Effects

Anticipated continued growth and development across the FLUSA will continue to affect area water quality and aquatic habitat. These effects are likely in either the build or no-build scenario. Construction of any of the new location alternatives under consideration for the project would have the potential to affect water quality and to contribute to aquatic habitat degradation. Under the build scenario, however, these effects could shift farther to the south and east. Direct natural environmental impacts by NCDOT projects will be addressed by avoidance, minimization, or mitigation, consistent with programmatic agreements with the natural resources agencies through interagency coordination during the environmental study and during the permitting process. All developments will be required to follow local, state, and federal guidelines and permitting regulations.

All of the build scenarios will cross the Swift Creek system in the vicinity of several past projects, including the Clayton Bypass, the Dempsey E. Benton Water Treatment Plant, and general residential and commercial development along I-40 and US 70 Business between Garner and Clayton. Commercial and residential development continues in this area, and there are several planned future transportation improvements in the area, including widening of I-40 and NC 42, and improvements to the I-40/NC 42 interchange, with possible new interchanges at Cleveland Road and Cornwallis Road (**Section 3.5**). The addition of the Complete 540 project to this area will add to the cumulative effects of these projects on water quality and aquatic habitat in the Swift Creek watershed. The Red Corridor Alternative is the only build alternative within a Water Supply Watershed, and therefore has the potential to add to potential cumulative effects of general growth and development on water quality in the Swift Creek Watershed Critical Area.

Water quality and aquatic habitat in Middle Creek is likely to continue to be affected in the no-build scenario by robust growth in the Holly Springs and Fuquay-Varina areas at the west side of the FLUSA for Complete 540. By encouraging faster growth in this area, the build scenarios all have the potential to contribute to cumulative effects on Middle Creek, along with other planned projects including the widening of US 401 and NC 42, the opening of the Western Wake Regional WWTP, and development of the Veridea project. As it is closest to the Middle Creek watershed, and crosses Middle Creek twice, the Purple to Blue Corridor Alternative has the strongest potential to result in notable cumulative effects on water quality and aquatic habitat in Middle Creek. The Purple to Blue Corridor also has the most notable potential to contribute to cumulative effects on streams south of NC 42 and in Harnett County.

According to Raleigh and Wake County officials, the planned Randleigh Farm project is more likely to begin to be developed if the Complete 540 project is constructed nearby. Cumulatively, these two projects will contribute to effects on water quality and aquatic habitat in the Neuse River, which is near Randleigh Farm. This effect could be slightly reduced with DSAs using the Brown Corridor Alternative, as this option is farther from Randleigh Farm than the other options and could somewhat limit the development potential of that project.

### 7.3.2 Dwarf Wedgemussel Habitat (Swift Creek Watershed)

#### 7.3.2.1 Affected Environment

The federally protected Dwarf wedgemussel is found throughout Swift Creek across the FLUSA; however, the portion of Swift Creek downstream of the Lake Benson dam, near NC 50, is particularly important for the long-term survival of this species in the region. Poor water quality and habitat conditions have led to the decline and loss of populations of the Dwarf wedgemussel and threaten the remaining populations (USFWS, 2011). The Dwarf wedgemussel is extremely sensitive to urban pollutants, especially in its early life stages. In addition, urban development activities lead to soil erosion and sedimentation that also harms the species. The alteration of floodplains or the removal of forested stream buffers can be especially harmful.

#### 7.3.2.2 Potential for Cumulative Effects

Continued development in the lower Swift Creek watershed, below the Lake Benson dam, will continue to pose challenges for the long-term viability of Dwarf wedgemussel habitat in this area. Even under the no-build scenario, the long-term viability of the species in the Swift Creek watershed is at risk. All of the build scenarios could contribute to more rapid growth in this area, although the Red Corridor Alternative could minimize this effect to some extent. Notable past projects in this area have included the Clayton Bypass and the Dempsey E. Benton Water Treatment Plant. As part of the mitigation process associated with the Clayton Bypass project, Wake County, Johnston County, and the Town of Garner entered into a Memorandum of Understanding (MOU) with NCDOT and USFWS. As described in **Section 5.6.1**, the MOU included several commitments for mitigation strategies to protect the Dwarf wedgemussel in Swift Creek.

Commercial and residential development continues in the lower Swift Creek watershed, and there are several planned future transportation improvements in the area, including widening of I-40 and NC 42 (**Section 3.5**). The addition of the Complete 540 project to this area has the potential to add to the cumulative effects of these projects on the long-term viability of the Dwarf wedgemussel in the lower Swift Creek watershed.

### 7.3.3 Terrestrial Communities and Habitat

#### 7.3.3.1 Affected Environment

Based on information presented in the *Natural Resources Technical Report* (Mulkey, 2014) prepared for this project, forested land cover in the study corridors for the project's DSAs ranges from about 35 to 40 percent of the total area. This is compared to about 25 to 30 percent maintained/disturbed areas, which correspond to urban development. The counties in the FLUSA have experienced loss of forested area in recent decades and notable increases in urban developed areas (Natural Resources Conservation Service, 2010). Loss of intact forested land, leading to increased forest fragmentation and habitat disturbance, threatens the habitat viability for terrestrial species.

#### 7.3.3.2 Potential for Cumulative Effects

Habitat loss is a result of conversion of undeveloped land to urban development. There is undeveloped land throughout most of the FLUSA, except in the areas along its northern edge. As discussed in **Sections 5.1** and **5.2**, robust growth is anticipated to continue across the Triangle Region, and this growth is not dependent on construction of the Complete 540 project. For this reason, loss of terrestrial habitat will continue under the No-Build Alternative, influenced by general trends in the region and by the planned projects discussed in **Sections 3.5** and **8.2**. Under the No-Build Alternative, terrestrial habitat loss will likely be most notable in areas closer to existing major roadways,

particularly those that are planned for capacity improvements, such as US 401, I-40, and Ten Ten Road. Planned water and sewer capacity projects will also contribute to land use conversion around Ten Ten Road west of I-40. The Veridea project in Apex will also have a notable effect on land use conversion at the western edge of the FLUSA, and the new Western Wake Regional WWTP and the increased capacity that it will provide will influence land use conversion across the western side of the FLUSA.

Construction of any of the new location alternatives under consideration for the project would have the potential to contribute to forest fragmentation and wildlife habitat disturbance. The key difference from the no-build scenario is that the Complete 540 project could shift these effects farther to the south and east. Areas where cumulative effects are likely to be most pronounced are described below.

Past projects in the vicinity of US 70 between Garner and Clayton, including the Clayton Bypass, the Dempsey E. Benton Water Treatment Plant, Johnston Health Clayton, construction of the Novo Nordisk plant and the expansion of the Talecris Biotherapeutics plant, have contributed to land use conversion in this area. Commercial and residential development continues in this area, and there are several planned future transportation improvements in the area, including widening of I-40 and NC 42 (**Section 3.5**). The addition of the Complete 540 project to this area will add to the cumulative effects of these projects on land use conversion in this area (Zone 8).

The planned Randleigh Farm project is more likely to begin to be developed if the Complete 540 project is constructed nearby. Cumulatively, these two projects will contribute to land use conversion in Zone 7. This effect could be slightly reduced with DSAs using the Brown Corridor Alternative, as this option is farther from Randleigh Farm than the other options and could somewhat limit the development potential of that project.

# 8 CONCLUSIONS

The Raleigh metropolitan area and the broader Triangle Region are among the nation's most rapidly growing regions. The region also has one of the nation's most robust job markets, and much of the FLUSA for the Complete 540 project lies within easy commuting distance of major employment centers in the Triangle Region. Population projections point to continued rapid growth in this area, suggesting that there will continue to be a high demand for residential, commercial, and office development in the FLUSA.

As a major new location facility, the Complete 540 project would dramatically increase access both within the project area and between locations in the project area and employment and commercial centers outside the project area. Local planners fully anticipate that the project would play a major role in influencing the land uses and intensities that will develop across the project area. In light of this anticipated influence on development, area local governments anticipate that the Complete 540 project will be constructed and have developed plans and goals based on that assumption.

## 8.1 BUILD VERSUS NO-BUILD SCENARIOS

The project is likely to influence the type, timing, location and intensity of development in the project area, particularly near potential interchange areas, and any of the build scenarios would result in indirect effects in the form of induced land development in the FLUSA. However, predicted growth and land development trends suggest that the area overall will continue to develop with or without the project. Under the No-Build Alternative, the project, growth and development would likely remain closer to existing major transportation facilities, such as I-40/I-440, NC 55, US 401, NC 50, NC 42, and Ten Ten Road. It is important to note that most local plans are based on an assumption that the project will be constructed and will support development of mixed use activity centers at interchange areas along the Complete 540 project, concentrating more intense development in these areas. The No-Build Alternative may not be able to support the desired higher land use densities and intensities that local governments anticipate for these areas. While future land use plans could be modified according to different patterns that would take shape under a No-Build Alternative, it is important to note that current development patterns, traffic volumes on existing roadways, and existing infrastructure investments may make it difficult to shift planned activity centers to other locations or to achieve the types of concentrated development envisioned for these planned activity centers. Under the No-Build Alternative, the likely land use pattern would include more numerous and less concentrated activity centers. This pattern would be inconsistent with local future land use plans.

Growth as an indirect effect of the construction of a Build Alternative would be guided by underlying local zoning and development regulations and future land use plans, which would help to direct growth to appropriate areas and within acceptable densities. The lack of existing or planned public water and sewer infrastructure in many parts of the FLUSA would also help direct growth to areas targeted by local jurisdictions for development.

Regardless of whether a build alternative or the no-build alternative is selected, growth and development is expected to continue in the FLUSA. This growth would likely result in indirect and cumulative effects on notable features in the FLUSA, although the more rapid growth in some areas as a result of the project could result in a greater effect on these features under a build scenario. Under both scenarios, development will likely increase in the watersheds located in the FLUSA; in particular, development is expected to increase in the Swift Creek watershed, the Middle Creek watershed, and near the Neuse River in the eastern part of the FLUSA. The *Swift Creek Land Management Plan* and

other local land development regulations will help to limit development density and intensity near the Swift Creek Watershed Critical Area, helping to mitigate the effects of continued growth on water quality in Swift Creek. The Neuse River Buffer Rules, the more stringent riparian buffer requirements in some jurisdictions, and NPDES Phase II requirements will also help to minimize effects on water quality. By facilitating development farther to the south and east, the Orange and Lilac build scenarios may have a somewhat greater potential for affecting water quality and habitat for the Dwarf wedgemussel in the lower Swift Creek watershed, below the Lake Benson dam.

Along with other past and planned future infrastructure and major development projects, any of the build scenarios for the Complete 540 project would have the potential to affect water quality and cause habitat fragmentation. The build scenarios would also have the potential to add to the cumulative effects of other past and planned future projects on the long-term viability of the Dwarf wedgemussel in the lower Swift Creek watershed. As part of this project, NCDOT is currently conducting a study examining Dwarf wedgemussel viability in the lower Swift Creek watershed. The results of this study will be documented in the project's Draft EIS.

The build scenarios under consideration for the Complete 540 project have the potential to affect water quality in the project FLUSA. For this reason, a quantitative analysis of the potential indirect and cumulative impacts (ICI) of the project on water quality as a result of increased impervious surface should be completed following selection of the Least Environmentally Damaging Practicable Alternative (LEDPA), after publication of the Final EIS.

Except for direct impacts to prime farmland soils, for which there is no mitigation, direct natural environmental impacts by NCDOT projects would be addressed by Programmatic Agreements with resource agencies, and will be further evaluated by the NCDOT Natural Environment Section during project permitting.

## 8.2 DETAILED STUDY ALTERNATIVES

The various DSAs under consideration for the project reflect a range of different build scenarios under consideration. The wide differences in locations in these scenarios would result in notable variations in the primary locations of potential induced development. Under each build scenario, it is anticipated that the project's interchange areas would encourage increased commercial and industrial development, along with a greater mix in land uses and higher density residential development which is consistent with locally adopted land use plans. Because interchange locations vary according to DSA, these locations of increased and more concentrated development would also vary according to DSA.

Because most of the adopted local land use plans are based on the assumption that the project will be constructed along the Orange Corridor Alternative west of I-40 and along the Green Corridor Alternative east of I-40, DSAs including these corridors have the greatest potential to support these development patterns in the locally desired locations. West of I-40, the Lilac Corridor Alternative would also support growth patterns similar to those anticipated by local plans. The Red Corridor Alternative would likely shift induced land development farther to the north, while the Purple to Blue Corridor Alternative would likely shift this effect farther south. Because the Purple to Blue Corridor Alternative extends into more rural areas farther from existing cities and towns, DSAs using this corridor could result in overall induced land development spread over a larger area, promoting development farther to the south than the other DSAs, leading to a more sprawling development pattern than under other scenarios and contributing to increased impervious surface cover over a larger

area. This development pattern would be in greater conflict with local land use goals than the other scenarios. For this reason, there is a greater potential for indirect land use effects with the DSAs including the Purple to Blue Corridor. East of I-40, there is less variation among the corridors under consideration in terms of induced land development, although the Brown Corridor Alternative could push these effects slightly farther to the south and east than the other options.

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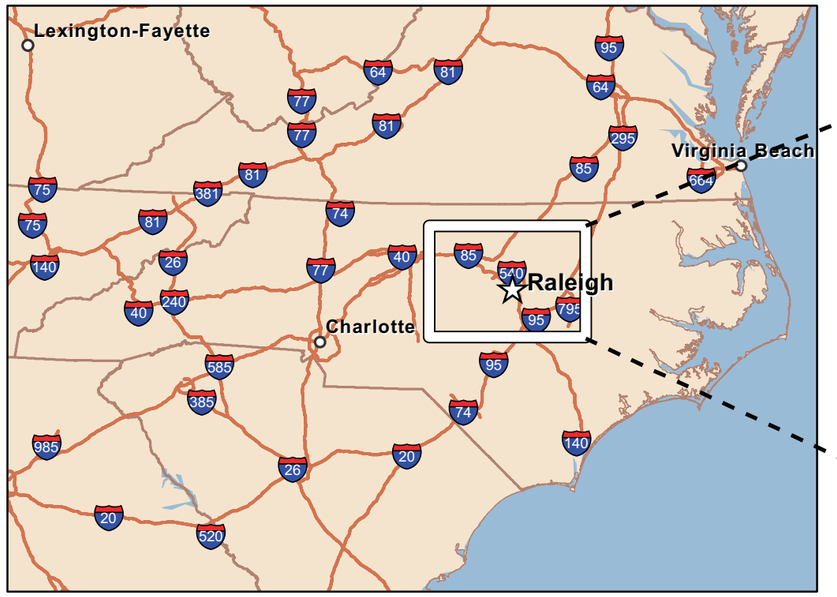
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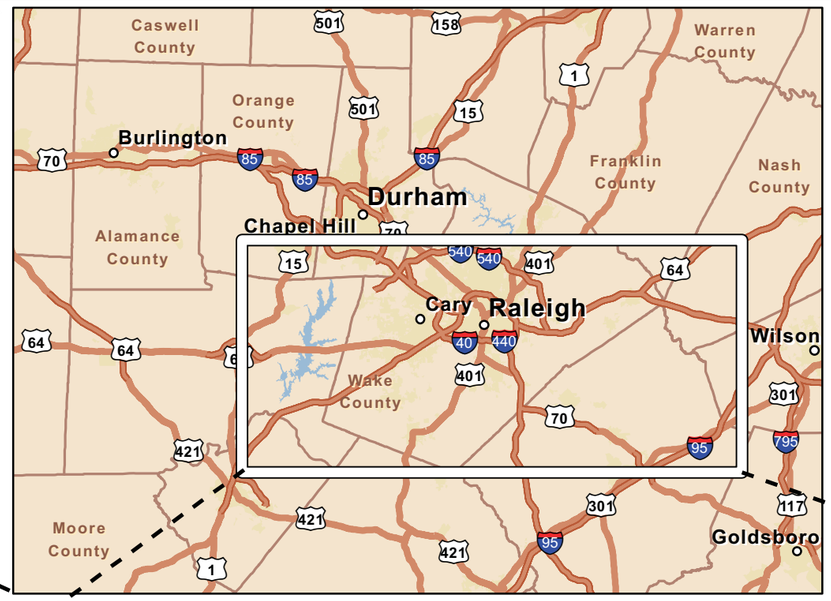
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Moore County
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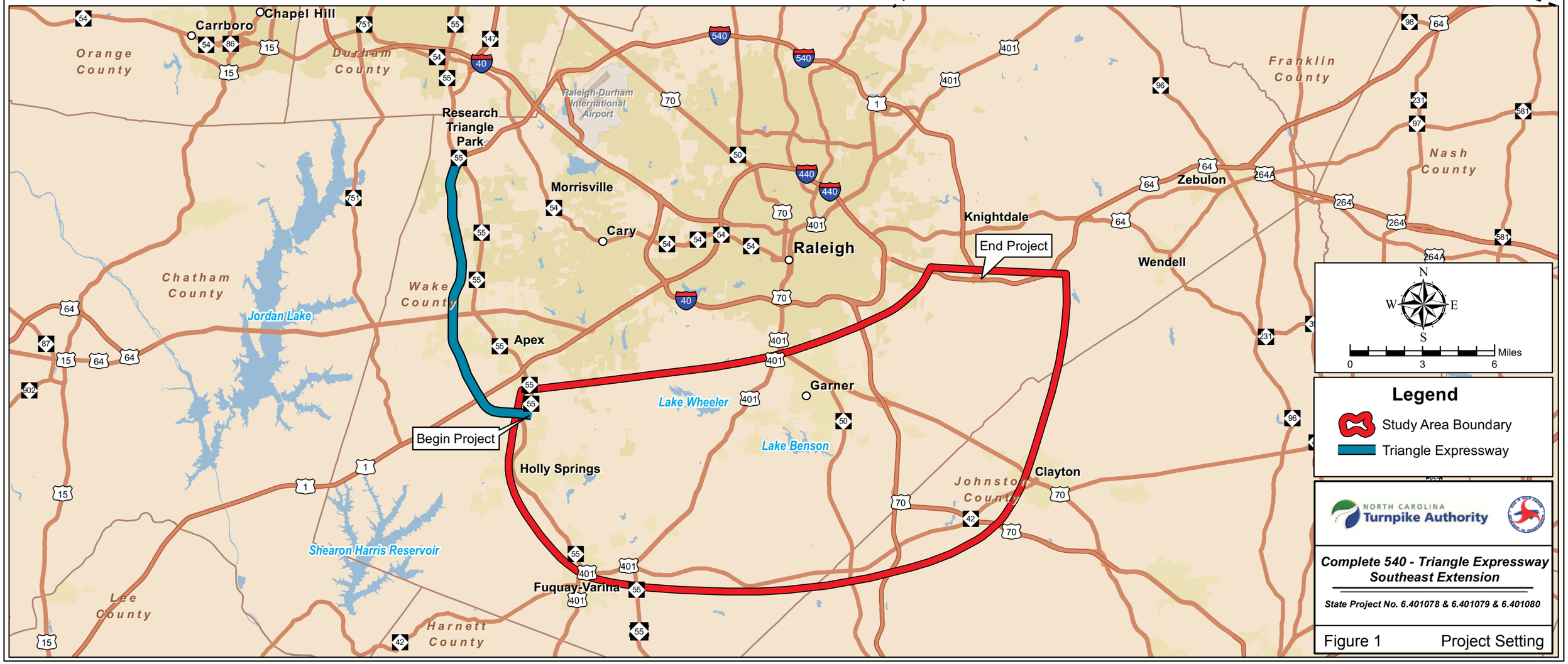
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Chapel Hill
Durham County
Raleigh-Durham International Airport
Research Triangle Park
Morrisville
Cary
Raleigh
Knightdale
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Franklin County
Zebulon
Wendell
Nash County
Chatham County
Jordan Lake
Wake County
Apex
Garner
Lake Wheeler
Lake Benson
Begin Project
Holly Springs
Clayton
Johnston County
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Miles
Legend
Study Area Boundary
Triangle Expressway
NORTH CAROLINA Turnpike Authority
Complete 540 - Triangle Expressway Southeast Extension
State Project No. 6.401078 & 6.401079 & 6.401080
Figure 1
Project Setting

## Legend

- Study Area Boundary
- Triangle Expressway

**Corridors**

- Orange
- Purple
- Blue
- Lilac
- Red
- Green
- Brown
- Mint
- Tan
- Teal

CARY
RALEIGH
KNIGHTDALE
APEX
GARNER
HOLLY SPRINGS
FUQUAY-VARINA
CLAYTON

Study Area
Study Area

I-40
WADE AVE
WESTERN BLVD
AVENT FERRY RD
POOLE RD
NEUSE RIVER
SR#2500
TAYLOR RD
TURNIPSEED RD
HODGE RD
TRYON RD
CENTER ST
TEN TEN RD
TINGEN RD
SMITH RD
CREECH RD
ROCK QUARRY RD
BATTLEBRIDGE RD
AUBURN KNIGHTDALE RD
OLD BAUCOM RD
SHOTWELL RD
COVERED BRIDGE RD
Wake County
Johnston County
Lake Wheeler
LAKE WHEELER RD
PIERCE OLIVER RD
WEST LAKE RD
BELLSLAKE RD
OLD STAGE RD
Lake Benson
WHITE OAK RD
WIN RD
White Oak Creek
GUY RD
WINSTON RD
NEW BETHEL RD
E MAIN ST
CITY RD
Middle Creek
HOLLY SPRINGS RD
Sunset Lake
Bass Lake
AVENT FERRY RD
BANKS RD
HILLTOP RD
Swift Creek
JACK RD
CASS HOLT RD
WADE NASH RD
SR#1154
SR#1119
SR#1101
MOUNT PLEASANT RD
OLD DRUG STORE RD

TOLL 540
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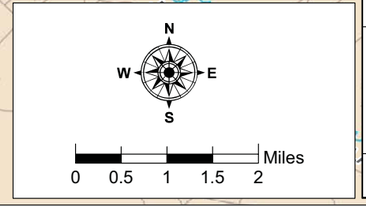
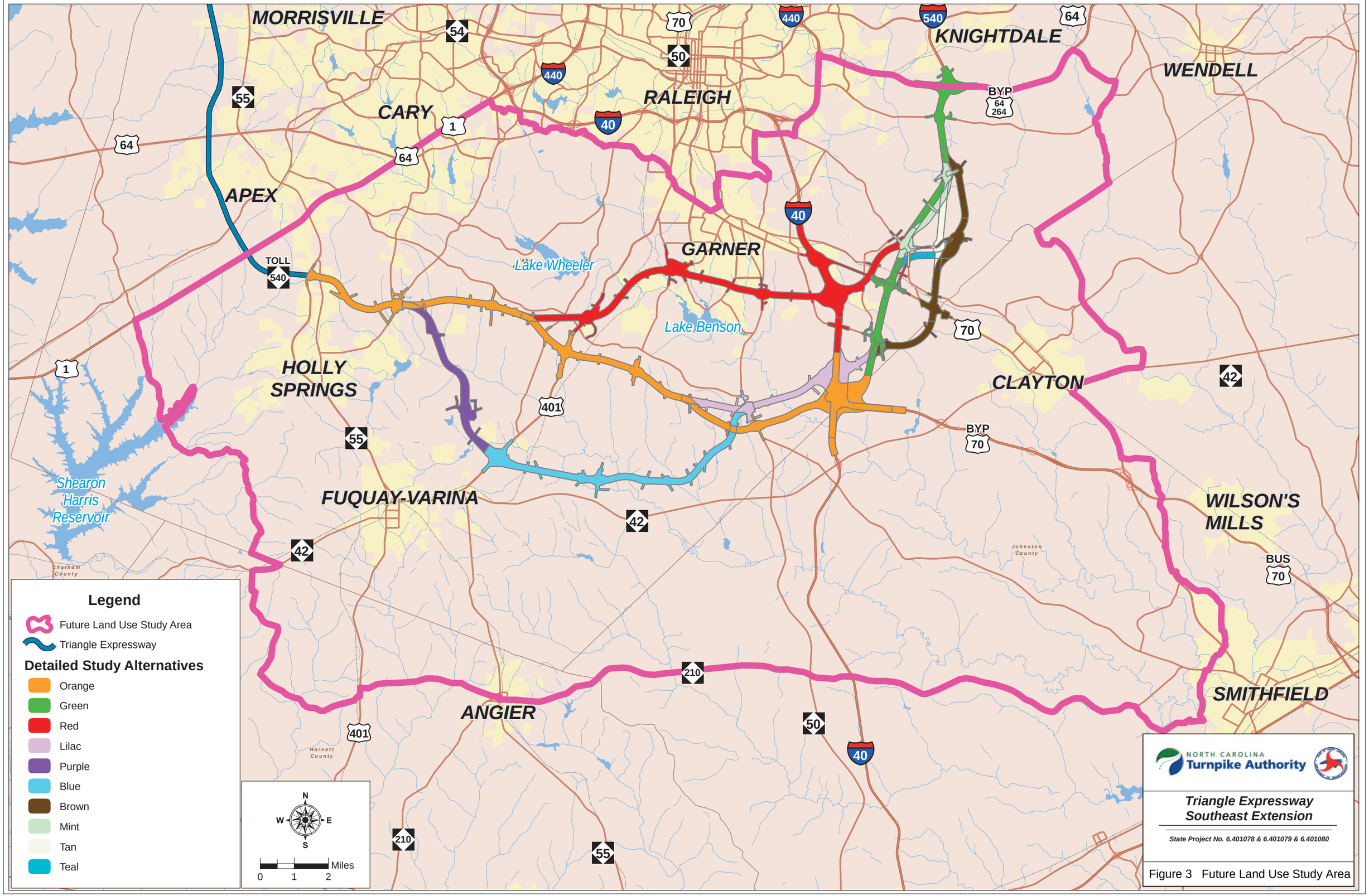



NORTH CAROLINA Turnpike Authority

**Complete 540 - Triangle Expressway Southeast Extension**

*State Project No. 6.401078 & 6.401079 & 6.401080*
*S.T.I.P. No. R-2721 & R-2828 & R-2829*

Figure 2 Detailed Study Alternatives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WENDELL
APEX
GARNER
HOLLY SPRINGS
CLAYTON
FUQUAY-VARINA
WILSON'S MILLS
SMITHFIELD
ANGIER
Lake Wheeler
Lake Benson
Shearon Harris Reservoir
Chatham County
Johnston County
Harnett County
TOLL
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Future Land Use Study Area
Triangle Expressway
Detailed Study Alternatives
Orange
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Red
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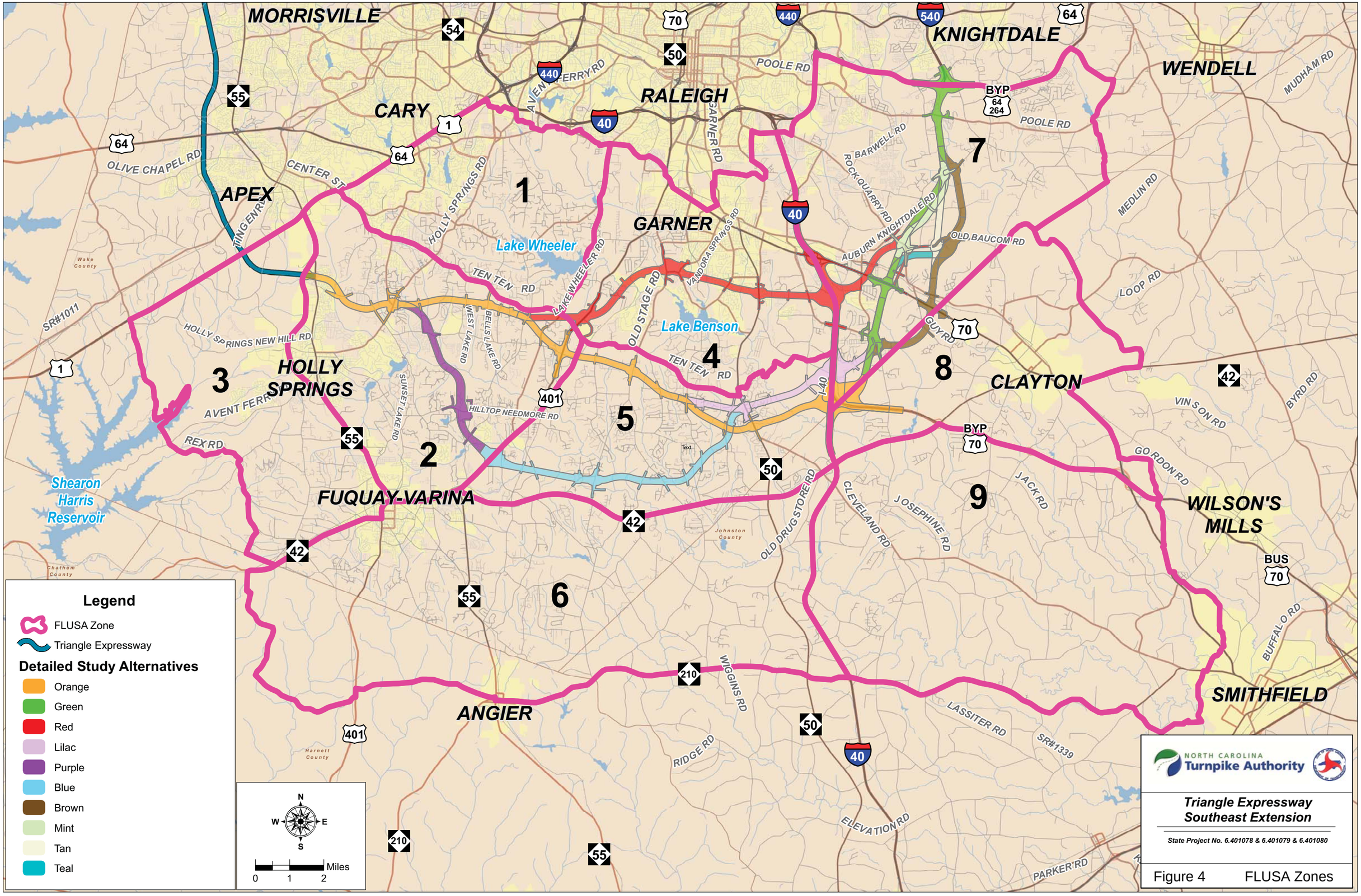
NORTH CAROLINA Turnpike Authority
Triangle Expressway Southeast Extension
State Project No. 6.401078 & 6.401079 & 6.401080
Figure 3 Future Land Use Study Area




## Legend

- FLUSA Zone
- Triangle Expressway

### Detailed Study Alternatives

- Orange
- Green
- Red
- Lilac
- Purple
- Blue
- Brown
- Mint
- Tan
- Teal

N W E S

0 1 2 Miles

NORTH CAROLINA Turnpike Authority

***Triangle Expressway Southeast Extension***

*State Project No. 6.401078 & 6.401079 & 6.401080*

Figure 4 FLUSA Zones

## Legend

Future Land Use Study Area

### Existing Land Use

- Low Density Residential/Rural/Agricultural
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Mixed Use/Office
- Conservation/Open Space/Park/Golf Course
- Educational Institution Area
- Residential Subdivision

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### Detailed Study Alternatives

- Orange
- Green
- Red
- Lilac
- Purple
- Blue
- Brown
- Mint
- Tan
- Teal

CARY
RALEIGH
APEX
GARNER
KNIGHTDALE
HOLLY SPRINGS
CLAYTON
FUQUAY-VARINA
ANGIER
Lake Wheeler
Lake Benson
AVENT FERRY RD
POOLE RD
GARNER RD
CENTER ST
TEN TEN RD
OLD STAGE RD
GUY RD
MEDLIN RD
LOOP RD
MUDHAM RD
SR#1011
REX RD
BELL SLAKE RD
Wake County
Harnett County
Johnston County
OLD DRUG STORE RD
JOSEPHINE RD
JACK RD
GORDON RD
VINSON RD
BYRD RD
BUFFALO RD
WIGGINS RD
RIDGE RD
LASSITER RD
SR#1339
ELEVATION RD
I-40
BYP 64 264
BYP 55
BYP 70
BUS 70

NORTH CAROLINA Turnpike Authority

**Complete 540 - Triangle Expressway Southeast Extension**

*State Project No. 6.401078 & 6.401079 & 6.401080*

Figure 5 Existing Land Use

## Legend

- Future Land Use Study Area
- Water Body
- 303(d) Stream
- Swift Creek Water Supply Watershed Critical Area
- Water Supply Watershed
- Hector Creek High Quality Water
- Park / Recreation Area
- Natural Heritage Program Natural Area

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## Detailed Study Alternatives

- Orange
- Green
- Red
- Lilac
- Purple
- Blue
- Brown
- Mint
- Tan
- Teal

CARY
APEX
RALEIGH
KNIGHTDALE
GARNER
HOLLY SPRINGS
CLAYTON
FUQUAY-VARINA
ANGIER

Swift Creek Water Supply Watershed
Cape Fear River Water Supply Watershed

TOLL 540
BYP 64 264
BYP 55
BYP 70
BUS 70

NORTH CAROLINA Turnpike Authority

**Complete 540 - Triangle Expressway Southeast Extension**

State Project No. 6.401078 & 6.401079 & 6.401080

Figure 6 Notable Features

# APPENDICES

# APPENDIX A
# LOCAL GOVERNMENT INTERVIEWS – QUESTIONNAIRE AND MEETING SUMMARIES

**Project: Triangle Expressway Southeast Extension**

Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis

General

1) Have there been any updates to your local plans since this time last year?

2) Have any of your annexation plans changed since this time last year?

3) Has your growth rate been affected by current economic conditions?

4) What do you consider to be "Notable Environmental Features" in future land use study area (examples of Notable Environmental Features defined as important, special or unique features including parks, historic districts, water supply areas, preservation areas, habitat areas, impaired streams, community resources, etc.)?

Socioeconomics

5) In looking at the current conceptual alternatives, are you aware of any pockets of low-income or minority residents that could potentially be affected?

6) Did you provide existing/future socioeconomic data by traffic analysis zone (TAZ) to CAMPO for their Metropolitan Transportation Plan (MTP)? If yes, go to #8. If no, go to #7.

7) Did you review and do you endorse the existing/future socioeconomic data used in the CAMPO MTP for the TAZs within your jurisdiction? If yes, go to #8. If no, please be prepared to provide us with revised numbers by TAZ in the near future.

8) Does the CAMPO MTP socioeconomic data for your jurisdiction assume the project would be constructed? If yes, go to #9. If no, go to #10.

9) If the project is NOT built, would you revise the socioeconomic data in your community to reflect the absence of the project? If no, go to #11. If yes, pleased be prepared to provide us with revised numbers by TAZ in the near future. Go to #11.

10) If the project IS built, would you revise the socioeconomic data in your community to reflect the presence of the project? If no, go to #11. If yes, please be prepared to provide us with revised numbers by TAZ in the near future. Go to #11.

11) Is there a need to revise the existing and/or socioeconomic data (unrelated to the project) in the CAMPO MTP for your jurisdiction? If yes, please be prepared to provide us with revised numbers by TAZ in the near future.

Planned Future Development

12) What ***major*** commercial, residential and industrial developments are planned in your locality (including both public and private actions)?

13) What ***major*** roadway and/or other transportation improvements (transit, bus, airports, etc.) are planned in your locality?

14) Do you have any planned water/sewer line extensions? New or expanded water/sewer facilities? If so, what will be the planned capacity at water/wastewater treatment plants?

15) What are your policies regarding the extension of water/sewer lines?

16) Are there any major planned actions that have been either cancelled or delayed? If delayed, for how long?

Development Constraints/Regulations/Land use Controls

17) What are the major constraints to development in your locality in terms of the natural and manmade environment?

18) Describe your stormwater management regulations, any regulations pertaining to riparian buffers, protection of local watersheds, local runoff management programs or other similar land use controls.

19) Have you enacted any specific regulations for the purpose of protecting the dwarf wedgemussel?

20) How often are variances/exceptions granted to these regulations (referred to in questions 19 and 20)?

21) Are you aware of any monitoring that has been done to determine compliance and/or effectiveness of these measures? Are you aware of any local water quality monitoring efforts (past or current) or sources for local water quality data over time?

22) Do you have any plans and/or policies that prioritize potential development areas? What are the development priorities in your locality?

23) What other local policies and/or polices do you have that notably affect how development may occur? For example, any service district boundaries?

24) In general, how would you describe your locality's commitment to development? (Pro-growth? anti-growth? Something in between?)

Potential Project Effects

25) What has induced recent development patterns in your locality?

26) In your opinion, what is the potential for new residential/commercial development if the Tri-Ex Southeast Extension project is built?

27) Will the project influence the timing, intensity or pattern of development?

28) If the Tri-EX Southeast Extension project is NOT built, what is the potential for new development in your locality?

29) In your opinion, what type of economic impacts would widening of existing roads in your locality have? Building a new toll road?

Past Actions

30) What past projects (within the past 20 +/-) have had major effects on the human and natural environment in your locality? (i.e. large residential subdivisions, large commercial centers, major employment centers, timbering, etc.)

31) Do you have any maps/data that show past land uses in watershed areas?

Contact

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Raleigh, NC 27612
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kmaseman@hwlochner.com

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: December 10, 2012

**Time**: 1:00 p.m.

**Place**: Conference Call

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Tim Maloney | Wake County PDI | tmaloney@wakegov.com |
| Tim Gardiner | Wake County PDI | tim.gardiner@wakegov.com |
| Bryan Coates | Wake County PDI | bryan.coates@wakegov.com |
| Jeff Schlotter | H.W. Lochner, Inc. | jschlotter@hwlochner.com |
| Kristin Maseman | H.W. Lochner, Inc. | kmaseman@hwlochner.com |

**Summary**:

This topic was introduced, and the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided, at an in-person meeting with Wake County representatives on September 18, 2012. The September 18 meeting focused on other topics and questions related to the Southeast Extension project's purpose and need. The conference call documented here was arranged specifically for the discussion of the project's indirect and cumulative effects (ICE).

Below is a summary of comments received from Wake County.

*Notable Environmental Features*

- Middle Creek corridor
- Farmland

*Land Use Plans and Socioeconomics*

- Much of unincorporated Wake County is within the extraterritorial jurisdictions (ETJs) or the urban service areas (USAs) of municipalities within the County. Municipalities govern land use planning decisions within ETJs (growth anticipated within the next 10 years) and USAs (growth anticipated within 10-20 years). The Wake County Land Use Plan (adopted in 2004) covers areas in the south central and southeastern portion of the project study area. Wake County's land use planning objectives within these areas are designed with the primary goal of ensuring that the municipalities can successfully enact their plans for their ETJs and USAs.

- There are three Wake County subarea land use plans in the project area: the Southwest Area Plan, the Fuquay-Varina/Garner Plan and the East Raleigh/Knightdale Plan. The Southwest Area Plan was updated in 2010 and the other plans were adopted prior to that.
- One land use plan amendment was completed in the project area in 2012 in a Neighborhood Center in the Fuquay-Varina/Garner Plan. The amendment expanded the Neighborhood Center. It is comprised of 22 acres of mixed use development at the intersection of White Oak Road and Escondido Farm Road
- Wake County's standing annexation policies encourage voluntary municipal annexation as developers request municipal water and sewer. Wake County does not provide water or sewer.
- Growth in Wake County has slowed somewhat but still continues at an annual rate of over 2%. Current development trends suggest that the western and southern portions of the project area (Holly Springs and Fuquay-Varina) will see larger proportions of the overall growth than the eastern portions (Garner, Knightdale, and Wendell).
- Existing/future socioeconomic data, by TAZ, was provided by Raleigh to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project.

*Planned Future Development/Transportation Improvements*

- Wake County is not anticipating large developments on land under County jurisdiction. This is because of the slower economy and the lack of water and sewer. The County would likely permit residential development and small commercial development (on well and septic) if requested.
- The biggest planned transportation improvement is the commuter rail line proposed in the Wake County Transit Plan. This line would run from Greenfield Parkway in Garner to Durham.
- The Randleigh Farm property was acquired from an interested property owner rather than acquired for a specific goal. As a result it has not had a formal timeline. The concept was to develop a model "green" development. Although construction of Phase II of the Southeast Extension would likely support development of this property, there are other political, financial and planning obstacles that remain.

*Water/Sewer*

- Wake County does not manage water or sewer.
- Wake County encourages proposed developments within 2500 feet of an existing utility line to request annexation and utility ties to municipal areas.

*Development Constraints/Regulations/Land Use Controls*

- The constraints to development within Wake County's jurisdiction are the relatively high cost of land, the high number of rural properties, strong intra-county recognition of the importance of employment centers, and pro-growth municipalities.
- The County has extensive stormwater regulations, as detailed in Article 9 of the Wake County UDO. The main objective of these regulations is to ensure that post-development runoff is similar to pre-development conditions. These regulations are complemented by erosion control regulations that manage runoff during construction.
- The zoning classifications of many parcels in sensitive areas, including areas in the vicinity of Dwarf Wedgemussel habitat, are designated as Resource Conservation Overlay District 2 (RCOD 2). Parcels with this designation require more stringent stream buffers and stormwater management. These regulations were put in place in response to the Clayton Bypass project.
- Variances and exceptions to regulations are rarely granted.
- Wake County regularly collects water samples from all of its watersheds.
- Municipal service boundaries between municipalities and the unincorporated County serve to regulate boundary relationships between them. These boundaries are intended to limit "land grabs" by municipalities.
- Wake County is pro-growth.

*Potential Project Effects*

- The County's strong economy and significant employment centers have induced recent development patterns in the area.
- The project will likely stimulate development of major and minor retail centers near interchanges and residential development nearby. Areas with particularly high development potential are the US routes and Interstate connections. It is important to note, however, that the County and municipalities and the development community are all anticipating and planning for this project.
- The project will shift development investment from other areas if constructed.
- If the Southeast Extension project is not built, development will continue using current nodes as the basis for development decisions. Proximity to these existing nodes to the project area may suggest that development will occur in the project area with or without the project.

*Past Actions*

- Residential subdivisions
- The County GIS department tracks residential developments based on year built and also has electronic-format historical land use maps for all uses going back to 2001. The County also has land cover maps from 1996, 2006, and 2008.

**Action Items:**

- None

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: December 19, 2012

**Time**: 9:00 a.m.

**Place**: Conference Call

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Matt Keough | Raleigh Senior Planner | matthew.keough@raleighnc.gov |
| Kristin Maseman, AICP | H.W. Lochner – Raleigh, NC | kmaseman@hwlochner.com |

**Summary**:

This topic was introduced, and the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided, at an in-person meeting with the City of Raleigh on October 4, 2012. The October 4 meeting focused on other topics and questions related to the Southeast Extension project's purpose and need. The conference call documented here was arranged specifically for the discussion of the project's indirect and cumulative effects (ICE).

Below is a summary of comments received from the City of Raleigh.

*Notable Environmental Features*

- Neuse River
- Swift Creek

*Land Use Plans and Socioeconomics*

- The City of Raleigh adopted a 2030 Comprehensive Plan in November 2009.
- Raleigh did not experience a large decrease in growth during the recent economic downturn; however, the City did experience notable changes in types of growth. There was a shift from single family development to multi-family development.
- Existing/future socioeconomic data, by TAZ, was provided by Raleigh to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project.

*Planned Future Development/Transportation Improvements*

- Olde Towne, a 600-acre master planned community near the intersection of New Hope Road and Rock Quarry Road
- Randleigh Farm—planning and development of uses for this site likely will not continue until there is a better understanding of where the Southeast Extension will be located
- A 120-acre site near Old Baucom Road and Auburn Knightdale Road, planned for mixed uses including regional retail commercial uses.
- The City plans to consider corridor improvements to address capacity issues along New Hope Road/Jones Sausage Road and Rock Quarry Road (these projects are on the City's Thoroughfare Plan.
- Barwell Road is planned for extension.

*Water/Sewer*

- The City of Raleigh provides water and sewer service within its jurisdiction and also to other neighboring jurisdictions.
- The Neuse River Wastewater Treatment Plant is planned for future expansion.
- Sunnybrooke
- For Raleigh to extend water and sewer lines, a property has to be annexed into the City. There are no level of service or density requirements. The developer of the property must pay for the extension.

*Development Constraints/Regulations/Land Use Controls*

- The major constraint to development in Raleigh over time is the quantity and quality of water supplies.
- The development priorities for Raleigh are the development of transit-oriented mixed use centers and multimodal connecting corridors, as identified in the Comprehensive Plan. Among these are areas strategically targeted for economic development.
- Rock Quarry Road, Tryon Road and Lake Wheeler Road are targeted for multimodal corridor development.
- The Rock Quarry Road/Battle Bridge Road area is targeted for future development as a small commercial area. A Small Area Plan is expected for this area congruent with development interest there.
- Areas within Raleigh's ETJ are prioritized for urban services in the short term future. Areas within the City's urban services boundary are slated for long term development.
- Raleigh promotes urban services concurrent with growth.

*Potential Project Effects*

- Raleigh's accessibility to major job centers in the Triangle Region has influenced development patterns. The Region's university system and high number of business startups have influenced business development patterns.
- If built, the Southeast Extension project would create more certainty in the market for new residential and commercial development. Regional mobility will be enhanced.
- The Southeast Extension project would likely influence the timing and intensity of development in the area while promoting increased densities. Increased densities would require expansion in water and sewer service by the City of Raleigh.
- If the Southeast Extension project is not built, development densities will likely be lower, leading to less efficient use of available land.

*Past Actions*

- Development of the Dempsey Benton Water Treatment Plant on Swift Creek.
- Neuse River Wastewater Treatment Plant with adjoining land uses including police facilities, bio-solid application areas, and solar array initiative,

**Action Items:**

- Lochner will follow up with Danny Bowden (919-996-3940) regarding stormwater management regulations and related topics.

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: September 12, 2012

**Time**: 10:00 a.m.

**Place**: Cary Town Hall

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Meredith Chandler | Cary Planning Department | meredith.chandler@townofcary.org |
| Kristin Maseman | H.W. Lochner | kmaseman@hwlochner.com |

**Summary**:

This topic was introduced, and the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided, at an in-person meeting with the Town of Cary on September 24, 2012. The October 5 meeting focused on other topics and questions related to the Southeast Extension project's purpose and need. The conference call documented here was arranged specifically for the discussion of the project's indirect and cumulative effects (ICE).

Below is a summary of comments received from the Town of Cary.

*Notable Environmental Features*

- Swift Creek

*Land Use Plans and Socioeconomics*

- The Cary Comprehensive Plan was adopted in 1996, last amended in 2009, and is about to be updated again. Cary also has a Comprehensive Transportation Plan, adopted in 2008. The Southeast Extension project is shown on maps in the Town's Comprehensive Plan and Comprehensive Transportation Plan.
- Cary is nearing "build-out," with about 9,000 acres of undeveloped land remaining. Most of Cary's growth has been occurring and is anticipated to continue occurring in western Cary, outside the boundaries of the Southeast Extension study area. There is some development occurring in the West Lake area, which is within the study area, but this development is in subdivisions that were platted and began developing several years ago.
- Existing/future socioeconomic data, by TAZ, was provided by Cary to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast

Extension project would be constructed. If the project is NOT built, Apex would not see a need to revise their socioeconomic data.

*Planned Future Development/Transportation Improvements*

- Since Cary is nearing build-out, most future development will mainly occur on a smaller scale or will take the form of redevelopment in and near downtown Cary. Mixed-use activity centers are being developed at major intersections in western Cary, particularly along Davis Drive, NC 55, McCrimmon Parkway, and Carpenter Fire Station Road.
- Areas near the interchanges along the Western Wake portion of the Triangle Expressway are becoming important growth areas.
- Most of the planned transportation improvements in Cary over the near term are in central and western Cary. Roads planned for improvements include Carpenter Fire Station Road, Morrisville Parkway, Green Level Church Road, Harrison Avenue and NC 54.

*Water/Sewer*

- A new wastewater treatment plant is under construction near US 1 west of the current Apex town limits. The plant is expected to open in 2014 and will serve Apex, Cary and Morrisville, helping to facilitate continued growth.
- The Kit Creek pump station in northwest Cary is planned for expansion, and a new sewer line will be constructed to connect this pump station to the O'Kelly Chapel Road/Green Level Church Road intersection area to help increase sewer capacity in this area. The town plans to construct the Holly Brook pump station in southwest Cary, near Kildaire Farm Road and Ten Ten Road.
- Cary and Apex are jointly working toward expanding the Cary/Apex Water Treatment Facility on Wimberly Road. The Town also plans to construct a 2 to 4.3 million gallon water storage tank along NC 55 near Petty Farm Road.

*Development Constraints/Regulations/Land Use Controls*

- The availability of water and sewer capacity (which will be affected by the opening of the new wastewater treatment plant in 2014) and the approach of build-out are the major constraints on future development in Cary.
- Cary requires Urban Transition Buffers (UTBs) within its jurisdiction and its ETJ. Cary requires 100 foot UTB buffers on all USGS streams, and 50 foot buffers on all streams mapped on the Wake County Soil Survey.
- Cary does not have any regulations related Dwarf Wedgemussel protection.
- Variances and/or exceptions to the above regulations are not granted.
- Cary prefers not to state its viewpoint on future development.
- The Town is trying to encourage more mixed-use and downtown development. There is increasing focus on devoting resources to improving the downtown area.

*Potential Project Effects*

- The Town of Cary generally views the project as providing support to broad Town goals of promoting regional connectivity, but the project would have a neutral relationship to local land use planning objectives-these objectives could be met without the project.
- The locations of various build alternatives would not affect the extent to which the project would support Cary's planning objectives.
- Given the distance between most of Cary and potential interchanges for the Southeast Extension, the project is not likely to have a largo effect on the timing, intensity or pattern of future development in Cary. The exception would be the West Lake Road area, but much of this area is already developed or platted for development.
- If the proposed project is NOT built, Cary would not expect much difference in future development patterns and intensities.

*Past Actions*

- Location relative to growth in Raleigh/Cary/RTP; Cary has been a major population growth center in the Triangle since the 1980s.

**Action Items:**

- None

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: September 12, 2012

**Time**: 10:00 a.m.

**Place**: Apex Town Hall

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Dianne Khin | Town of Apex Planning Director | dianne.khin@apexnc.org |
| Reed Huegerich | Town of Apex Transportation Planner | reed.huegerich@apexnc.org |
| Kristin Maseman | H.W. Lochner | kmaseman@hwlochner.com |
| Jeff Schlotter | H.W. Lochner | jschlotter@hwlochner.com |

**Summary**:

The September 12 meeting had two functions: 1) to discuss the Town's responses to the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided and 2) to discuss topics and questions related to the Southeast Extension project's purpose and need. Discussion of the second topic is summarized in a separate document. Below is a summary of comments received from the Town of Apex regarding indirect and cumulative effects.

*Notable Environmental Features*

- Middle Creek, which has a large floodplain
- Closed landfill near NC 55 south of US 1/64

*Land Use Plans and Socioeconomics*

- The Town's Comprehensive Plan was adopted in 2004 and is updated regularly, as needed. The Plan designates the Veridea area, near the western terminus of the Southeast Extension, as an activity center to accommodate higher-density, mixed use development, with office space a key feature of this area.
- Apex does not do involuntary annexation, so there is no annexation plan.
- Growth did slow during the economic downturn but is starting to return to pre-downturn levels. There is increasing developer interest in commercial and multi-family development. The Town would like to expand its non-residential tax base and employment base. The opening of the western Wake portion of the Triangle Expressway is stimulating growth.
- Existing/future socioeconomic data, by TAZ, was provided by Apex to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for

any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast Extension project would be constructed. If the project is NOT built, Apex would not see a need to revise their socioeconomic data.

*Planned Future Development/Transportation Improvements*

- The Veridea project is the primary location for the Town's future growth in the vicinity of the Southeast Extension study area. Veridea developers plan to begin development in the next two years and are working with Town officials to extend Town water and sewer infrastructure to the site. Developers are also trying to get a new interchange located on the western Wake portion of the Triangle Expressway to serve Veridea. Buildout is expected within the next ten to fifteen years. The NC Department of Health and Human Services is considering locating a large facility in Veridea.
- Areas near the interchanges along the Western Wake portion of the Triangle Expressway are also anticipated to be important growth areas, with new commercial and multi-family development expected. The Westford PUD is one of these areas.
- The Wake County Public School System owns land near US 1 west of the current Apex town limits and plans to build a new high school on the site.
- Wake County is considering building a park on the closed landfill site near NC 55 and US 1/64.

*Water/Sewer*

- A new wastewater treatment plant is under construction near US 1 west of the current Apex town limits. The plant is expected to open in 2014 and will serve Apex, Cary and Morrisville, helping to facilitate continued growth.
- A pump station may be constructed in the Veridea development.
- Developers must provide utility lines and pump stations if they want their developments to be served by Town facilities. They must also be annexed into the Town to receive service.

*Development Constraints/Regulations/Land Use Controls*

- The major constraints to development in Apex are transportation capacity (roads), stream buffer regulations, and the availability of water and sewer capacity (which will be affected by the opening of the new wastewater treatment plant in 2014.)
- Stream buffer regulations require setbacks of 50 or 100 feet, depending on location. There are also buffer requirements around Jordan Lake, and the USACE-owned land near Harris Reservoir.
- Stormwater regulations include required BMPs for any developments disturbing at least one acre of land. Regulations dictate the allowable limits of impervious surface for various types of developments.
- New stormwater rules for Jordan Lake are planned for development.
- Apex does not have any regulations related Dwarf Wedgemussel protection.
- Variances and/or exceptions to the above regulations are not granted.
- In the past, Apex has been fairly pro-growth, but this sentiment has been tempered somewhat as the town has expanded. There is less interest in encouraging more residential development (particularly multi-family development) and more interest in commercial development and expansion of the local tax base. However, there is currently notable developer interest in multi-family residential projects. Developers are also becoming more interested in commercial projects.
- The Town is trying to encourage more mixed-use development and prefers that multi-family residential development be brought in as a component of mixed-use development.

*Potential Project Effects*

- The Town's land use and economic development objectives are highly dependent on the construction of the Southeast Extension. Veridea, in particular is heavily dependent on the project and on construction of a new interchange on the Western Wake portion of the Triangle Expressway that would serve the development.

- A build, new-location alternative is needed to support the Town's planning objectives including development of employment centers, accommodating development at higher densities, and expanding Apex's position as a strong business center to balance tremendous residential growth.
- The project will also help cluster development, possibly encouraging more walkability and bikeability.
- If the proposed project is NOT built, Apex may not see the increased densities and greater commercial development it would like to see.

*Past Actions*

- Triangle Expressway
- Expansion of water and sewer capacity
- Location relative to growth in Raleigh/Cary/RTP.

**Action Items:**

- None

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: October 10, 2012

**Time**: 10:00 a.m.

**Place**: Fuquay-Varina Town Hall

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Mike Sorensen | Fuquay-Varina Planning Director | msorensen@fuquay-varina.org |
| Danny Johnson | Fuquay-Varina Asst. Planning Director | djohnson@fuquay-varina.org |
| Samantha Ficzko | Fuquay-Varina Planner | sficzko@fuquay-varina.org |
| Roy Bruce | H.W. Lochner, Inc. | rbruce@hwlochner.com |
| Kristin Maseman | H.W. Lochner, Inc. | kmaseman@hwlochner.com |

**Summary**:

The October 10 meeting had two functions: 1) to discuss the Town's responses to the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided and 2) to discuss topics and questions related to the Southeast Extension project's purpose and need. Discussion of the second topic is summarized in a separate document. Below is a summary of comments received from the Town of Fuquay-Varina regarding indirect and cumulative effects.

*Notable Environmental Features*

- Middle Creek
- Open space
- Parks (including a planned park on Banks Road)

*Land Use Plans and Socioeconomics*

- The Town does not have a single master plan, but does have a Comprehensive Land Use Plan, adopted in 2005 and amended regularly as needed. There has been an increasing focus on mixed used development on major corridors, especially US 401.
- The Town also has a Community Transportation Plan, which was adopted in 2006 and is also amended regularly.
- The Town has seven identified Preferred Growth Areas (PGAs), areas where the Town has made or intends to make investments in infrastructure in support of nonresidential mixed-use growth or residential growth. Four of these PGAs are in in the vicinity of project alternatives. The PGA policy was adopted in 2006.

- The Town also has a Greenway Plan (1999) and an Open Space Plan (2003).
- Fuquay-Varina does not do involuntary annexation, so there is no annexation plan.
- Growth has slowed somewhat since to the economic downturn, but remains moderately steady. Most current development is occurring in approved subdivisions being revived or smaller commercial projects.
- Existing/future socioeconomic data, by TAZ, was provided by Fuquay-Varina to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast Extension project would be constructed. If the project is NOT built, Fuquay-Varina would not see a need to revise their socioeconomic data.

*Planned Future Development/Transportation Improvements*

- Growth is expected to continue along the US 401 corridor, near NC 55 and NC 42, and along Hilltop-Needmore Road.
- The Town has identified targeted major urban centers on US 401 and is actively marketing these areas to developers. The Town would like to do a Corridor Area Plan study for US 401.
- The US 401 Bypass (currently being studied by NCDOT) is the other major transportation project in the area.
- The Town is trying to get regional bus service expanded along US 401, south from Raleigh/Wake Tech.

*Water/Sewer*

- There is sufficient existing and planned water and sewer infrastructure to support growth in these areas for the next 20 years.
- In the past, the Town has identified desired growth areas and has extended water and sewer service into these areas.

*Development Constraints/Regulations/Land Use Controls*

- The major constraints to development in Fuquay-Varina are Middle Creek and its ETJ boundary.
- The Town doesn't yet have its own stormwater regulations in place, but the Town engineering department is working to implement regulations. There are State-mandated riparian buffer regulations for both the Cape Fear and Neuse basins that development in the Town must adhere to.
- Apex does not have any regulations related Dwarf Wedgemussel protection.
- Fuquay-Varina is fairly pro-growth, with a growing preference for mixed use and multi family development, and performance-based development concepts.

*Potential Project Effects*

- Recent development patterns in the Town have been influenced by broader economic trends and an influx of commuters to jobs in RTP and nearby areas.
- If the Southeast Extension project is built, there will be much more development focus on US 401. Right now, most of the focus is on the NC 55 corridor.
- This project will influence both the timing and intensity of development because it will become easier for residents to commute to jobs.
- If the proposed project is NOT built, Fuquay-Varina will need to recalibrate its expectations for future growth and will have to rework its local plans as these are based on the assumption that the project will be built in the protected corridor.

*Past Actions*

- Subdivisions: South Lakes, Brighton Forest, Ballentine
- Mixed use/commercial development on US 401 near NC 55 and NC 42

**Action Items:**

- None

**Triangle Expressway Southeast Extension** **Revised 11-19-2012**

Questions Related to the Indirect and Cumulative Effects Analysis/Community Impacts Analysis

## Town of Garner Responses

General Questions

1. No updates to the 2006 Comprehensive Growth Plan or 2010 Garner Transportation Plan occurred during the last year.

2. No changes to the Town of Garner's annexation plans has occurred during the last year (no active statutory annexation plans currently).

3. Garner growth has been impacted by current economic conditions (based on the 2011 Growth and Development Report).

4. Notable environmental features in Garner include Lake Benson and its protected critical watershed area. Swift Creek and associated tributaries including floodplain areas and riparian buffers are located in the study area. Lake Benson Park, White Deer Park, South Garner Park and Bryan Nature Park are also located in this area.

Socioeconomics

5. A portion of the red and modified red corridor alternatives cross several Census Tracts with poverty levels between 10% to 20% (Tracts 053009, 053111, 052809 and 052807).

   Portions of the green, tan and brown corridors alternative also cross a couple of Census Tracts with poverty levels above 10%.

   **Source:** American Community Survey 5 Year Summary 2007-2011

6. Garner staff provided CAMPO with land use and density information (based on our growth projections) at the parcel level. CAMPO generated population and income projections from that input.

7. Yes, the Town of Garner did review and revise existing/future socioeconomic data from CAMPO for the MTP after it was generated.

8. Yes (based on Orange Corridor).

9. Yes. Garner staff would need to contact CAMPO (they have the data) and suggest revisions to the data are needed to reflect the no-build option. Since the information was generated by CAMPO (with municipal input) coordination with them is required in order to generate revised numbers by TAZ. More discussion is needed here.

10. It depends on where the project is built (final corridor) as to whether revised data is needed. If the project is built along the Orange Corridor then Garner does not believe revisions to the data are needed.

    However, if the project is built in other corridors (red or modified red for example) then revised data would be necessary to account for the devastating and significant impacts those scenarios would have to community. Again coordination with CAMPO is required in order to regenerate data at the TAZ level.

11. No.

12. The WakeMed Garner HealthPlex (50,000 s.f.) emergency care facility located on US 70 is under construction.

    Major retail development (up to 800,000 s.f.) built over a 5 to 7 year time period is expected at the intersection of US 70 and White Oak Road. First phase is expected by 2014 or 2015.

    A 336 unit apartment at the White Oak Mixed Use Development is slated to start construction in 2013. In addition, discussion continues regarding another large apartment complex for Garner. At this time a formal site plan has not been submitted.

    The Garner Economic Development Corporation is actively marketing the 100 acre Garner Technology Center site (former ConAgra Food property) for redevelopment as industrial/office use.

    The future site of the Garner YMCA is located in the red corridor.

13. The Timber Drive East Road Project was completed in December 2011. This facility is a 1.3 mile four lane divided road from NC 50 to White Oak Road.

    A $5.2 million road improvement project is planned for the I-40 East ramp and US 70 along with major improvements at the intersection of US 70 and White

Oak Road. Construction is expected to start in 2013 and be completed in 12 to 15 months.

The $800,000 Buffaloe Road / Vandora Springs Roundabout Project is currently under construction and is expected to be completed in December 2012.

Enhanced bus service is recommended by the *Wake County Transit Plan* for the Town of Garner. Availability of the enhanced bus service depends on voter approval of the ½ sales tax in Wake County. Currently a date for the referendum has not been set by the Wake County Commissioners.

Commuter rail service is also recommended by the Plan for the Town of Garner. Two transit stations are recommended for Garner. One station is located in downtown Garner and is designed for walk up traffic with some limited parking available. The second station is designated at the eastern terminus of the commuter rail service line (near Greenfield Park) and will be designed as a park and ride facility. This transit service is also dependent on voter approval of the ½ sales tax as well.

If voter approval is obtained in 2013, enhanced bus service could be implemented in 2-3 years while commuter rail service could be implemented in 7-8 years.

14. No major water/sewer line extensions are planned at this time. Garner is part of the city of Raleigh public utility system.

15. The Town has a Utility Extension Policy as well as regulations requiring development to extend water/sewer lines to and through property when it is constructed if public utilities are available and within a certain distance. Connection to public water and sewer is subject to available capacity which is controlled by the Town's Utility Allocation Policy.

16. At one time the city of Raleigh had the Southwest Garner Sewer Pump Station in its Capital Improvement Program. The project has been delayed due to lack of funding at this time.

17. The largest natural constraint to development in Garner is Lake Benson and the critical watershed area associated with it. Only low density residential development is allowed in these areas. Floodplains and riparian buffers while small in area also constraint development. Man-made constraints include US 70 which effectively divided Garner in half cutting through existing neighborhoods and separating the small downtown area from the rest of the community.

18. The Town of Garner has very comprehensive stormwater management regulations. These regulations deal with both stormwater quantity and quality. From a quantity perspective the Town requires that post-development peak run-off for the 1, 25 and 100 year storm events be attenuated to pre-development peak flows. Also, with a few exceptions, no new development is allowed within the 100 year flood plain.

    From a water quality perspective the Town has four programs in force:

    a) Sediment and erosion control program;
    b) Water supply watershed controls;
    c) Neuse River Nutrient Sensitive Waters Management and;
    d) Phase II Stormwater Program.

    Wake County administers the sediment and erosion control program while the Town manages the other three programs.

19. Swift Creek Conservation Overlay Zoning District was enacted in 2005 to protect the dwarf wedge mussel as a result of the construction of the Clayton Bypass.

20. There have been very few variances granted regarding the Town's stormwater management requirements. A total of 3 variances regarding floodplain regulations have been granted since the Unified Development Ordinance was adopted in 2003. No variance or exception has been granted regarding requirements outlined in the Swift Creek Conservation Overlay Zoning District.

21. Garner staff is not aware of any monitoring to determine the effectiveness of our stormwater standards. The city of Raleigh most likely has a water quality monitoring program for Lake Benson since it is a source of drinking water for Raleigh and Garner.

22. The Comprehensive Growth Plan adopted in 2006 outlined six growth areas in the community. Based on infrastructure investment decisions made by the Town Council, the top priority growth area is the White Oak area which is generally the area east of NC 50, south of US 70 and west of White Oak Road. Also, the adoption of the 2010 Historic Downtown Garner Plan by the Town Council placed a high priority on the revitalization and redevelopment of the Town Core area in north Garner.

23. None.

24. The Garner community tends to pro-growth provided development is well planned and is done in a responsible manner.

Potential Project Impacts

25. Construction of new infrastructure (roads, water and sewer lines) has influenced development patterns in the Town of Garner. Most recent examples include the Timber Drive East road project that connects NC 50 to White Oak Road. That road facility along with past Town expenditures to extend public water and sewer lines into the area have and will continue to induce new development in this area of the community.

    The Town over the years has invested heavily in developing a great park system. Several of the parks have influenced development decisions (Lake Benson Park, White Deer Park, South Garner Park and Centennial Park).

26. To some degree if the Tri-Ex Southeast Extension project is built along the Orange Corridor, Garner staff believes the potential for new residential/commercial would be enhanced. We believe this would be true particularly for residential growth based on recent residential growth in Apex and Holly Springs where portions of I-540 have been recently completed.

27. Yes (see above). However if this road facility is constructed in the Red, Modified Red or Pink Corridors not only will there be devastation to existing residential neighborhoods and business parks, but the potential for new growth will be significantly diminished in the community.

28. Without the Tri-Ex Southeast Extension the potential for new development in South Garner (along the Orange Corridor) is diminished. While we expect some growth to continue in the area it would less intense and likely to be mostly low density residential. We would expect to see significant growth in the White Oak area near I-40 in the future.

    Without the facility we would expect to see increasing traffic volumes on the major thoroughfares in Garner (US 70, US 401, NC 50, Timber Drive, Old Stage Road) which could negatively impact future growth potential due to significant increases in congestion and travel delays.

29. Widening existing thoroughfares in the Garner could have positive impacts for economic development in the community if done at strategic locations. However, to advocate that as a substitute for the Tri-Ex Southeast Extension (Orange Corridor) could eventually lead to long term diminished economic

development potential due to increased traffic volumes, congestion, and travel delays.

While many do not like toll roads, overall we believe the construction of Tri-Ex Southeast Extension (Orange Corridor) would have positive potential for economic development in Garner.

Past Actions

30. The following past projects had major effects on the human and natural environment.

- extension of I-40 on the eastern side of Garner (late 1980's)
- Greenfield Business Park
- Eagle Ridge Golf Community
- White Oak Mixed Use Center at US 70 and I-40

31. See Map.

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**
**Final**

**Date**: March 21, 2011

**Time**: 1:00 PM

**Place**: 128 S. Main Street, Holly Springs, NC

**Purpose**: Community Impact Assessment/Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Gina Clapp, AICP | Town of Holly Springs Planning Director | Gina.clapp@hollyspringsnc.us |
| Jenny Mizelle, CEcD | Town of Holly Springs Economic Dev. Dir. | Jenny.mizelle@hollyspringsnc.us |
| Stephanie Sudano, PE | Town of Holly Springs Engineering Director | Stephanie.sudano@hollyspringsnc.us |
| Kendra Parrish, PE | Town of Holly Springs Senior Engineer | Kendra.parrish@hollyspringsnc.us |
| Mike Rutkowski | Kimley-Horn | Michael.rutkowski@kimley-horn.com |
| Kristin Maseman, AICP | H.W. Lochner – Raleigh, NC | kmaseman@hwlochner.com |
| Karin Ertl, AICP | H.W. Lochner – Richmond, VA | kertl@hwlochner.com |

**Summary**:

Handouts provided at the meeting included:

- Meeting Agenda (copy attached)
- Potential Detailed Study Alternatives map (copy attached)
- Draft Future Land Use Study Area map (copy attached)
- Questionnaire (copy attached)

Following introductions, Karin Ertl provided an update on the study's progress as follows:

- Purpose and Need report in the process of being finalized.
- Draft Alternatives Analysis report is being refined. At this point, the final list of Detailed Study Alternatives to be carried forward in the Environmental Impact Statement (EIS) has not been determined.
- Study Team is conducting field surveys (including endangered mussel surveys) and documenting existing conditions within the study area for the EIS.
- Study Team is initiating the Community Impact Assessment and qualitative Indirect and Cumulative Effects Analysis – toward that end, input from the localities is being solicited, including input on the Draft Future Land Use Study Area map.

Below is a summary of comments received from the Town of Holly Springs.

*Notable Environmental Features*

- Woodcreek subdivision greenway crossing and one other planned greenway
- Sunset Lake
- Habitat for tiger salamander along Middle Creek
- Middle Creek on 303d list

*Draft Future Land Use Study Area Map*

- No comment.

*Land Use Plans and Socioeconomics*

- The Town is currently doing a Small Area Plan for potential Kildaire Farm/Holly Springs Road interchange area.
- Transportation Plan currently being updated – expect completion June 2011.
- Holly Springs has a Secondary & Cumulative Impacts Master Mitigation Plan (SCIMMP) document that needs to be updated. This document addresses mitigation measures to use when implementing infrastructure projects with secondary and cumulative impacts.
- Residential growth has been slowed by the economic downturn (went from 800 single family permits/year to 200 last year) but they are still growing.
- Recent economic downturn resulted in delays and/or cancellations of several planned projects:
  - New Hill Center – delayed by a year and scaled back to have less retail
  - Planned sections of Bridgewater and Holly Point subdivisions – cancelled but other developers coming in
  - Langston Ridge subdivision – on hold (put road/gutter in, but no homes)
  - New Hampton Inn near 64 Bypass – delayed – hope to get financing within 6 months
- Exiting/future socioeconomic data, by TAZ, was provided by Holly Springs to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast Extension project would be constructed. If the project is NOT built, Holly Springs does not see a need to revise their socioeconomic data at this time.

*Planned Future Development/Transportation Improvements*

- Shopping center anchored by Target (700,000 square feet) and residential component
- New Hill Place – 150-acre development near 55 Bypass and New Hill Road – opening Spring 2013
- Woodcreek subdivision
- Planning for transit/bus service
- Protecting corridor between Apex and Fuquay for rail – very conceptual

*Water/Sewer*

- Holly Springs gets water from Raleigh and Harnett County. Still have a lot of water capacity.
- 1.2 mgd allocated to the Town from Raleigh, and 2 mgd allocated to Town from Harnett with potential of up to 10 mgd.
- Planning extension to NW area of Town.
- Planning to extend water/sewer to new Route 1 interchange.
- Planning treatment plant expansion to meet demand
- Developers can extend utility lines to serve their projects, but they have to be brought in according to Town standards.
- The Town is extending water/sewer to certified Shovel Ready Sites for industrial recruitment.

*Development Constraints/Regulations/Land Use Controls*

- The major constraints to development in Holly Springs are:
  - Numerous branches of the Cape Fear River bisect properties in the western portion of the Town
  - Progress Energy – occupies 14,000 acres in NW portion of the Town.
- Holly Springs is a Phase II community for NPDES compliance purposes and the town does not conduct any water quality monitoring of its own.
- Stormwater management controls are fairly stringent.
  - Set limits on SWM – developer must show that nitrogen/total suspended solids go down
  - Require BMP's on all sites
  - Locally administered program that does not allow disturbance of 100-year floodplain
  - Neuse/Cape Fear watershed buffers – voluntary right now
  - Bass Lake - 100-foot undisturbed buffers
  - Policy that requires a flood study if development could potentially impact a flood-prone area downstream; mitigation on site to prevent downstream impacts if needed.
- In order to protect Dwarf Wedgemussel habitat in Middle Creek, Holly Springs implemented voluntary riparian buffers.
- Variances and/or exceptions to the above regulations are not granted.
- In general, the Town is pro-growth but emphasizes quality growth.
- The Town seeks to concentrate development and utility expansions in the Core Growth Areas (CGAs) as identified in their future land use map.
- Development is prioritized in accordance with the Comprehensive Plan, UDO, Parks/Rec Plan, etc.

*Potential Project Effects*

- If the proposed project IS built, more commercial development would occur at interchanges and along 540 itself.
- Building the proposed road would result in better access/transportation mobility – this increases their market share and improves their local economy.
- If the proposed project is NOT built, development would still occur but not as rapidly. The development pressures will still exist because Holly Springs is still a desirable area.
- Not building the project will result in worse impacts because existing roads will need to be widened and development would be limited. The Town would have to bear the brunt of the expense of widening the roads.

*Past Actions*

- As a bedroom community to Raleigh/RTP, development has been a natural outgrowth of the area's population and employment growth.
- Recent development has been induced by Novartis (2009) and the 55 Bypass project (2002).
- Past projects that have had major effects on the human and/or natural environment include:
  - Progress Energy (plant opened in 1987)
  - Sunset Ridge residential development/golf course (1991) – first big development in Holly Springs
  - WalMart/Shops of Holly Springs
  - Public water/sewer
- The primary environmental impact from past development has been to Mingo Creek primarily as a result of development along Hodge Road (and to a lesser extent from the new Hodge Road Siphon project).

**Action Items:**

- Town of Holly Springs requested another meeting in the future to discuss potential impacts to their planned greenway system.

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**
**Final**

**Date**: March 21, 2011

**Time**: 3:00 PM

**Place**: 950 Steeple Square Court, Knightdale, NC

**Purpose**: Community Impact Assessment/Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Chris Hills, AICP, CZO | Town of Knightdale Planning Director | chris.hills@knightdalenc.gov |
| Jeff Triezenberg, AICP, GISP | Town of Knightdale Long Range Planning | jeff.triezenberg@knightdalenc.gov |
| Jennifer Currin, LEED AP | Town of Knightdale Planning | jennifer.currin@knightdalenc.gov |
| Jonathan Williamson, AICP | H.W. Lochner – Raleigh, NC | jwilliamson@hwlochner.com |
| Karin Ertl, AICP | H.W. Lochner – Richmond, VA | kertl@hwlochner.com |

**Summary**:

Handouts provided at the meeting included:

- Meeting Agenda (copy attached)
- Potential Detailed Study Alternatives map (copy attached)
- Draft Future Land Use Study Area map (copy attached)
- Questionnaire (copy attached)

Following introductions, Karin Ertl provided an update on the study's progress as follows:

- Purpose and Need report in the process of being finalized.
- Draft Alternatives Analysis report is being refined. At this point, the final list of Detailed Study Alternatives to be carried forward in the Environmental Impact Statement (EIS) has not been determined.
- Study Team is conducting field surveys (including endangered mussel surveys) and documenting existing conditions within the study area for the EIS.
- Study Team is initiating the Community Impact Assessment and qualitative Indirect and Cumulative Effects – toward that end, input from the localities is being solicited, including input on the Draft Future Land Use Study Area map.

Below is a summary of comments received from the Town of Knightdale.

*Notable Environmental Features*

- Neuse River
- Panther Rocks – outcropping near Hodge Road/64 bypass interchange that is privately owned but owner wants to conserve this area for parks/rec credits
- Rugby club

*Draft Future Land Use Study Area Map*

- Suggest that the study area be extended eastward to include the Town of Wendell since their land use patterns and economy would also be affected by the proposed project.

*Land Use Plans and Socioeconomics*

- The Town recently updated their **Comprehensive Plan** (January 19, 2011), including revisions to their Land Use Plan, Transportation Plan, Parks and Recreation Plan. The Town has incorporated a Gateway Plan, Arterial & Collector Plan, Bicycle and Pedestrian Plan, and other elements into their revised Comprehensive Plan. (Hard copy of plan provided at meeting.)
- Knightdale has seen approximately 50% decline in single-family residential building permits since 2008 (from 264 in 2008 to 126 in 2010). However, multi-family units have gone up (600 units in 2009/2010).
- Recent economic downturn resulted in delays and/or cancellations of several planned projects:
  - Fire Station/Public Safety Center #2 - delayed
  - New Wal-Mart – cancelled
  - Langston Ridge subdivision – on hold (put road/gutter in, but no homes)
  - New Hampton Inn near 64 Bypass – delayed – hope to get financing within 6 months
- Pockets of low-income and/or minority populations found in vicinity of Poole Road/Hodge Road intersection (trailer/RV park), SW quadrant of proposed interchange (Hispanic), and Kemp Road (mobile homes).
- Exiting/future socioeconomic data, by TAZ, was provided by Knightdale to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast Extension project would be constructed. If the project is NOT built, Knightdale does not see a need to revise their socioeconomic data in the near term.

*Planned Future Development/Transportation Improvements*

- Army Reserve Training Center (44,840 square feet) off of I-540 north of I-64
- Subsequent phases of several residential projects
- Mingo Village Apartments (72 Units) off of I-540
- Mingo Spring Apartments (48 Units)
- Laurel Crossing Apartments (60 Units)
- W&W Residential Subdivision (up to 800 dwelling units)
- Potential 200,000 square foot office park in Legacy Oaks
- Knightdale Park (75 acre park) off of 1st Ave.
- Carillon Assisted Living (96 units) near Hodge Road
- Rex Wellness Center off of I-64
- Potential expansion to existing KRX Express Bus Service
- Creation of Knightdale Circulator Bus Service

*Water/Sewer*

- Knightdale's utility system merged with Raleigh, and is owned by CORPUD.
- Total system capacity of 60 mgd with recent expansion – of that amount, Knightdale owns 2.2 mgd, but only uses 0.8 mgd.

- New Poplar Creek Sewer Line along Poplar Creek – construction 80% complete, expect to open by end of year
- Just completed new Hodge Road Siphon to replace pipes under Neuse – no additional capacity
- New 32-inch water main on north side of Poole Road all the way to Wendell
- All Town capital improvement water/sewer projects will have been completed with the completion Poplar Creek Sewer Line. All other public improvements will be considered CORPUD projects.
- Developers can extend utility lines to serve their projects, though they may need to be oversized in accordance with CORPUD policies.
- Utilities are put in Planned Growth Areas

*Development Constraints/Regulations/Land Use Controls*

- The 3 major constraints to development in Knightdale are:
  - Subsurface rock and rock formations
  - Wake Stone Quarry – very large property expected to operate for over 200 years
  - Norfolk Southern Railroad right-of-way – cost prohibitive to provide road overpasses
- Knightdale is a Phase II community for NPDES compliance purposes and they do not conduct any water quality monitoring.
- Water quality/water resources protection regulations are as follows:

| | |
|---|---|
| Riparian Buffer Protection<br>UDO Chapter 6.3 and 6.5 | Neuse Buffer Rules apply.<br>Built-upon area to be 50 feet from perennial and intermittent streams.<br>The environmental survey requires the identification of watercourses and buffers for preservation. |
| Floodplain Protection<br>UDO Chapter 6.5 | FEMA requirements apply; ordinance applies to future flood elevations.<br>Areas of Special Flood Hazard are those identified by FEMA in its Flood Insurance Rate Map(s) for the Town of Knightdale dated March 3, 1992. The FIRM maps have been updated as of May 2, 2006. Structures must be located 2 feet above base flood elevation. |
| Erosion and Sediment Control<br>UDO Chapter 6.2 | The Town of Knightdale has a contract with Wake County under which the County oversees, administers, implements and enforces the erosion and sediment control program for the Town.<br>Mass grading in residential developments is not allowed. The initial clearing and grading of major residential subdivisions shall be limited to dedicated public rights-of-way and easements for the installation of streets, utilities, and other infrastructure. |
| Stormwater and Impervious Surface Limitations<br>UDO Chapter 6.3 and 16.13 | Low-density development (<24 percent impervious) must implement stormwater measures that control and treat the difference in stormwater volume between pre- and post- development conditions for the 1-year, 24-hour storm. High-density projects must also remove 85 percent of total suspended solids.<br>Approval of stormwater permits requires enforceable restriction on property usage to ensure that future development/redevelopment maintains the site consistent with the approved project plans.<br>Ordinance requires annual maintenance and inspection of stormwater BMPs. Homeowners Associations must establish escrow account for repair of BMPs.<br>Member of NC Clean Water Education Partnership (CWEP) providing stormwater education. CWEP ran educational TV ads on proper use of lawn chemicals and vehicle maintenance. |

- The Town has not enacted any specific regulations for the purpose of specifically protecting the Dwarf Wedgemussel. However, the UDO would require that developers conduct an analysis if the dwarf wedge mussel is potentially an issue.

- Variances and/or exceptions to the above regulations are not granted.
- In general, the Town is Pro-Growth but emphasizes quality growth.
- The Town seeks to concentrate development around the Town core and near physical infrastructure to avoid sprawl.
- Development is prioritized in accordance with the Comprehensive Plan's Design District elements (form based) that deal more with intensity than just simple land use, and the Water Allocation Policy which asks developers to go beyond requirements.
- There are UDO requirements dictating connections to public utilities.
- Development patterns are also influenced by the Wake County Urban Service Area coordinated between the County and the Town.

*Potential Project Effects*

- If the proposed project IS built, development would increase along Hodge Road and Poole Road – the Town's water/sewer plan was based on the assumption that the project would be built.
- The project will spur additional development near the new roadway. It is expected that this development will be more intense and the expected completion of project has influenced the Comprehensive Plan Amendment by now indicating a Primary Activity Center at the intersection of Poole Road and the Southeastern Extension.
- If the proposed project is NOT built, development would still occur but not as rapidly. The development pressures will still exist because this is a rapidly urbanizing area.
- More specifically, if the project is NOT built, development will be diminished in the Poole Rosf and Hodge Road Corridors and the aforementioned Primary Activity Center will likely never be realized without the planned interchange at Poole and I-540.
- Widening of existing roads (I-40, I-440, 64 Bypass) would probably not induce the same intensity of development and would have a negative economic impact in comparison to the new toll road.
- Important to remember that the Town had pushed hard to get 540 through Knightdale (as opposed to an alignment further east near Wendell) in order to generate development in that area. There would be a negative economic effect if the proposed project is NOT built.
- The Town would like to see the eastern section of the project (Phase II) built the same time as the southern section (Phase I).

*Past Actions*

- Prior to 1980, the Town was primarily farmland. There was a spurt of development in the 1980's and then another in the 2000's.
- Recent development patterns have been induced by I-540N, the 64 Bypass, proximity to the Research Triangle Park, and affordable land prices.
- Past projects that have had major effects on the human and/or natural environment include:
  - Shoppes at Midway Plantation/Midtown Commons Shopping Centers
  - Mingo Creek Subdivision, Planters Walk Subdivision, Widewaters Subdivision, Churchill Subdivision
  - Square D/Eastpoint
- The primary environmental impact from past development has been to Mingo Creek primarily as a result of development along Hodge Road (and to a lesser extent from the new Hodge Road Siphon project).

**Action Items:**

- No action items at this time.

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**

**Date**: October 3, 2012

**Time**: 10:00 a.m.

**Place**: Johnston County Planning Department

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| Berry Gray | Johnston County Planning Director | berry.gray@johnstonnc.com |
| Jeff Schlotter | H.W. Lochner, Inc. | jschlotter@hwlochner.com |
| Kristin Maseman | H.W. Lochner, Inc. | kmaseman@hwlochner.com |

**Summary**:

The October 3 meeting had two functions: 1) to discuss the County's responses to the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" and 2) to discuss topics and questions related to the Southeast Extension project's purpose and need. Discussion of the second topic is summarized in a separate document. Below is a summary of comments received from the Johnston County regarding indirect and cumulative effects.

*Notable Environmental Features*

- Swift Creek
- Neuse River
- Mountains to Sea Trail
- Clemmons State Forest

*Land Use Plans and Socioeconomics*

- Johnston County adopted its Comprehensive Land Use Plan in 2009 and adopted its first Comprehensive Transportation Plan in 2011.
- While growth rates have slowed somewhat compared to growth rates a decade or two ago, Johnston County anticipates continued growth and has seen a recent increase in residential building permits issued. Most of the permits are for single-family residences, although there has been some multi-family residential development near the I-40/NC 42 interchange.
- Johnston County does not do involuntary annexation, so there is no annexation plan.
- Existing/future socioeconomic data, by TAZ, was provided by Johnston County to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project. The data provided assumed that the Tri-Ex Southeast

Extension project would be constructed. If the project is NOT built, Johnston County would not see a need to revise their socioeconomic data.

*Planned Future Development/Transportation Improvements*

- Areas in northwestern Johnston County near I-40 (Cleveland Township and Clayton Township) are growth areas for the County. The I-40/NC 42 is a particularly important growth area.
- The County Land Use Plan identifies the I-40/NC 42 and I-40/Clayton Bypass interchanges as Interstate Highway Overlay Districts. The County provides sewer service to areas with this designation, which helps encourage more intensive development in these areas.
- A 600-lot development on Old Drugstore Road is slowly developing.
- I-40 will be widened south to NC 42, and may eventually be widened south to NC 210. NC 42 is also in the CAMPO LRTP to be widened, but this improvement remains unfunded.

*Water/Sewer*

- Johnston County recently expanded its sewer plant and has no plans to expand it any further.
- Water and sewer service can only be extended to PUDs or to commercial/industrial areas.

*Development Constraints/Regulations/Land Use Controls*

- The major constraints to development in Johnston County are infrastructure and soils.
- Johnston County does not have any stormwater management regulations outside of those required by State regulations.
- Stormwater regulations include required BMPs for any developments disturbing at least one acre of land. Regulations dictate the allowable limits of impervious surface for various types of developments.
- Johnston County had to expand the environmentally sensitive district designation on its land use plan into the Swift Creek area for protecting the Dwarf Wedgemussel. This designation requires a 100-foot buffer (instead of the normal 50-foot buffer) and prohibits development in the floodplain.
- Variances and/or exceptions to the above regulations are not granted.
- Johnston County is pro-growth.

*Potential Project Effects*

- Johnston County's proximity to the Raleigh area and RTP and extension of sewer lines into specific areas have induced development.
- The Southeast Extension project has the potential to ease congestion on roads such as NC 50 and on more local roads in northern Johnston County. It also has the potential to reduce travel times to employment centers. The project has a fair amount of potential to stimulate more development in Johnston County for those reasons.
- If the proposed project is NOT built, Johnston County's development may be more moderated.

*Past Actions*

- Clayton Bypass
- I-40 and its interchange at NC 42

**Action Items:**

- None

# Triangle Expressway Southeast Extension

Wake and Johnston Counties
STIP Nos. R-2721, R-2828, R-2829

**MEETING SUMMARY**
**Draft**

**Date**: January 9, 2013

**Time**: 1:00 p.m.

**Place**: Conference Call

**Purpose**: Indirect and Cumulative Effects

**Attendees**:

| Name | Organization | Email Address |
|---|---|---|
| David DeYoung | Clayton Planning Director | ddeyoung@townofclaytonnc.org |
| Kristin Maseman, AICP | H.W. Lochner – Raleigh, NC | kmaseman@hwlochner.com |

**Summary**:

This topic was introduced, and the list of "Questions Related to the Indirect and Cumulative Effects Analysis/Community Impact Analysis" was provided, at an in-person meeting with the Town of Clayton on October 5, 2012. The October 5 meeting focused on other topics and questions related to the Southeast Extension project's purpose and need. The conference call documented here was arranged specifically for the discussion of the project's indirect and cumulative effects (ICE).

Below is a summary of comments received from the Town of Clayton.

*Notable Environmental Features*

- Swift Creek

*Land Use Plans and Socioeconomics*

- The Town's Strategic Growth Plan was adopted in 2008.
- Clayton anticipates continued growth at an annual rate of 2 to 3 percent for the foreseeable future. There is ample existing and planned infrastructure to serve this growth. Growth has been and is expected to continue to be primarily residential. There has been a recent increase in multi-family residential development.
- The NC 42 corridor near the Clayton Bypass is a major growth area in the town. Development interest has picked up significantly in this area. Much of the anticipated development in this corridor is medical-related due to the presence of Johnston Medical Center (hospital) in this area.
- Existing/future socioeconomic data, by TAZ, was provided by Raleigh to CAMPO for their Metropolitan Transportation Plan and they do not see a need to revise their data at this time for any reasons unrelated to this project.

*Planned Future Development/Transportation Improvements*

- Various medical office projects along NC 42 corridor. Nursing home under consideration in this area.
- Apartment complex on NC 42 west of I-40.
- New 55+ community under consideration on Shotwell Road.
- Developing small area concept for the NC 42/Clayton Bypass area to include more mixed-use development to include residential and commercial uses (including hotels).
- The US 70/Clayton Bypass area south of town is under conceptual consideration as a commercial/industrial area.
- Widening of NC 42 is in the CAMPO LRTP. Widening US 70 from I-40 to Amelia Church Road is also in the LRTP.

*Water/Sewer*

- Interchange areas along the Clayton Bypass are planned for water/sewer infrastructure extension. The Town is working on developing concepts and plans for infrastructure extension in these areas.
- Clayton aims to take a proactive but responsible approach to infrastructure expansion.

*Development Constraints/Regulations/Land Use Controls*

- The major constraint to development in Clayton over time is the availability of water and sewer infrastructure.
- The development priorities for Clayton are the NC 42 corridor and the NC 42/Clayton Bypass interchange area.
- Clayton has a Scenic Highway Overlay designation that dictates how development can occur along certain corridors.
- Clayton promotes quality growth.

*Potential Project Effects*

- The opening of the Clayton Bypass (2008) and of Johnston Medical Center (2010) have induced recent development patterns in the area.
- All of the new-location build alternatives for the Southeast Extension have the potential to induce development in Clayton, particularly along the Clayton Bypass and NC 42.
- The Southeast Extension project would likely influence the timing and intensity of development in the area while promoting increased densities.
- If the Southeast Extension project is not built, development will still continue, but it may be somewhat slower.

*Past Actions*

- Clayton Bypass

**Action Items:**

- Lochner will follow up with Jamie Guerrero (919-209-8333) regarding stormwater management regulations and related topics.

# APPENDIX B
# CITY OF RALEIGH PLANNED
# WATER AND SEWER IMPROVEMENTS

# CAPITAL IMPROVEMENT PROJECTS

**Capital Improvement Projects**

Public Utilities

Legend
- CIP PROJECT POINTS
- CIP PROJECT LINES

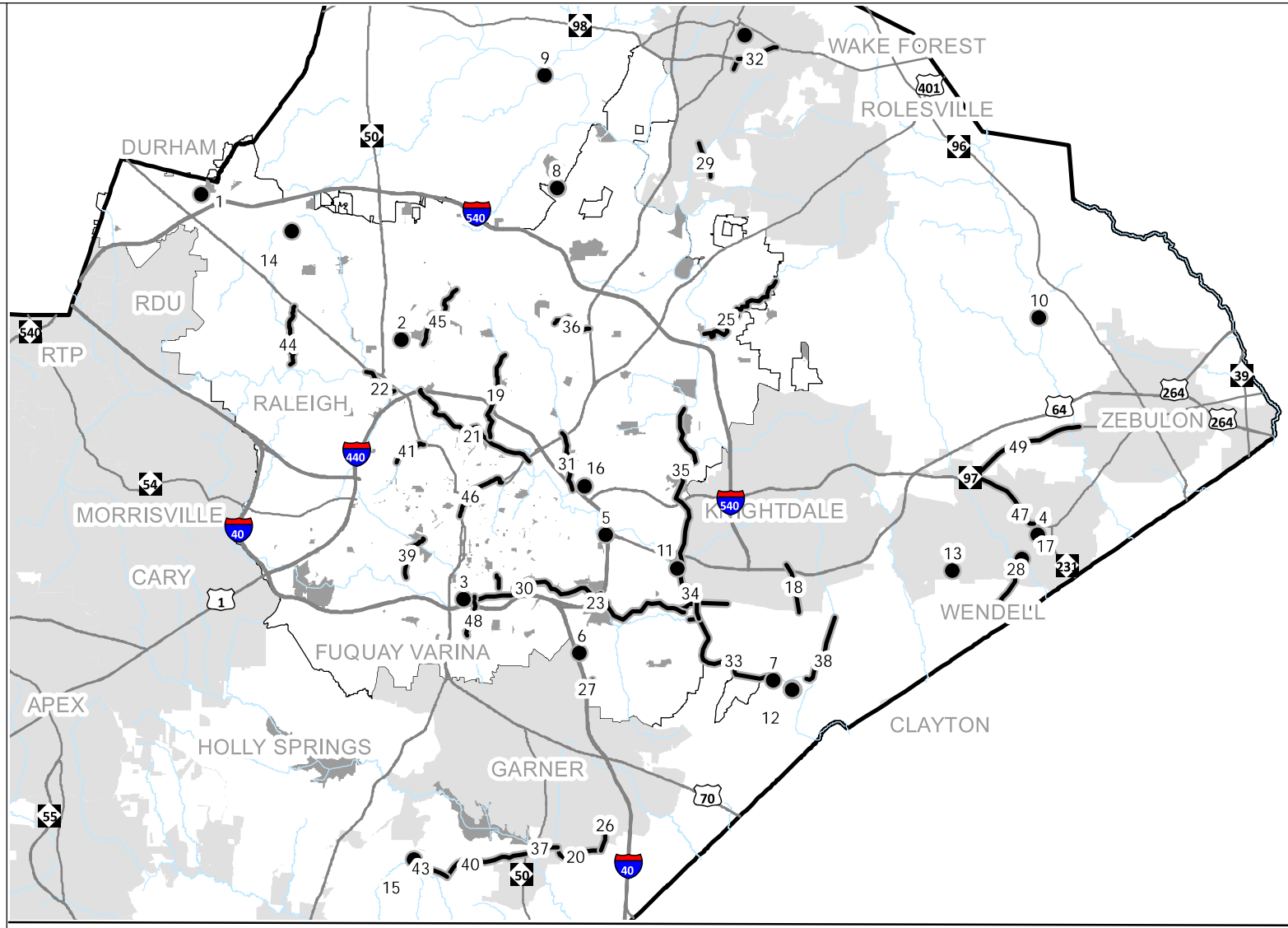
Other Data
- Interstate
- US Highway
- NC Highway
- Parks

0 1.75 3.5
Miles

**Overview Map**


Map updated May 2013 by City of Raleigh GIS Division

This map is a graphic representation and should only be used for illustrative purposes. In no way should this map be used for exact locations.




## Public Utility Projects

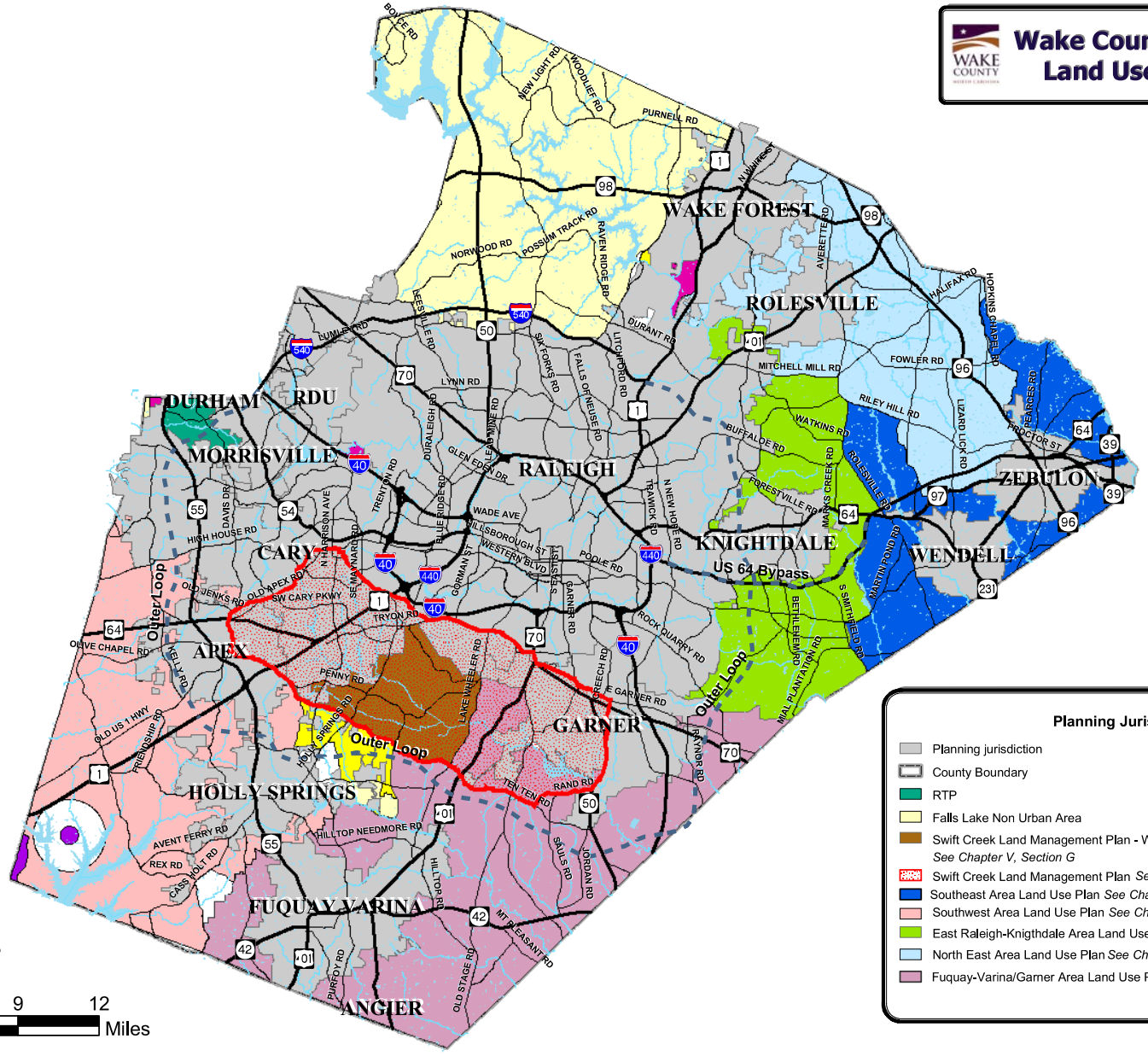
| ID | PROJECT NAME | ID | PROJECT NAME | ID | PROJECT NAME | ID | PROJECT NAME | ID | PROJECT NAME | ID | PROJECT NAME |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 MGD Pump Upgrade at Mt. Herman PS (B401) | 8 | EMJ WTP Pilot Plant Facility | 10 | Little River Reserv Environmental Impact Statement | 14 | Replace Springdale Tank (B402) | 26 | Hebron Church Rd Transmission Main 24-inch (B511) | 38 | Poplar Creek Interceptor |
| 2 | 3 MGD pump addition to Shelly Road PS (A303) | 8 | EMJ WTP New Laboratory Facility | 11 | Neuse River Pump Station Pump Addition | 15 | Ten Ten Road Water Tank | 27 | Jones Sausage Road Upgrade Under I-40 | 39 | Pullen Park Pump Station 24" Discharge |
| 3 | Bain Pump Station Upgrade (B103) | 8 | EMJ WTP Chemical Storage Tank Replacement | 12 | NRWWTP Dewatering and Sludge Dryer | 16 | Utility Field Operation Facilities Improvements | 28 | Lake Glad Road Waterline Extension | 40 | Rand Road Transmission Line 12-inch (B513) |
| 4 | Control Valve Installation at Wendell Blvd (B901) | 8 | EMJWTP Facility/Equipment Rehabilitation | 12 | NRWWTP 15 MGD Capacity Expansion (Includes W15A) | 17 | Wendell Lake Glad Rd. Demolition | 29 | Ligon Mill Road Waterline 12-inch (B604) | 41 | Southwest Beaver Creek Interceptor |
| 5 | Crabtree Lift Station Improvements | 8 | EMJ WTP Add. High Service Discharge Pipe (B302) | 12 | NRWWTP Electrical Transformer Rehabilitation | 18 | Bethlehem Road Transmission Main | 30 | Lower Walnut Creek Parallel Interceptor (W1) | 42 | State Street Interceptor |
| 6 | Debris Drying Pads | 8 | EMJWTP High Service Pump No. 1 upgrade (B301) | 12 | NRWWTP Anaerobic Digestors | 19 | Big Branc Interceptor Parallel | 31 | Marsh Creek Parallel Phase I | 43 | Ten Ten Road Transmission Line |
| 6 | Debris Drying Pads | 8 | EMJWTP Filter/Sed/Floc. Basin Additions | 12 | NRWWTP Facilities Improvement | 20 | Clifford Road Transmission Main 24-inch (B510) | 32 | NC 98 Bypass Waterline 12-inch (B603) | 44 | Turkey Creek Interceptor Rehab |
| 7 | E. Neuse Reg. Pump Station & Force Main (W16A&17A) | 8 | EMJWTP UV/Solids Handling | 12 | NRWWTP Lab Improvements | 21 | Crabtree Basin WW System Conveyance Improvements | 33 | Neuse River East Parallel Interceptor Ph III | 45 | Upper Mine Creek Interceptor |
| 8 | EMJWTP Clearwell Expansion | 8 | EMJWTP Settling Basin Rehabilitation | 12 | NRWWTP Land Purchase | 22 | Crabtree Valley Sewer Replacement | 34 | Neuse River East Parallel Interceptor Phase IV | 46 | Upper Pigeon House Rehabilitation (Portion of C8) |
| 8 | EMJWTP Ozone Expansion | 9 | Falls Lake Initiative | 12 | NRWWTP Onsite Reuse Improvements | 23 | DEBWTP Water Transmission Main (B101) | 35 | Neuse River East Parallel Interceptor Phase V | 47 | Wendell Blvd Water line (B902) |
| 8 | EMJWTP Solids Handling | 10 | Little River Res. Wetland Mitig. Property Acquis. | 12 | NRWWTP Thickening Bld Switchgear Replacement | 24 | Franklin Street Waterline 12-inch (B602) | 36 | Oak Forest 30" wtr Main Atlantic Ave-Capital Blvd | 48 | Wildcat Branch Interceptor Parallel |
| 8 | EMJWTP Sedimentation Improvements | 10 | Little River Reserv. Wake City Land Acqu Reimburs | 13 | Poole Road Booster Pump Station (B102) | 25 | Harris Creek Interceptor Parallel | 37 | Oregon Trail Road Transmission Main 23-inch (B509) | 49 | Zebulon Water line on NC 97 (B903) |

**Appendix C**
**Public Parks and Recreational Facilities**

| Name | Location | Ownership |
|---|---|---|
| Clemmons Educational State Forest | Old US 70, Clayton | State of North Carolina |
| Crowder District Park | Ten Ten Road, Apex | Wake County |
| Southeast Regional Park *(proposed)* | Barber Bridge Road, Willow Spring | Wake County |
| Historic Yates Mill County Park | Lake Wheeler Road, Raleigh | Wake County |
| Harris Lake County Park | County Park Drive, New Hill | Wake County |
| Historic Oak View County Park | Carya Drive, Raleigh | Wake County |
| Neuse River Greenway Trail | Eastern Raleigh | City of Raleigh |
| Barwell Road Park | Barwell Road, Raleigh | City of Raleigh |
| Lake Wheeler Park | Lake Wheeler Road, Raleigh | City of Raleigh |
| Anderson Point Park | Anderson Point Drive, Raleigh | City of Raleigh |
| Raleigh Golf Association | Tryon Road, Raleigh | Private ownership – open to public |
| Meadowbrook Golf Club | South of White Oak Road, Garner | Private ownership – open to public |
| 401 Par Golf | Fayetteville Road, Raleigh | Private ownership – open to public |
| Knights Play Golf Center | Ten-Ten Road, Apex | Private ownership – open to public |
| Middle Creek School Park | Optimist Farm Road, Cary | Town of Cary |
| Regency Park | Regency Parkway, Cary | Town of Cary |
| Harold D. Ritter Park | Lochmere Drive, Cary | Town of Cary |
| Stevens Nature Center | Kildaire Farm Road, Cary | Town of Cary |
| Bartley Park (proposed) | Penny Road, Cary | Town of Cary |
| Bass Lake Park and Retreat Center | Bass Lake Road, Holly Springs | Town of Holly Springs |
| Sunset Oaks Park *(proposed)* | Sunset Oaks neighborhood, Holly Springs | Town of Holly Springs |
| Parrish Womble Park | Stinson Avenue, Holly Springs | Town of Holly Springs |
| Sugg Farm Park | Grigsby Avenue, Holly Springs | Town of Holly Springs |
| Jones Park | Holly Springs Road, Holly Springs | Town of Holly Springs |
| Veterans Park | Sunset Ridge neighborhood, Holly Springs | Town of Holly Springs |
| Falcon Park | Central Fuquay-Varina | Town of Fuquay-Varina |
| Action Park | Wake Chapel Road, Fuquay-Varina | Town of Fuquay-Varina |
| Library Park | Central Fuquay-Varina | Town of Fuquay-Varina |
| Fuquay Mineral Spring Park | Central Fuquay-Varina | Town of Fuquay-Varina |
| Kinton Soccer Field | Central Fuquay-Varina | Town of Fuquay-Varina |
| Lawrence Street Park | Central Fuquay-Varina | Town of Fuquay-Varina |
| West Jones Street Park | Central Fuquay-Varina | Town of Fuquay-Varina |
| South Park | South Main Street, Fuquay-Varina | Town of Fuquay-Varina |
| Honeycutt Road Park | NC 55, Fuquay-Varina | Town of Fuquay-Varina |
| Ransdell Soccer Field | Ideal Lane, Fuquay-Varina | Town of Fuquay-Varina |
| Carroll Howard Johnson Environmental Education Park | Wagstaff Road, Fuquay-Varina | Town of Fuquay-Varina |
| Fleming Loop Recreational Park | Fleming Loop Road, Fuquay-Varina | Town of Fuquay-Varina |
| Ballentine School Park | Sunset Lake Road, Fuquay-Varina | Town of Fuquay-Varina |
| Herbert Akins Park | Herbert Akins Road, Fuquay-Varina | Town of Fuquay-Varina |
| Banks Road Park | US 401, Fuquay-Varina | Town of Fuquay-Varina |
| Alston Ridge Park | Town of Fuquay-Varina | Town of Fuquay-Varina |
| Lake Benson Park | Buffaloe Road, Garner | Town of Garner |
| White Deer Park *(existing and proposed expansion)* | Aversboro Road, Garner | Town of Garner |
| Bryan Road Nature Park *(proposed)* | Bryan Road, Garner | Town of Garner |
| Thompson Road Park | Central Garner | Town of Garner |
| Centennial Park | New Bethel Church Road, Garner | Town of Garner |
| South Garner Park | Heather Hills neighborhood, Garner | Town of Garner |
| Garner Recreational Park | Central Garner | Town of Garner |
| Legend Park | Northern Clayton | Town of Clayton |
| Clayton Community Park | Amelia Church Road, Clayton | Town of Clayton |
| Municipal Park | Northern Clayton | Town of Clayton |
| All-Star Park | Central Clayton | Town of Clayton |
| Clayton River Walk on the Neuse | Covered Bridge Road, Clayton | Town of Clayton |
| Jack Marley Park | Central Angier | Town of Angier |

# APPENDIX D
# AREA LAND USE PLAN MAPS

# Wake County Land Use Plan: Land Use Classifications




**Legend**

- Major Roads
- Minor Roads
- Proposed Roads
- Lakes
- Rivers and Streams

**Land Use Classifications**

- Unresolved or other
- Open Space
- Industrial
- Res 1-4 units per acre
- Res 4-8 units per acre
- Res < 1 units per acre
- Res > 8 units per acre
- SFF

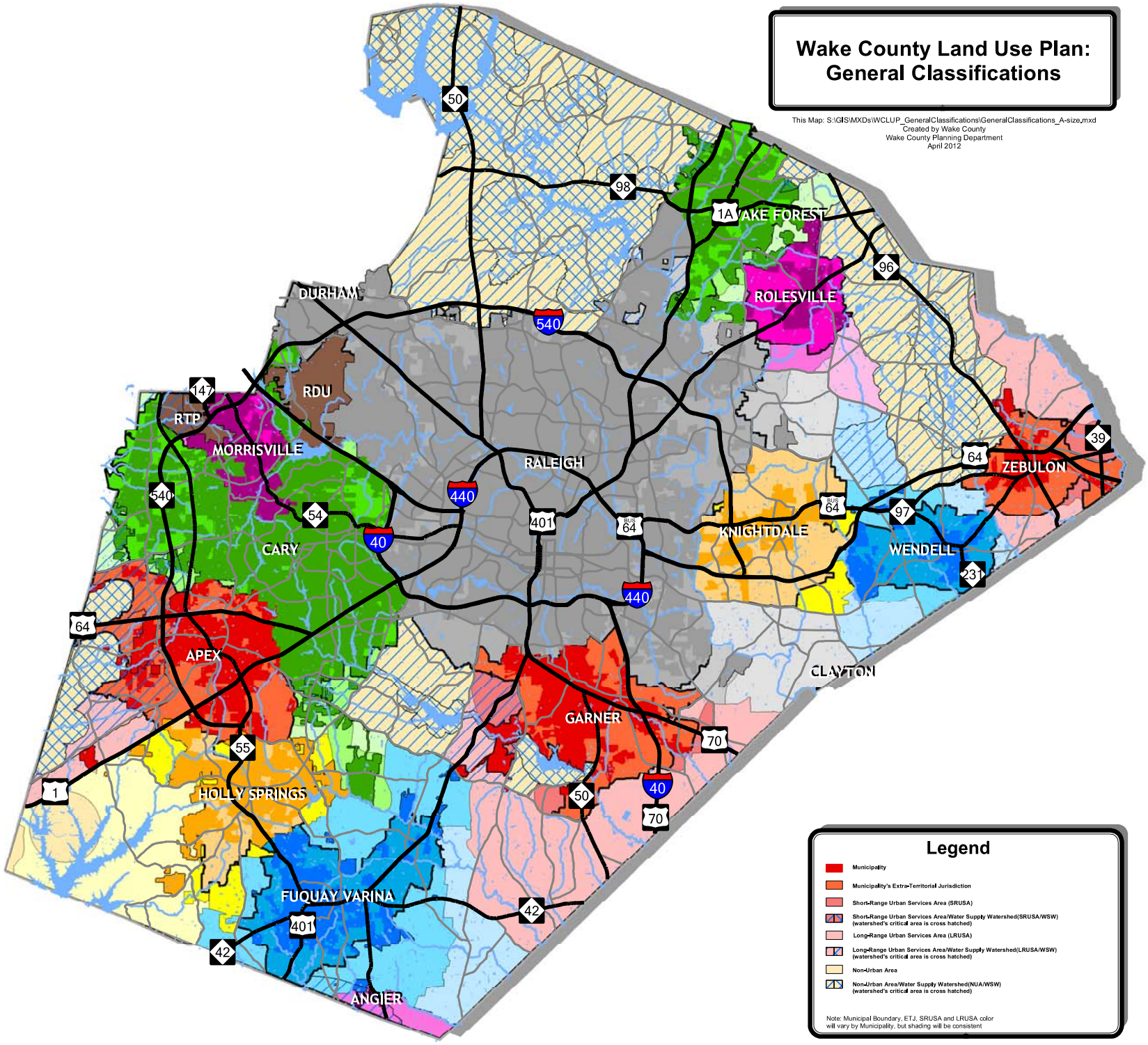
**Planning Jurisdictions**

- Planning jurisdiction
- County Boundary
- RTP
- Falls Lake Non Urban Area
- Swift Creek Land Management Plan - Wake Co. Jurisdiction. *See Chapter V, Section G*
- Swift Creek Land Management Plan *See Chapter V, Section G*
- Southeast Area Land Use Plan *See Chapter VIII. D*
- Southwest Area Land Use Plan *See Chapter VIII. B*
- East Raleigh-Knigthdale Area Land Use Plan *See Chapter VIII.C*
- North East Area Land Use Plan *See Chapter VIII. E*
- Fuquay-Varina/Garner Area Land Use Plan *See Chapter VIII. F*

0 1.5 3 6 9 12 Miles

# Wake County Land Use Plan: General Classifications

This Map: S:\GIS\MXDs\WCLUP_GeneralClassifications\GeneralClassifications_A-size.mxd
Created by Wake County
Wake County Planning Department
April 2012




**Original Adoption Date**
July 21, 1997

**Short Range Urban Services Areas**
Adopted
November 1, 1999

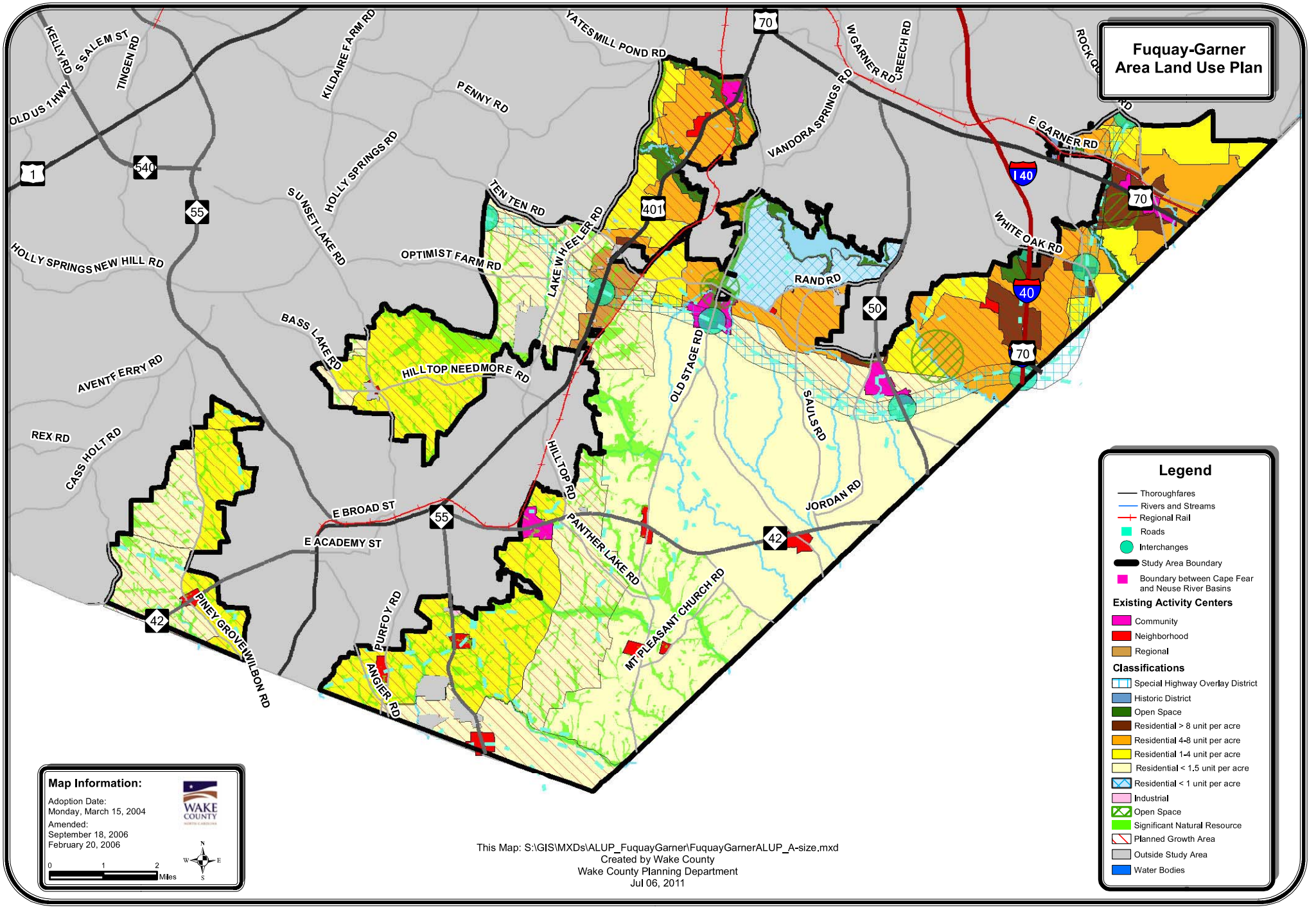
**Last Amended**
January 6, 2014
October 21, 2009
September 8, 2009
March 23, 2009
January 12, 2009
July 24, 2008
March 28, 2008
October 10, 2008
October 02, 2007
November 20, 2006
September 18, 2006
July 12, 2004

1 inch = 5 miles

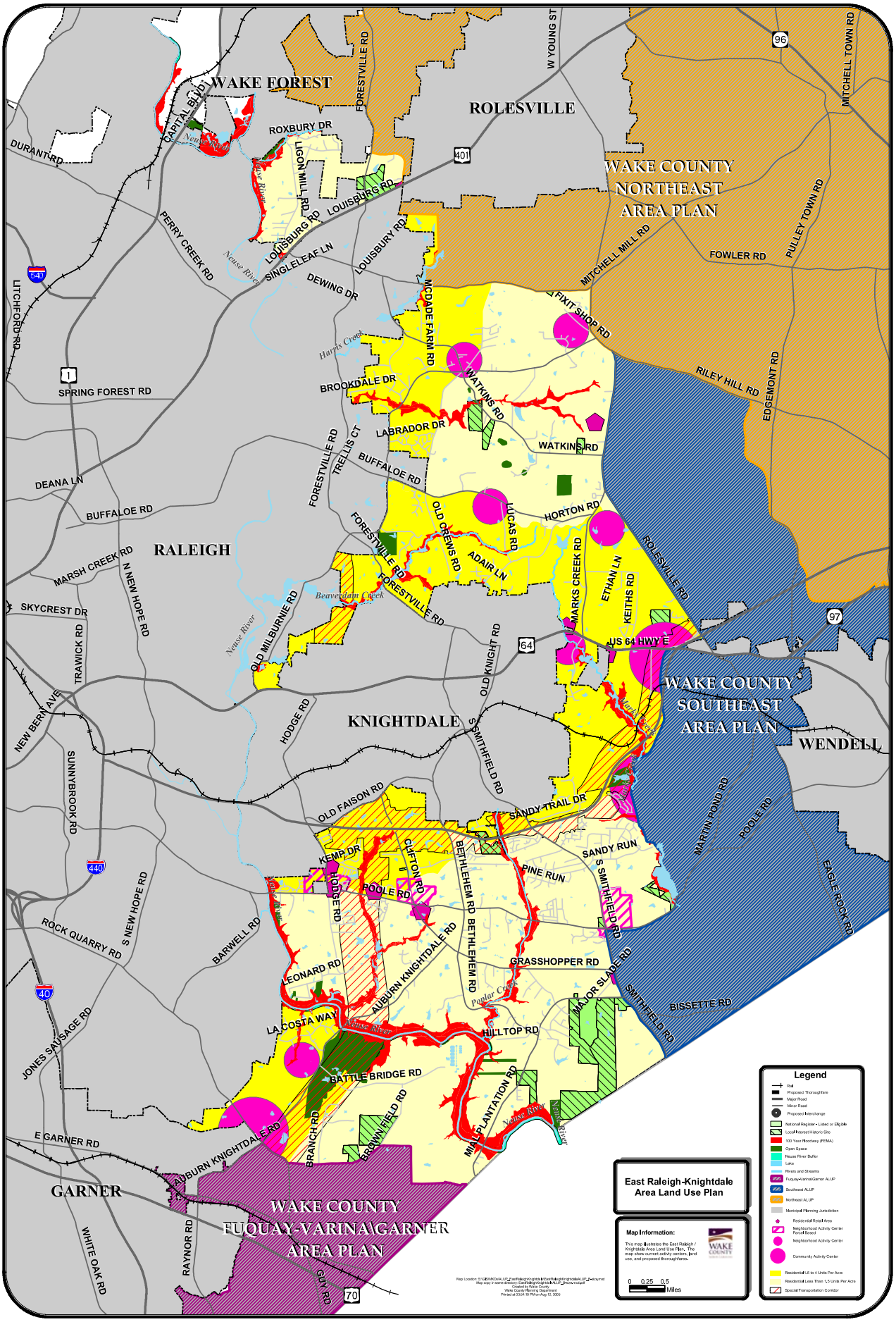
## Legend

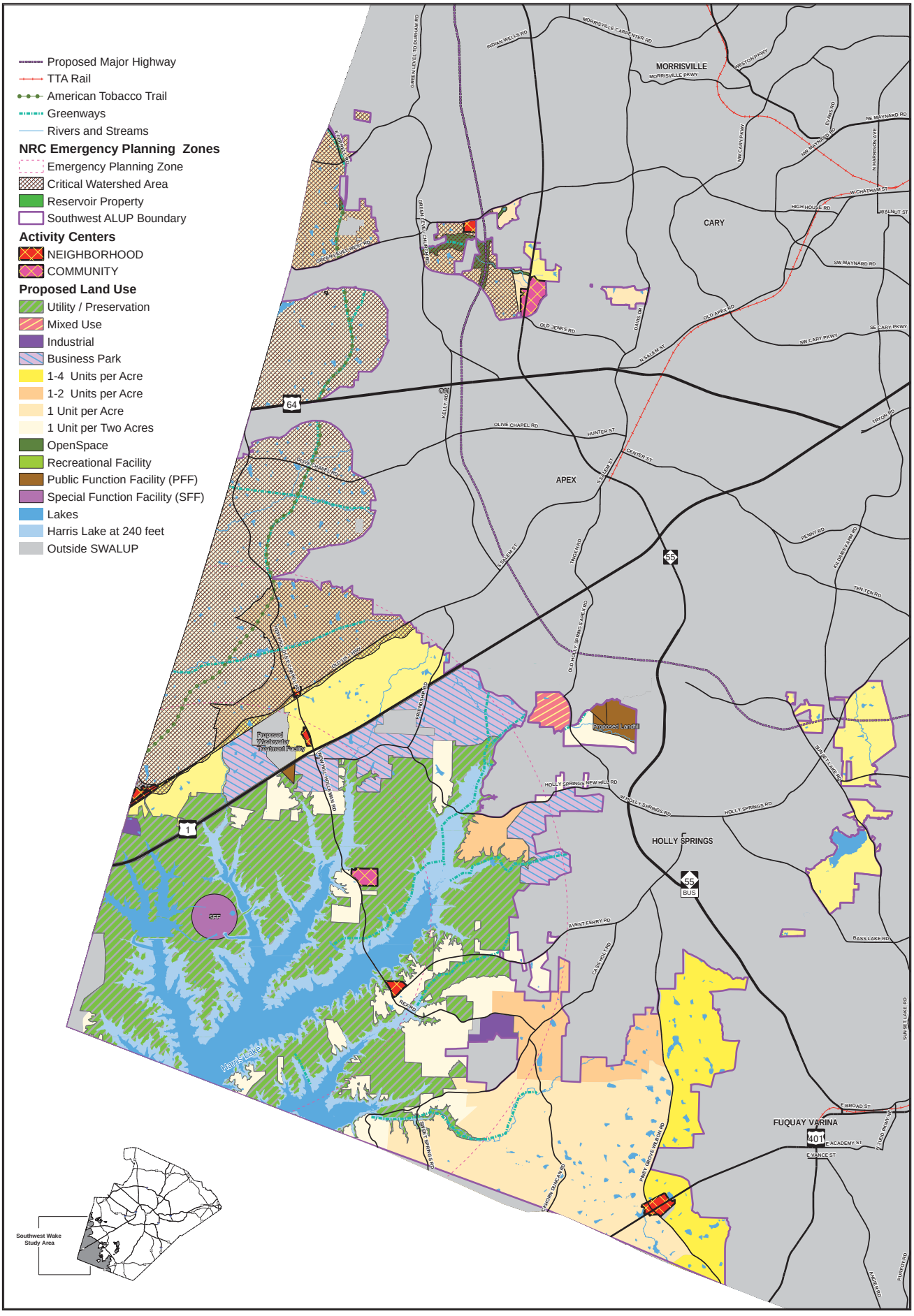
- Municipality
- Municipality's Extra-Territorial Jurisdiction
- Short-Range Urban Services Area (SRUSA)
- Short-Range Urban Services Area/Water Supply Watershed(SRUSA/WSW) (watershed's critical area is cross hatched)
- Long-Range Urban Services Area (LRUSA)
- Long-Range Urban Services Area/Water Supply Watershed(LRUSA/WSW) (watershed's critical area is cross hatched)
- Non-Urban Area
- Non-Urban Area/Water Supply Watershed(NUA/WSW) (watershed's critical area is cross hatched)

Note: Municipal Boundary, ETJ, SRUSA and LRUSA color will vary by Municipality, but shading will be consistent




This Map: S:\GIS\MXDs\ALUP_FuquayGarner\FuquayGarnerALUP_A-size.mxd
Created by Wake County
Wake County Planning Department
Jul 06, 2011

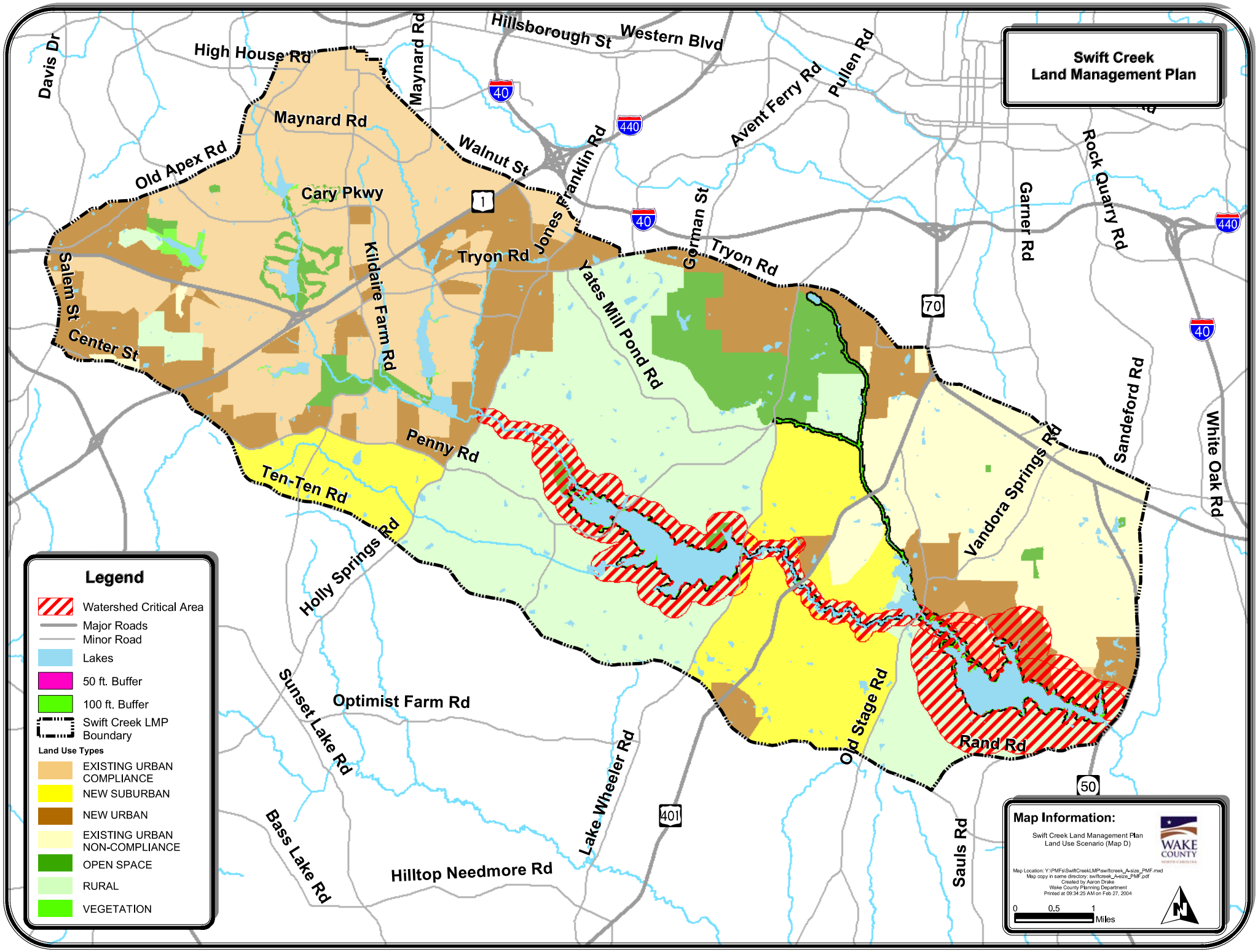

WAKE FOREST
ROLESVILLE
RALEIGH
KNIGHTDALE
GARNER
WENDELL
WAKE COUNTY NORTHEAST AREA PLAN
WAKE COUNTY SOUTHEAST AREA PLAN
WAKE COUNTY FUQUAY-VARINAGARNER AREA PLAN
CAPITAL BLVD
DURANT RD
ROXBURY DR
FORESTVILLE RD
W YOUNG ST
MITCHELL TOWN RD
LIGON MILL RD
LOUISBURG RD
PERRY CREEK RD
SINGLELEAF LN
DEWING DR
LITCHFORD RD
SPRING FOREST RD
MITCHELL MILL RD
FOWLER RD
PULLEY TOWN RD
J FIXIT SHOP RD
MCDADE FARM RD
WATKINS RD
BROOKDALE DR
LABRADOR DR
RILEY HILL RD
EDGEMONT RD
TRELLIS CT
BUFFALOE RD
DEANA LN
HORTON RD
OLD CREWS RD
LUCAS RD
ADAIR LN
MARSH CREEK RD
N NEW HOPE RD
SKYCREST DR
TRAWICK RD
OLD MILBURNIE RD
MARKS CREEK RD
ETHAN LN
KEITHS RD
ROLESVILLE RD
US 64 HWY E
OLD KNIGHT RD
NEW BERN AVE
HODGE RD
S SMITHFIELD RD
SUNNYBROOK RD
OLD FAISON RD
SANDY TRAIL DR
MARTIN POND RD
POOLE RD
EAGLE ROCK RD
KEMP DR
CLIFTON RD
BETHLEHEM RD
PINE RUN
SANDY RUN
ROCK QUARRY RD
S NEW HOPE RD
BARWELL RD
LEONARD RD
AUBURN KNIGHTDALE RD
GRASSHOPPER RD
MAJOR SLADE RD
BISSETTE RD
LA COSTA WAY
HILLTOP RD
JONES SAUSAGE RD
BATTLE BRIDGE RD
MALPASS PLANTATION RD
BRANCH RD
BROWN FIELD RD
E GARNER RD
WHITE OAK RD
RAYNOR RD
GUY RD
Neuse River
Harris Creek
Beaverdam Creek
Poplar Creek
Mark's Creek
Legend
East Raleigh-Knightdale Area Land Use Plan
Map Information:
This map illustrates the East Raleigh / Knightdale Area Land Use Plan. The map shows current activity centers, land use, and proposed thoroughfares.
0 0.25 0.5 Miles




**Southwest Wake ALUP Update**
**Adopted July 9, 2007**
**(Amended 4/5/10, LUPA 03-09)**

0 1 2 Miles

This Map: S:\GIS\LandUse\SouthWest\LUPA_09\SouthwestALUP_D-Size.mxd
Created by Wake County
Wake County Planning Department
Mar 23, 2011


Swift Creek
Land Management Plan
Legend
Watershed Critical Area
Major Roads
Minor Road
Lakes
50 ft. Buffer
100 ft. Buffer
Swift Creek LMP Boundary
Land Use Types
EXISTING URBAN COMPLIANCE
NEW SUBURBAN
NEW URBAN
EXISTING URBAN NON-COMPLIANCE
OPEN SPACE
RURAL
VEGETATION
Map Information:
Swift Creek Land Management Plan
Land Use Scenario (Map D)
WAKE COUNTY
Map Location: Y:\PMFs\SwiftCreekLMP\swiftcreek_A-size_PMF.mxd
Map copy in same directory: swiftcreek_A-size_PMF.pdf
Created by Aaron Drake
Wake County Planning Department
Printed at 09:34:25 AM on Feb 27, 2004
0 0.5 1 Miles
Davis Dr
High House Rd
Maynard Rd
Hillsborough St
Western Blvd
Avent Ferry Rd
Pullen Rd
Old Apex Rd
Walnut St
Cary Pkwy
Jones Franklin Rd
Gorman St
Garner Rd
Rock Quarry Rd
Salem St
Center St
Kildaire Farm Rd
Tryon Rd
Yates Mill Pond Rd
Penny Rd
Ten-Ten Rd
Holly Springs Rd
Vandora Springs Rd
Sandeford Rd
White Oak Rd
Sunset Lake Rd
Optimist Farm Rd
Old Stage Rd
Rand Rd
Lake Wheeler Rd
Bass Lake Rd
Hilltop Needmore Rd
Sauls Rd
1
40
440
70
401
50

# City of Raleigh
# Future Land Use

## Future Land Use Categories

### RESIDENTIAL CATEGORIES:

**Rural Residential**

This category is generally mapped over areas zoned "R1" (or areas in the ETJ / USA with rural residential land use designations and rural County zoning) where intensification to more urban uses is not expected due to watershed constraints and existing fragmented parcel patterns. Rural Residential areas are generally developed with "ranchettes," hobby farms, estates, large-lot subdivisions, or conservation subdivisions with large common open space areas. The intent of this designation is to preserve the rural character of these areas and achieve compatible resource conservation objectives such as watershed conservation and base protection. Gross densities in these areas would be one unit per acre or less, although clustered housing on large tracts could result in small pockets of more densely developed land.

**Low Density Residential**

This category encompasses most of Raleigh's single family detached residential neighborhoods, corresponding roughly to the R-2, R-4, and R-6 zoning districts (but excluding parks within these districts). It also identifies vacant or agricultural lands – in the city and in the county – where single family residential use is planned over the next 20 years. Smaller lots, townhouses and multifamily dwellings would only be appropriate as part of a conservation subdivision resulting in a significant open space set-aside. As defined in the zoning regulations, manufactured home parks could also be appropriate in this land use category.

**Moderate Density Residential**

This category applies to some of the city's older single family residential neighborhoods, along with newer small lot single family subdivisions and patio home developments. Other housing types including townhouses and multifamily dwellings would be consistent with this designation as long as an overall gross density not exceeding 14 units per acre was maintained. Gross density in these areas would be 6 to 14 units per acre. Corresponding zoning districts are R-6 and R-10, or RX conditioned to limit density.

**Medium Density Residential**

This category applies to garden apartments, townhomes, condominiums, and suburban style apartment complexes. It would also apply to older neighborhoods with a mix of single-family and multi-family housing. RX zoning with a three or four story height limit is appropriate for these areas.

**High Density Residential**

This category would apply to apartment buildings and condominiums. Conforming zoning would consist of the RX district with a height limit of 5 to 12 stories, depending on location and context. Other zoning districts which permit multi-family housing, appropriately conditioned, could be conforming as well. Although this is a residential zone, ground floor retail uses (with upper story housing) may be appropriate under certain circumstances. Comprehensive Plan Land Use Element policies should be consulted for additional guidance.

### MIXED USE CATEGORIES:

**Office & Residential Mixed Use**

This category is applied primarily to frontage lots along major streets where low density residential uses are no longer appropriate, as well as office parks and development nodes suitable for a more mixed-use development pattern. This category encourages a mix of residential and office use. Retail not ancillary to employment and/or residential uses is discouraged so that retail can be more appropriately clustered and concentrated in retail and mixed-use centers at major intersections and planned transit stations. OX is the closest corresponding zoning district. Higher impact uses such as hotels and hospitals are not contemplated or recommended in this land use category except in limited cases in appropriate locations. Heights would generally be limited to four stories when near neighborhoods, with additional height allowed for larger sites and locations along major corridors where adjacent uses would not be adversely impacted.

**Neighborhood Mixed Use**

This category applies to neighborhood shopping centers and pedestrian-oriented retail districts. The service area of the type of retail found in these districts is generally about a one mile radius or less. Typical uses would include corner stores or convenience stores, restaurants, bakeries, supermarkets (other than super-stores/centers), drug stores, dry cleaners, video stores, small professional offices, retail banking, and similar uses that serve the immediately surrounding neighborhood. Residential and mixed-use projects with upper story housing are also supported by this designation. Where residential development occurs, ground floor retail would be encouraged and minimum building heights might be applied in transit-rich areas. Heights would generally be in the three to five story range, although additional height up to 12 stories would be appropriate in TOD areas and at the core of mixed-use centers.
CX is the primary corresponding zoning district for these areas. Appropriate urban form standards for frontage should be applied, recognizing that some of the designated areas are established neighborhood "main streets" and others are suburban auto-oriented shopping plazas or strip centers fronting on high-volume arterial roadways. For both this category and Neighborhood Mixed Use, greater height should include appropriate transitions and be accompanied by a pedestrian-friendly relationship to the public realm.

**Community Mixed Use**

This category applies to medium-sized shopping centers and larger pedestrian-oriented retail districts such as Cameron Village. Typical commercial uses include large-format supermarkets, large drug stores, department stores and variety stores, clothing stores, banks, offices, restaurants, movie theaters, hotels, and similar uses that draw from multiple neighborhoods. Development intensities could be higher than in Neighborhood Center areas, with mid-rise buildings as well as low rise buildings. Where residential development occurs, ground floor retail would be encouraged and minimum building heights might be applied in transit-rich areas. Heights would generally be in the three to five story range, although additional height up to 12 stories would be appropriate in TOD areas and at the core of mixed-use centers.
CX is the primary corresponding zoning district for these areas. Appropriate urban form standards for frontage should be applied, recognizing that some of the designated areas are established neighborhood "main streets" and others are suburban auto-oriented shopping plazas or strip centers fronting on high-volume arterial roadways. For both this category and Neighborhood Mixed Use, greater height should include appropriate transitions and be accompanied by a pedestrian-friendly relationship to the public realm.

**Regional Mixed Use**

This category applies to the Triangle Town Center area, the Brier Creek area, and the North Hills/Midtown and Crabtree Centers. The intent is to identify the major retail and service hubs that draw customers from across the city. These areas may include high-density housing, office development, hotels, and region-serving retail uses such as department stores and specialty stores. These areas would typically be zoned CX. Heights could be as tall as 12 to 20 stories in core locations, but should taper down to meet the context of surrounding development. As in other mixed-use areas, taller buildings should be accompanied by enhanced pedestrian amenities.

**Central Business District**

This category applies to the Raleigh Central Business District, and is intended to enhance Downtown Raleigh as a vibrant mixed use urban center. The category recognizes the area's role as the heart of the city, supporting a mix of high intensity office, retail, housing, government, institutional, visitor-serving, cultural, and entertainment uses. Multiple zoning districts might apply within the CBD, corresponding to the different character and vision for its various neighborhoods, with DX being the primary district for the mixed use core of downtown. Heights in the downtown could reach as high as 40 stories in the core, but would taper down to meet the adjacent neighborhoods at a height of three to four stories.

### EMPLOYMENT CATEGORIES:

**Office/Research & Development**

This category identifies major employment centers where housing is not considered an appropriate future land use. Principal uses are office parks, free-standing office buildings or corporate headquarters, high-tech, research and development uses, hotels, and ancillary service businesses and retail uses that support the office economy. This category can also apply in appropriate locations to office-industrial hybrids such as light fabrication and assembly ancillary to an R&D use, flex parks, and office-distribution combinations. OP is the most appropriate zoning district for this category, although OX could be used if conditioned to restrict housing development.

**Business & Commercial Services**

This category is for higher impact or "heavy" commercial activities that would not be compatible with residential uses, or that have locational needs (such as frontage along freeways, expressways, or other major streets) that are not conducive to mixed use development. Examples would include auto dealerships, auto repair and service businesses, lumberyards, nurseries, contractor suppliers, warehousing, printers, machinery distribution centers, and other uses that are quasi-industrial or highway-oriented in character. These areas would generally be zoned IX. Housing would be limited, but live-work units or housing combined with an employment-generating ground floor could be permitted in certain locations.

**General Industrial**

This category designates areas programmed for industrial land uses, including manufacturing, concrete plants and other extractive industries, junkyards/scrap yards, and outdoor storage uses. These uses tend to have greater impacts than the commercial service uses, and may require additional buffering or separation from nearby uses. Some of these uses are dependent on rail for freight movement, and others require convenient access to freeways or other major streets for truck deliveries and shipments. Railyards, power plants, and similar uses are also included in this designation. Most of these areas should be zoned IH to prevent use conflicts with housing or retail.

### PUBLIC & INSTITUTIONAL CATEGORIES:

**Public Facilities**

This category identifies large publicly owned non-park properties, including public schools, city facilities (such as libraries, fire stations, public works yards, etc.), stadiums, state government facilities, fire fairgrounds, and federal government facilities (postal distribution centers, etc.). Such sites are identified on the Future Land Use Map if they cover more than about two acres.

**Institutional**

This category identifies land and facilities occupied by colleges and universities, large private schools, hospitals and medical complexes, religious organizations, and similar institutions. Smaller institutional uses such as churches are generally not mapped unless they are sites that are more than two acres in size. Institutional properties may be public or private. While institutional uses are permitted in a variety of zoning districts, large institutions in a campus setting such as universities and major hospitals are appropriately zoned CMP.

### PARK, OPEN SPACE & RESOURCE CONSERVATION CATEGORIES:

**Public Parks & Open Space**

This category applies to paramount open space intended for recreational or resource conservation uses. Included are neighborhood, community, and regional parks and greenways. Greenways include both existing greenway property as well as potential greenway corridors designated in the Comprehensive Plan and subject to regulation under the City code. Also included are publicly owned lands that are managed for watershed protection, resource conservation, botanical preserves, and the protection of important visual resources. Land with this designation is intended to remain in open space in perpetuity. Where potential greenway corridors are mapped (typically as buffers to streams identified in the City's Greenway Master Plan), greenway dedication will be subject to the City's code requirements during the subdivision and site planning process, but shall not be a part of the rezoning process unless voluntarily offered.

**Private Open Space**

This category includes open space that is privately owned and maintained, including private golf courses and country clubs, cemeteries, open space easements, land zoned Conservation Management, and land that should be retained in its natural state to protect public health and safety (such as floodways and steep slopes), preserve sensitive or important ecological resources (such as important tree stands), or provide a public benefit (such as watershed protection). Land with this designation may have a limited amount of development potential, and may be used for agriculture, forestry, pasture, etc. but the overall intent is to protect its open and undeveloped character through the horizon year of the Plan.

### CRITICAL AREAS:

**Critical Areas**

The critical areas overlay is mapped over lands that are environmentally sensitive and merit preservation and protection from development. The critical areas overlay encompasses publicly and privately owned land mostly encumbered by the 100-year floodplain. Some of this area is currently zoned Conservation Management; other portions are zoned for a wider range of use. The use of an overlay on top of another designation recognizes that while preservation is the long term goal, private landowners are entitled to a productive use of the property as allowed by the underlying zone district until such time as the appropriate steps can be taken to protect those resources.

### SPECIAL STUDY AREAS:

**Special Study Areas**

The Future Land Use Map includes another category to identify areas where the future land use pattern has not been determined. These areas are outlined with a dashed line, labeled, and in some cases left "blank" (white) on the map, indicating that the future land use pattern was still under study at the time of Plan adoption. The text of the plan provides further detail.

This designation is used on large sites where land use planning studies incorporating focused community outreach are necessary to determine a preferred land use pattern. Examples include areas such as active rock quarries, landfills, large tracts outside of the City's current jurisdiction but in its future urban services area, and publicly-owned sites of particular importance.

See Resolution 2009-15 for additional guidance regarding Special Study Areas.

A-1: Northwest Quarry
A-2: Duraleigh Quarry
A-3: Major Industrial/Chemical Facility
A-4: Dorothea Dix Campus *** (see Ashe Street LU 12.2 & 12.5; Policy Statement LU 12.1)
A-5: Southeast Waste Facility
A-6: North Urban Service Area*
A-7: South Urban Service Area*

** Future Land Use for areas A-6 & A-7, which are outside the City's ETJ, reflect current zoning and land use patterns as well as past City and County planning, and are subject to change pending future detailed planning for these areas.*

Raleigh Jurisdictional Limit
Short-Range Urban Service Area
Long-Range Urban Service Area
Water Bodies

N

0 0.25 0.5 1 1.5 2 Miles

Map by Ray Hall

**Amendments**

| | |
|---|---|
| 11/01/2009 [Original] | 04/01/2014 [ CP-3-14 ] |
| 12/07/2010 [ CP-1(A)-10 ] | |
| 02/01/2011 [ CP-1(A)-11 ] | |
| 03/15/2011 [ CP-2(A)-11 ] | |
| 04/05/2011 [ CP-1(C)-11 ] | |
| 08/02/2011 [ CP-2(B)-11 ] | |
| 09/20/2011 [ CP-2(A)-11 ] | |
| 11/01/2011 [ CP-1(A)-10 ] | |
| 01/06/2012 [ CP-1(A)-12 ] | |
| 11/06/2012 [ CP-3-12 ] | |
| 05/19/2015 [ CP-1(A)-15 ] | |
| 04/02/2015 [ CP-1(C)-15 ] | |
| 06/06/2017 [ CP-2-17 ] | |
| 09/05/2017 [ CP-4-17 ] | |

## Guidelines For Using This Map

This Future Land Use Map provides the geographic framework to guide the City's land use policies and development decisions. The Future Land Use Map is part of the adopted Comprehensive Plan and carries the same legal weight as the Plan document itself.

Together with the Comprehensive Plan text, this map will be used to help determine whether proposed changes to zoning—both text and map amendments—are consistent with the Comprehensive Plan. It uses color-coded categories to show the general character, distribution, and intensity of recommended and planned land use for Raleigh in 2030, the horizon year of the Comprehensive Plan.

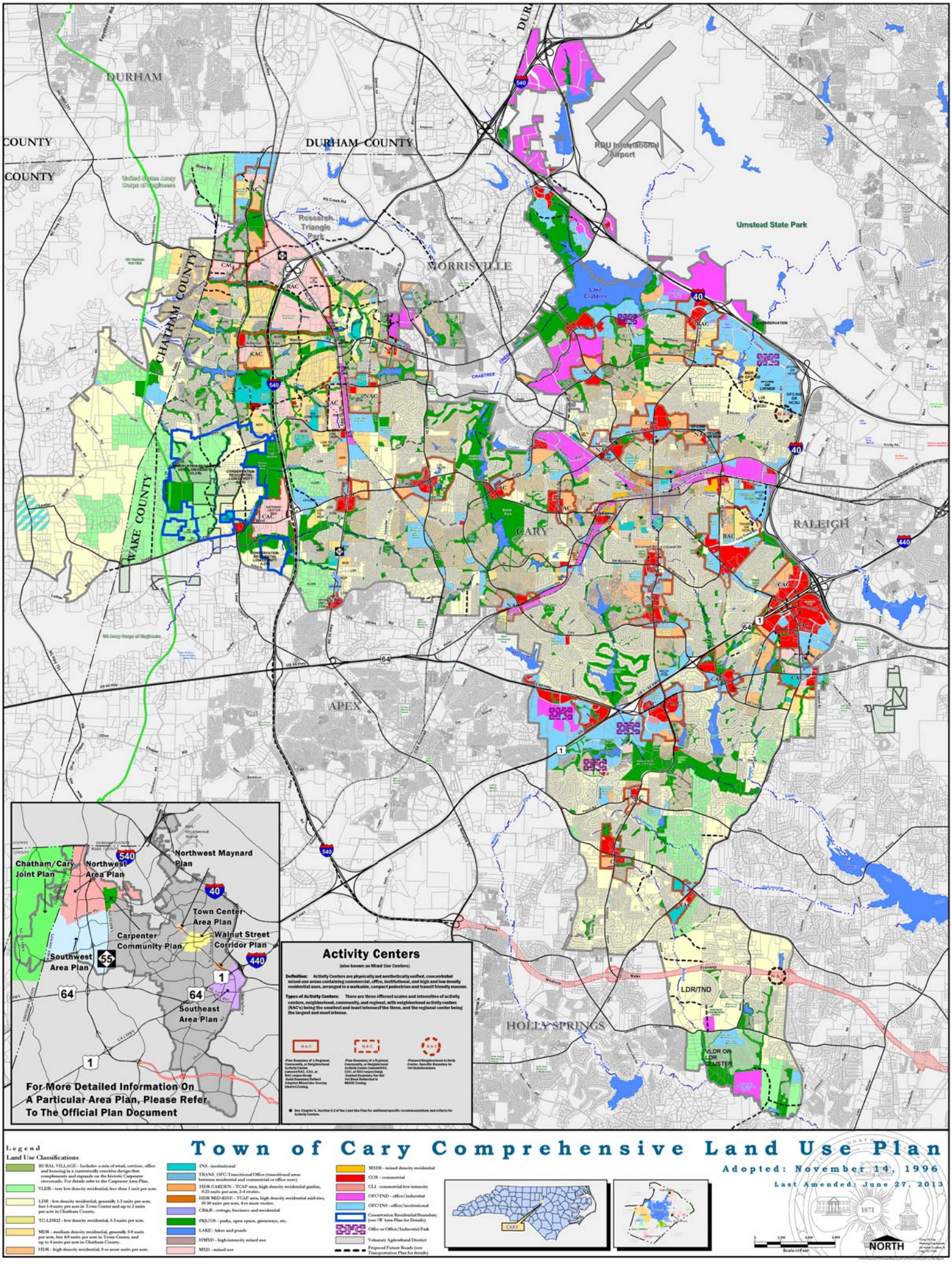
Consistency with the Future Land Use Map is not the only criterion that will be used to determine the reasonableness of a zoning map amendment. Other criterion include, but are not limited to, compatibility with the existing character of the surrounding area and impact on public services, infrastructure, traffic, transit, hydrology, fire, safety, parks and recreation, and historic resources.

This map seeks to achieve the following objectives:

- > Provide greater land use predictability and transparency;
- > Incorporate relevant aspects of the previous Urban Form Map that related to land use;
- > Use a nomenclature that is reasonably compatible with the Wake County Comprehensive Plan and the plans for adjacent jurisdictions;
- > Advance Raleigh's Vision and Themes, as described in the Comprehensive Plan's Framework Chapter; and
- > Create a logical framework for future zoning and development.

The following parameters apply to the use and interpretation of the Future Land Use Map:

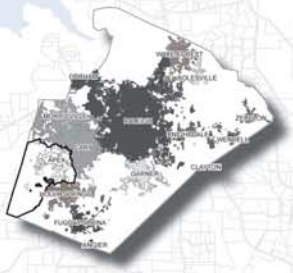
- > The Future Land Use Map is a generalized depiction of intended uses. It is not an "existing land use map," although in many cases future uses in an area may be the same as those that exist today.
- > The rezoning of any given area should be guided by the Future Land Use Map, interpreted in conjunction with the policies of the Comprehensive Plan. However, the Future Land Use Map is not a zoning map.
- > While the Future Land Use Map will influence future zoning, it does not alter current zoning or affect the right of property owners to use the land for its purpose as zoned at the time of this Plan's adoption. The Future Land Use Map will not be referenced as part of the site plan review.
- > Whereas zoning maps establish detailed requirements for setbacks, height, use, parking, and other attributes, the land use categories of the Future Land Use Map recommend a range of potentially appropriate land uses and intensities.


DURHAM
DURHAM COUNTY
CHATHAM COUNTY
WAKE COUNTY
RDU International Airport
Umstead State Park
Research Triangle Park
MORRISVILLE
CARY
RALEIGH
APEX
HOLLY SPRINGS
Lake Crabtree
CRABTREE
LDR/TND
VLDR OR LDR CLUSTER
Chatham/Cary Joint Plan
Northwest Area Plan
Northwest Maynard Plan
Town Center Area Plan
Carpenter Community Plan
Walnut Street Corridor Plan
Southwest Area Plan
Southeast Area Plan
For More Detailed Information On A Particular Area Plan, Please Refer To The Official Plan Document
Activity Centers
(also known as Mixed Use Centers)
Definition: Activity Centers are physically and aesthetically unified, concentrated mixed-use areas containing commercial, office, institutional, and high and low density residential uses, arranged in a walkable, compact pedestrian and transit friendly manner.
Types of Activity Centers: There are three different scales and intensities of activity centers, neighborhood, community, and regional, with neighborhood activity centers (NAC's) being the smallest and least intense of the three, and the regional center being the largest and most intense.
NAC
NAC
NAC
See Chapter 6, Section 6.3 of the Land Use Plan for additional specific recommendations and criteria for Activity Centers.
Legend
Land Use Classifications
RURAL VILLAGE - Includes a mix of retail, services, office and housing in a contextually sensitive design that complements and expands on the historic Carpenter crossroads. For details refer to the Carpenter Area Plan.
VLDR - very low density residential, less than 1 unit per acre.
LDR - low density residential, generally 1-3 units per acre, but 1-4 units per acre in Town Center and up to 2 units per acre in Chatham County.
TC-LDR12 - low density residential, 1-3 units per acre.
MDR - medium density residential, generally 3-8 units per acre, but 4-8 units per acre in Town Center, and up to 4 units per acre in Chatham County.
HDR - high density residential, 8 or more units per acre.
INS - institutional
TRANS_OFC-Transitional Office (transitional areas between residential and commercial or office uses)
HDR GARDEN - TCAP area, high density residential garden, 8-25 units per acre, 2-4 stories.
HDR MID-RISE - TCAP area, high density residential mid-rise, 10-50 units per acre, 4 or more stories.
CH&R - cottage, business and residential
PKS/OS - parks, open space, greenways, etc.
LAKE - lakes and ponds
HMXD - high intensity mixed use
MXD - mixed use
MXDR - mixed density residential
CON - commercial
CLI - commercial low intensity
OFC/IND - office/industrial
OFC/INS - office/institutional
Conservation Residential Boundary, (see CW Area Plan for Details)
Office or Office/Industrial Park
Voluntary Agricultural District
Proposed Future Roads (see Transportation Plan for details)
Town of Cary Comprehensive Land Use Plan
Adopted: November 14, 1996
Last Amended: June 27, 2013
CARY
Scale in Feet
NORTH

# 2030 Land Use Map

## Town of Apex, North Carolina

Printed August 7, 2013



0 0.5 1 2 3 4 Miles

0 2,500 5,000 10,000 15,000 20,000 Feet

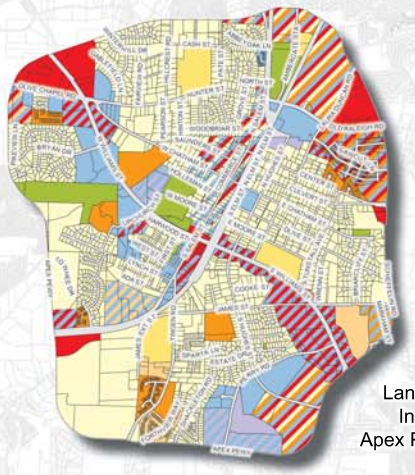
N

CARY

HOLLY SPRINGS

CHATHAM COUNTY

CHATHAM COUNTY



Land Use Inside Apex Peakway

### Future Land Classifications

- Protected Open Space
- Rural Density Residential
- Low Density Residential (Single-family homes)
- Medium Density Residential (Single-family homes and townhomes)
- Medium/High Density Residential (Single-family homes and townhomes)
- High Density Residential (Townhomes and apartments)
- Office Employment
- Commercial Services
- Industrial Employment
- Park
- Golf Course
- School
- Landfill
- Right-of-Way
- Property Lines
- Duke Energy Land
- Proposed Major Collectors/Thoroughfares

### Potential Activity Centers

- Neighborhood Mixed Use (NMU)
  - Up to 100,000 ft² of retail
  - 1 to 2-mile trade area
- Employment Mixed Use (EMU)
  - Office, warehousing, tech/flex
  - Some retail
- Community Mixed Use (CMU)
  - Up to 350,000 ft² of retail
  - 4 to 6-mile trade area
- Regional Mixed Use (RMU)
  - Over 500,000 ft² of retail
  - 10-mile trade area

| 2030 Land Use Map Classification | Allowable Zoning Districts |
|---|---|
| Protected Open Space | CB |
| Rural Residential | RA, RR, PUD |
| Low Density Residential | RA, RR, LD, PUD |
| Medium Density Residential | MD, PUD |
| Medium/High Density Residential | MH, MHP, HDSF, HDMF, PUD, TND |
| High Density Residential | HDMF, PUD, TND |
| Office Employment | B1, B2, O&I, TF, PUD, MEC |
| Commercial Services | B1, B2, PC, PUD |
| Industrial Employment | LI, TF, PUD, MEC |
| Mixed Use | MORR, PUD, TND, MEC, SD |

The 2030 Land Use Map is based on the recommendations of *Peak Plan 2030: The Apex Comprehensive Plan*. *Peak Plan 2030* was adopted by the Town of Apex Town Council on August 6, 2013 and provides a snapshot of the Town's vision for future land use on that date. All land use classification amendments approved by the Town Council following the original Map adoption are reflected on this map and, therefore, make the 2030 Land Use Map a dynamic document. Amendment dates are listed below.

No amendments to the adopted map have been approved as of the print date.

Created and published by the Town of Apex Planning Department

# Town of Fuquay-Varina
# Comprehensive Land Use Plan

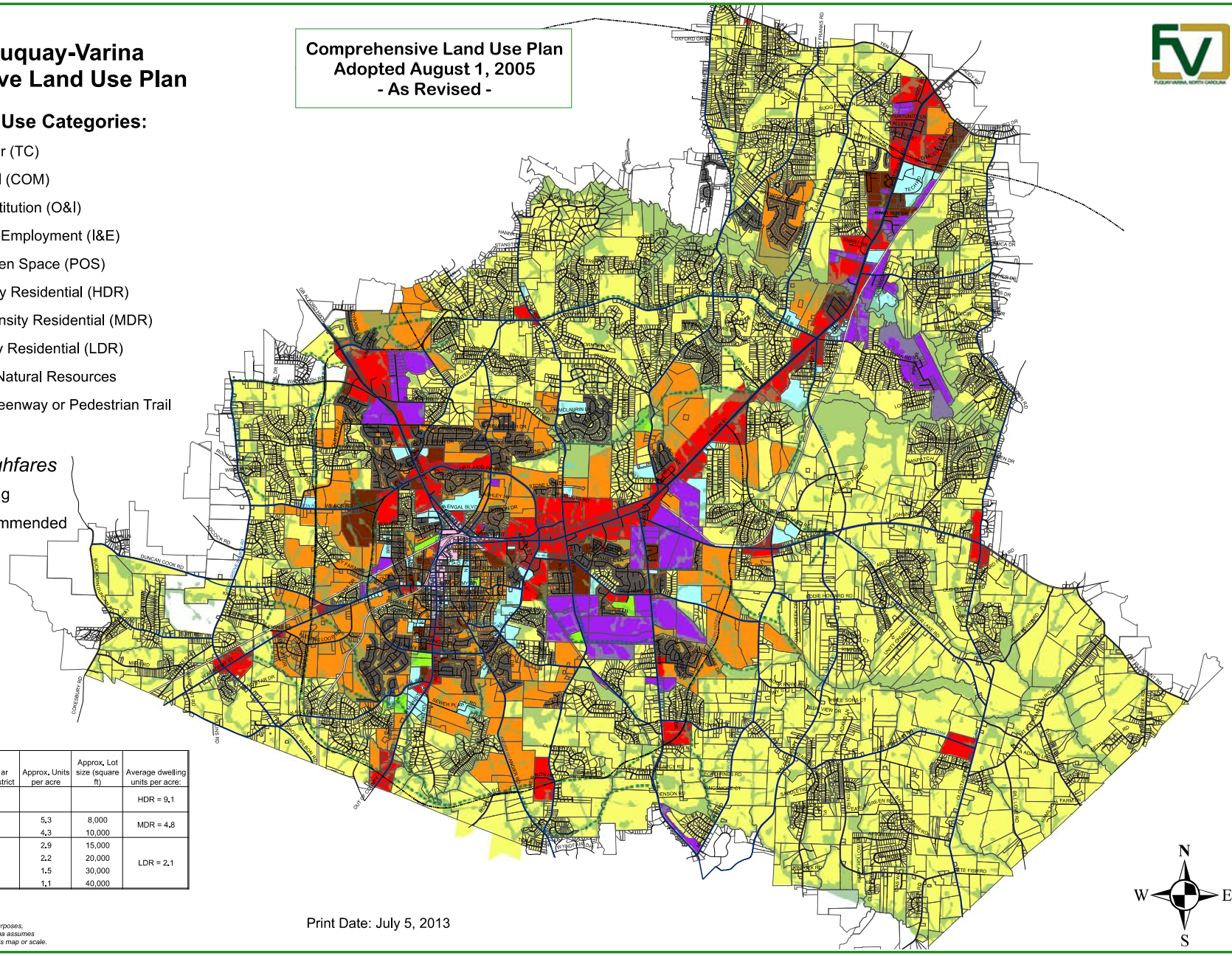
**Comprehensive Land Use Plan**
**Adopted August 1, 2005**
**- As Revised -**

## Future Land Use Categories:

- Town Center (TC)
- Commercial (COM)
- Office & Institution (O&I)
- Industrial & Employment (I&E)
- Parks & Open Space (POS)
- High Density Residential (HDR)
- Medium Density Residential (MDR)
- Low Density Residential (LDR)
- Significant Natural Resources
- Planned Greenway or Pedestrian Trail

*Major Thoroughfares*

- Existing
- Recommended



| FV Future Residential land use classifications and densities | | FV Similar Zoning district | Approx. Units per acre | Approx. Lot size (square ft) | Average dwelling units per acre: |
|---|---|---|---|---|---|
| | | | | | HDR = 9.1 |
| Medium | 4 to 6.9 dwelling units per acre | R-8 | 5.3 | 8,000 | MDR = 4.8 |
| | | R-10 | 4.3 | 10,000 | |
| Low | 1 to 3.9 dwelling units per acre | R-15 | 2.9 | 15,000 | LDR = 2.1 |
| | | R-20 | 2.2 | 20,000 | |
| | | R-30 | 1.5 | 30,000 | |
| | | R-40 | 1.1 | 40,000 | |

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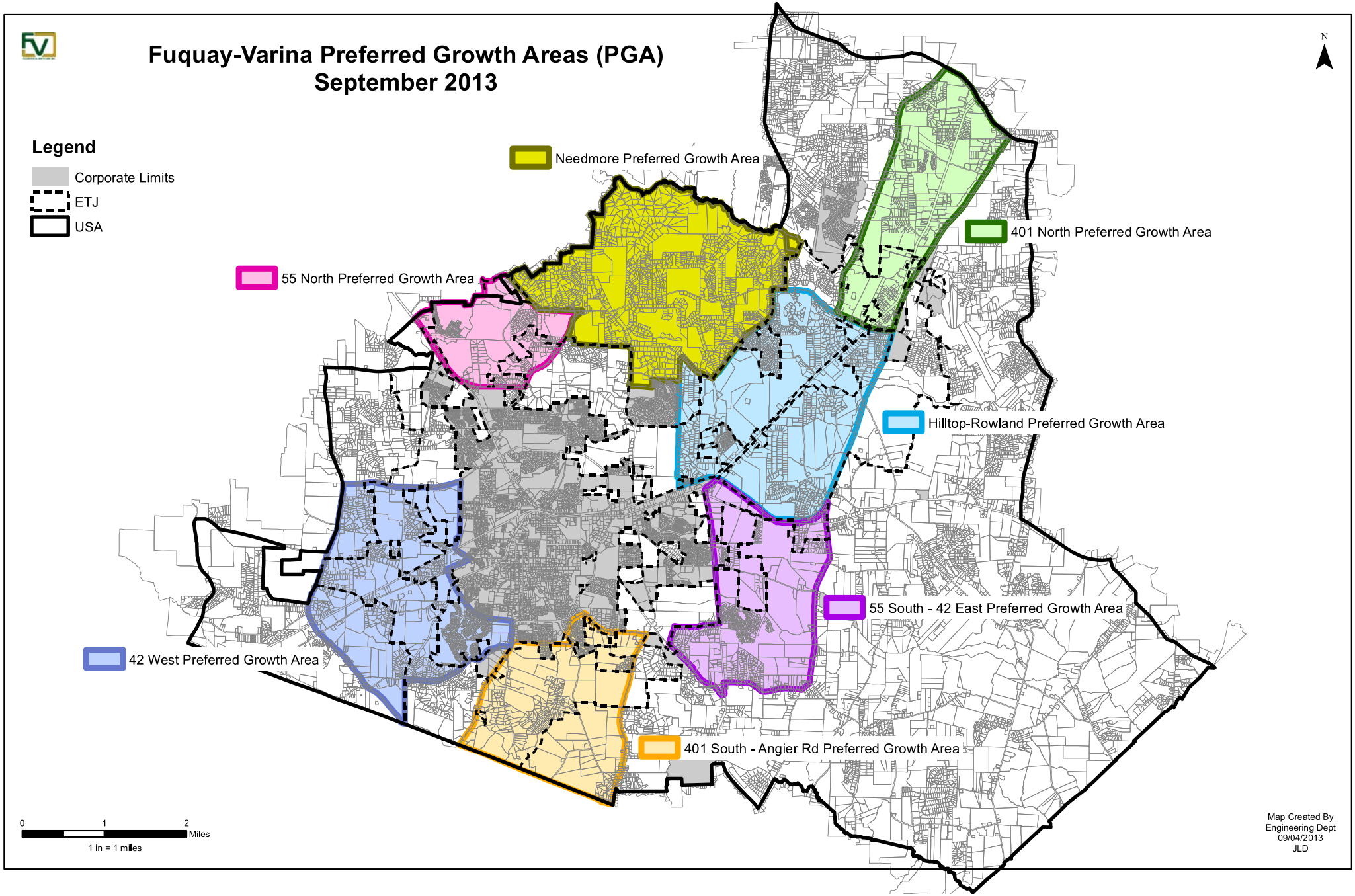
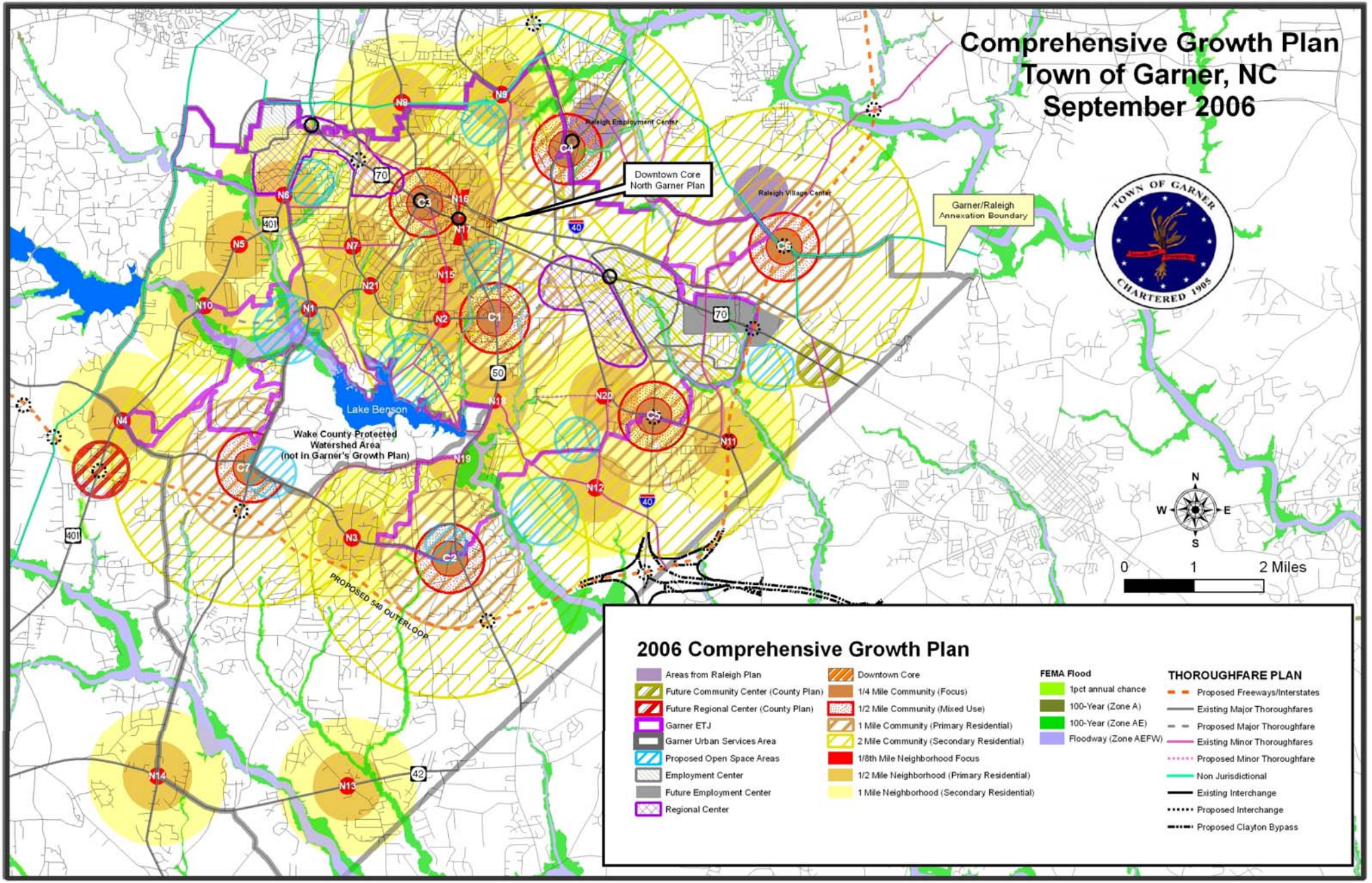
Print Date: July 5, 2013

# Fuquay-Varina Preferred Growth Areas (PGA)
## September 2013




Comprehensive Growth Plan
Town of Garner, NC
September 2006
Downtown Core
North Garner Plan
Raleigh Employment Center
Raleigh Village Center
Garner/Raleigh
Annexation Boundary
TOWN OF GARNER
CHARTERED 1905
Lake Benson
Wake County Protected
Watershed Area
(not in Garner's Growth Plan)
PROPOSED 540 OUTER LOOP
N
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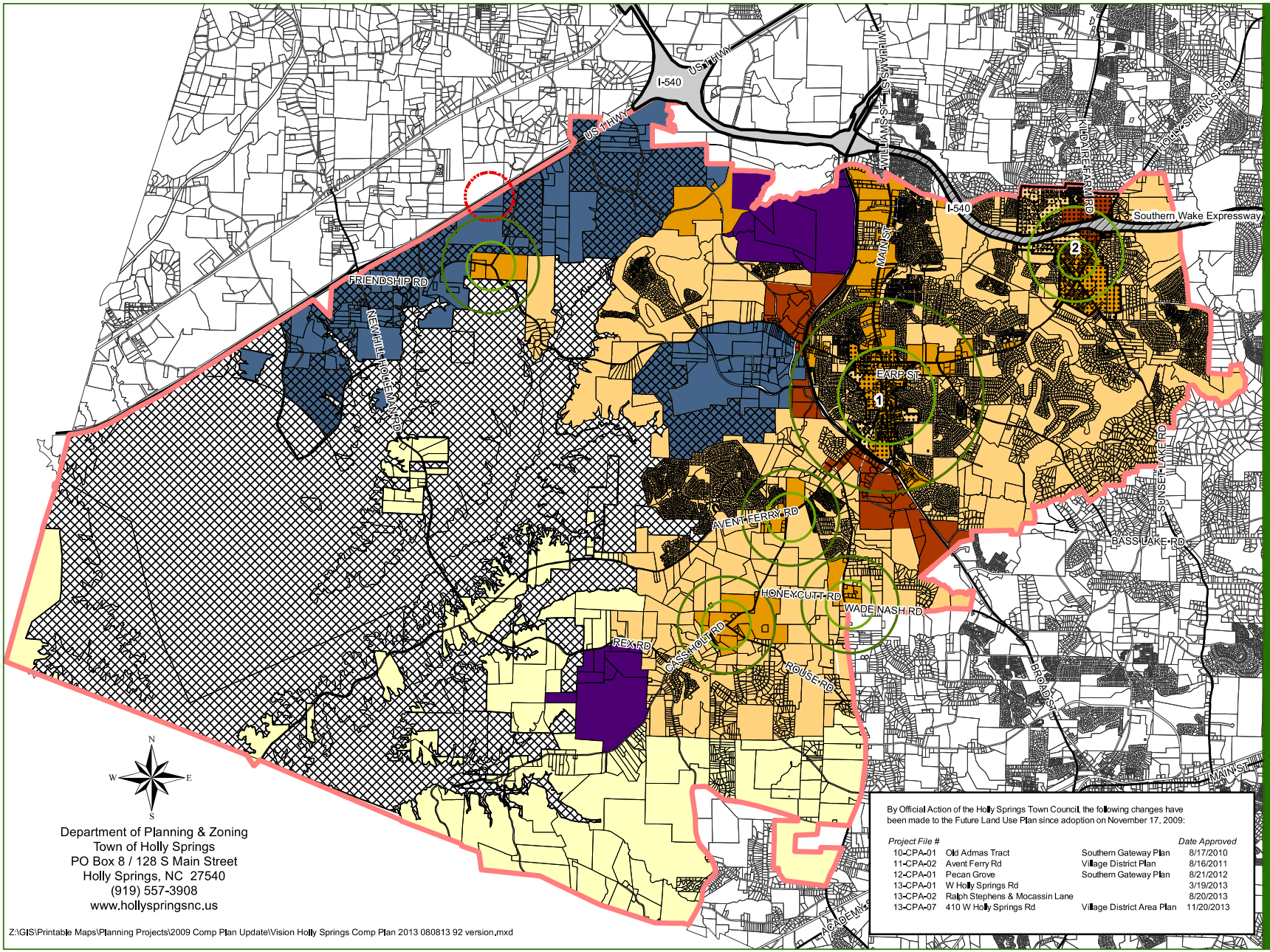
0
1
2 Miles
2006 Comprehensive Growth Plan
Areas from Raleigh Plan
Future Community Center (County Plan)
Future Regional Center (County Plan)
Garner ETJ
Garner Urban Services Area
Proposed Open Space Areas
Employment Center
Future Employment Center
Regional Center
Downtown Core
1/4 Mile Community (Focus)
1/2 Mile Community (Mixed Use)
1 Mile Community (Primary Residential)
2 Mile Community (Secondary Residential)
1/8th Mile Neighborhood Focus
1/2 Mile Neighborhood (Primary Residential)
1 Mile Neighborhood (Secondary Residential)
FEMA Flood
1pct annual chance
100-Year (Zone A)
100-Year (Zone AE)
Floodway (Zone AEFW)
THOROUGHFARE PLAN
Proposed Freeways/Interstates
Existing Major Thoroughfares
Proposed Major Thoroughfare
Existing Minor Thoroughfares
Proposed Minor Thoroughfare
Non Jurisdictional
Existing Interchange
Proposed Interchange
Proposed Clayton Bypass

# Future Land Use Plan




Updated Supplement #2

*Vision* Holly Springs
Town *of* Holly Springs
***Comprehensive Plan***

**Legend**

- Low Density Residential
- Residential
- Mixed Use
- Regional Center
- Heavy Industrial
- Business Park
- Business Park/Progress Energy Land
- Progress Energy Land
- Community Growth Area
- Central Core
- Regional Center
- Comprehensive Plan Study Area
- Village District Area Plan (see back)
- Northeast Gateway Plan (see back)
- Southern Gateway Plan (see back)

By Official Action of the Holly Springs Town Council, the following changes have been made to the Future Land Use Plan since adoption on November 17, 2009:

| *Project File #* | | | *Date Approved* |
|---|---|---|---|
| 10-CPA-01 | Old Admas Tract | Southern Gateway Plan | 8/17/2010 |
| 11-CPA-02 | Avent Ferry Rd | Village District Plan | 8/16/2011 |
| 12-CPA-01 | Pecan Grove | Southern Gateway Plan | 8/21/2012 |
| 13-CPA-01 | W Holly Springs Rd | | 3/19/2013 |
| 13-CPA-02 | Ralph Stephens & Mocassin Lane | | 8/20/2013 |
| 13-CPA-07 | 410 W Holly Springs Rd | Village District Area Plan | 11/20/2013 |


Department of Planning & Zoning
Town of Holly Springs
PO Box 8 / 128 S Main Street
Holly Springs, NC 27540
(919) 557-3908
www.hollyspringsnc.us


Z:\GIS\Printable Maps\Planning Projects\2009 Comp Plan Update\Vision Holly Springs Comp Plan 2013 080813 92 version.mxd

# DESIGN DISTRICT PLAN

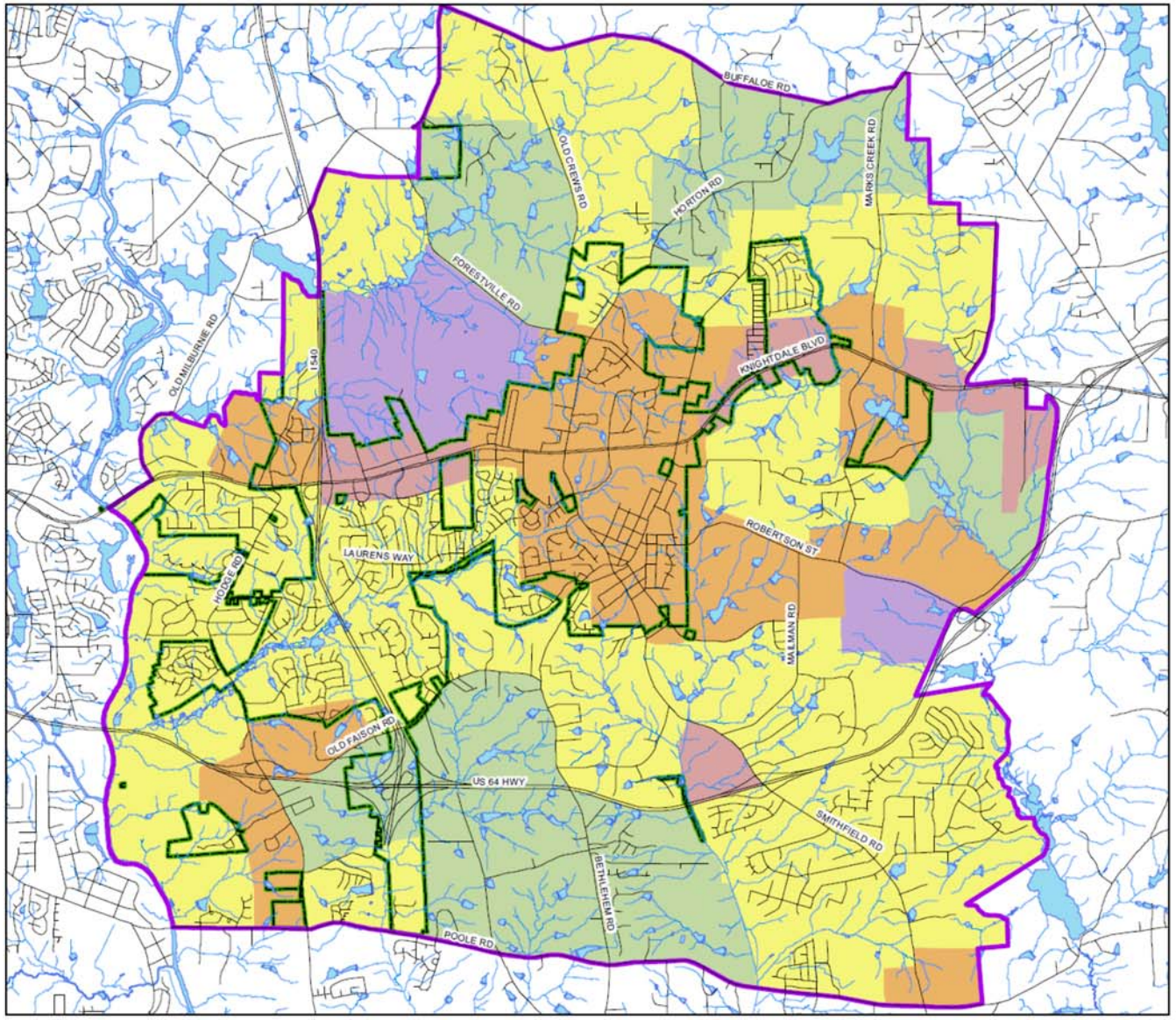
Town of Knightdale
Planning Department
2010

**Legend**

- Streets
- Urban Service Area Boundary
- Surface Waters
- Surface Streams
- Knightdale Corporate Limits (2009)

**Design Districts**

- Countryside Design
- Neighborhood Design
- Urban Village Design
- Highway Design
- Special Use Design

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1 inch = 3,400 feet

0 1,700 3,400 6,800 10,200 Feet

**FIGURE 5.2**

# DESIGN DISTRICT PLAN

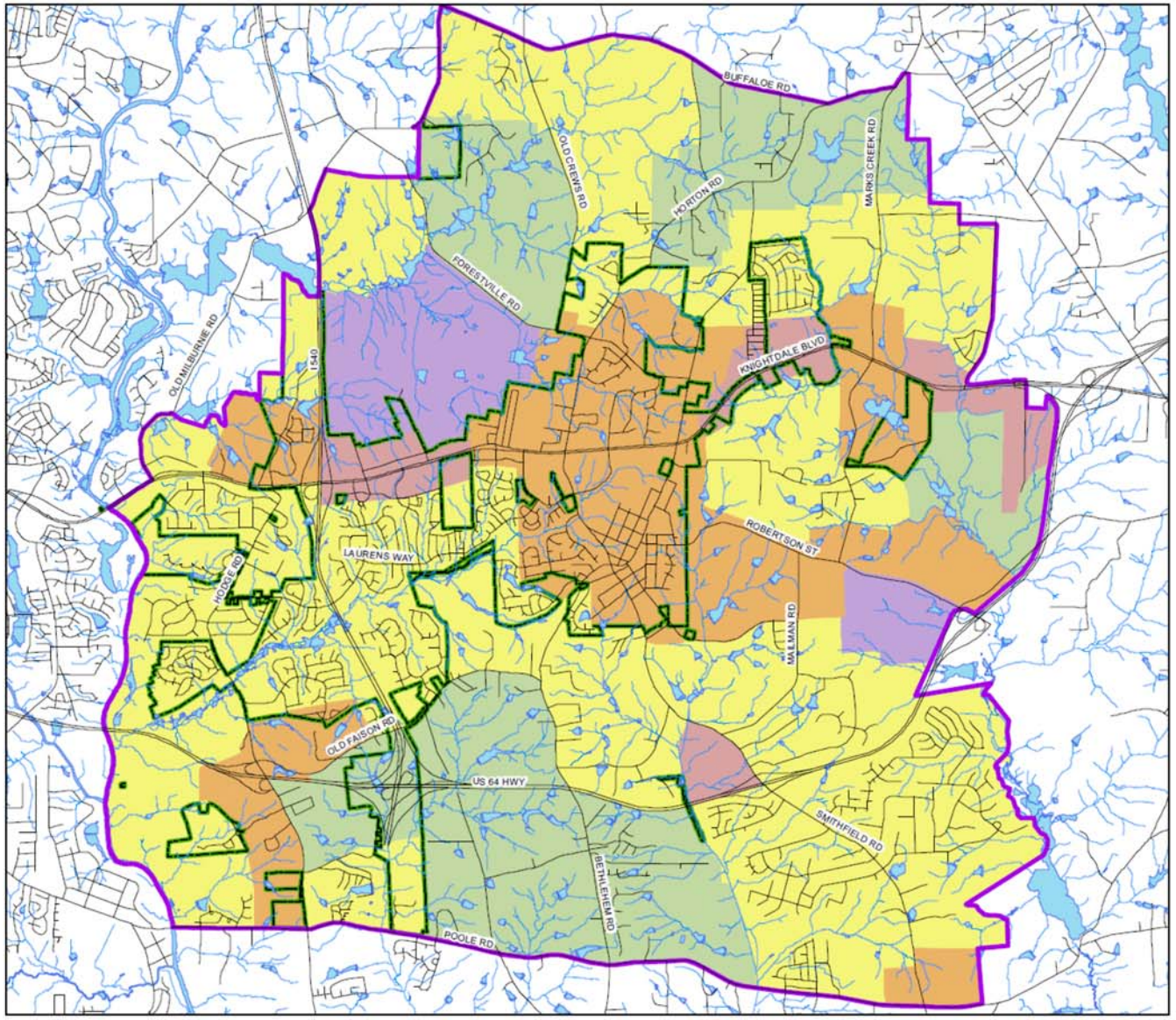
Town of Knightdale
Planning Department
2010

**Legend**

- Streets
- Urban Service Area Boundary
- Surface Waters
- Surface Streams
- Knightdale Corporate Limits (2009)

**Design Districts**

- Countryside Design
- Neighborhood Design
- Urban Village Design
- Highway Design
- Special Use Design




N
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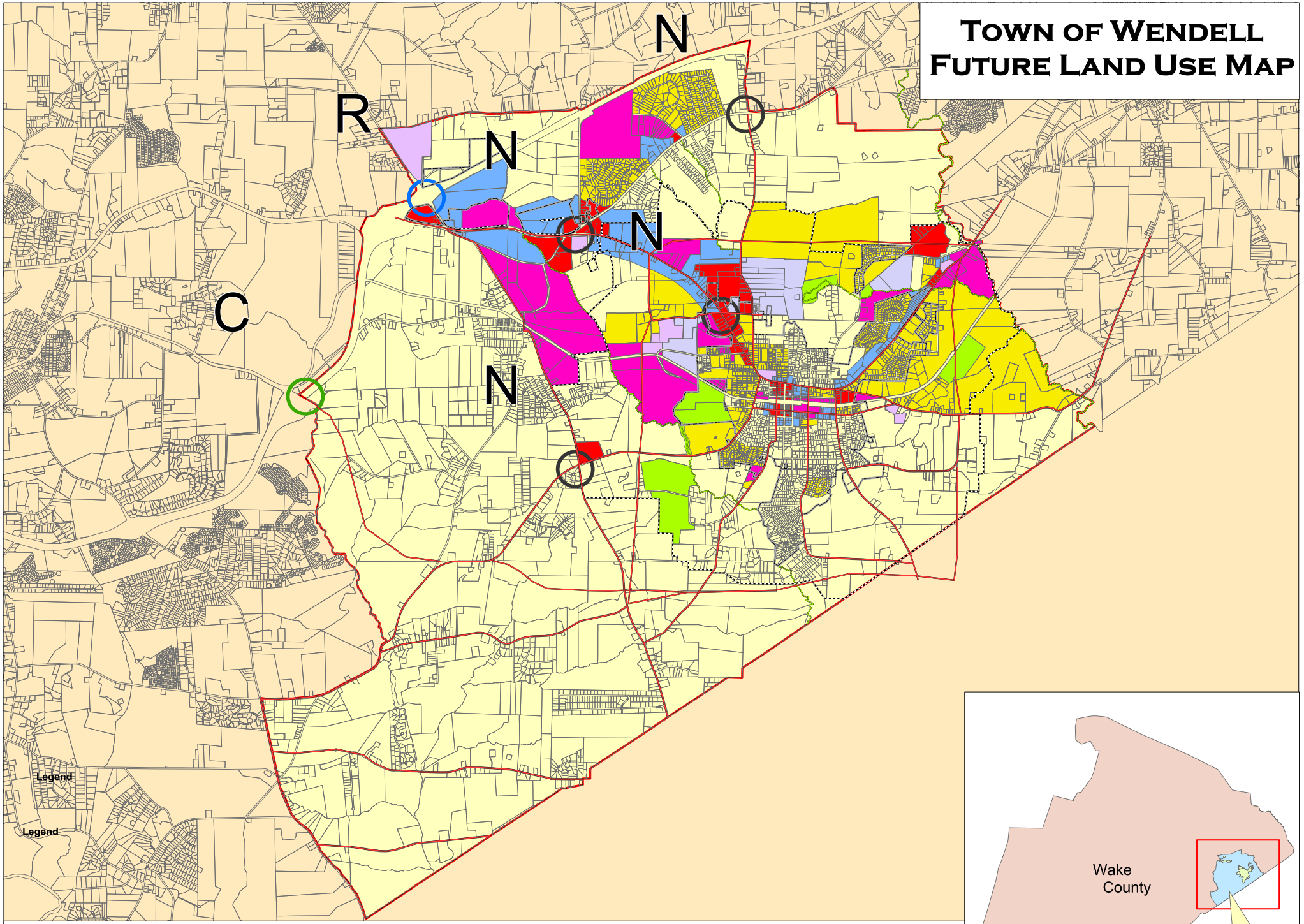
1 inch = 3,400 feet

0 1,700 3,400 6,800 10,200 Feet

**FIGURE 5.2**

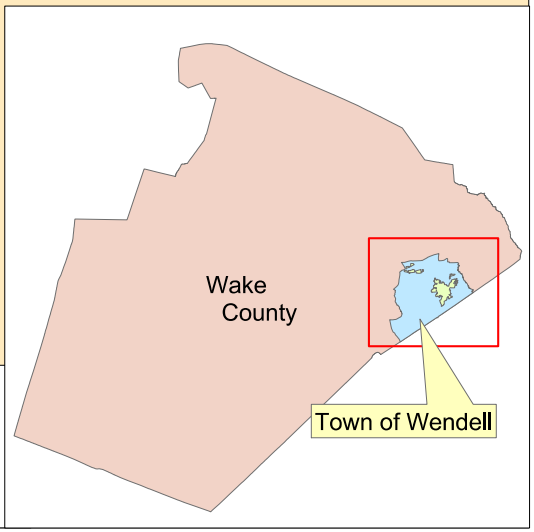
# Town of Wendell
# Future Land Use Map




- Low Density Residential (1-4 DU/Acre)
- Medium Density Residential (4-8 DU/Acre)
- High Density Residential (8-12 DU/Acre)
- Mixed Use
- Open Space
- Commercial
- Institutional
- Industrial
- Corporate Limits
- ETJ Boundary
- Short Range Urban Service Area
- Thoroughfare
- Greenway

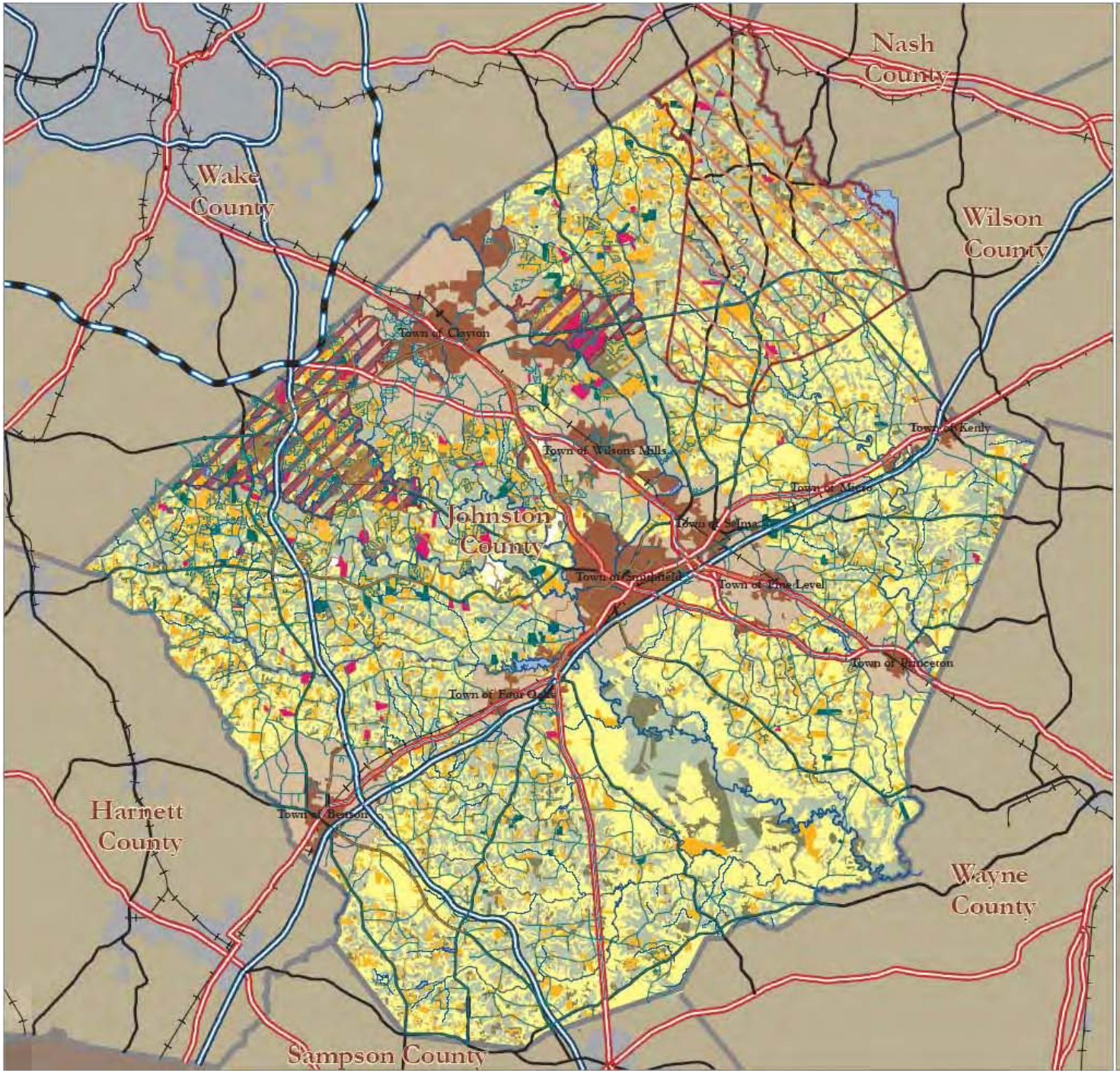
0 2,050 4,100 8,200 12,300 16,400 Feet

N W E S




This map was created by the Wendell Planning Department and is for reference only. The Town of Wendell assumes no responsibility for errors or misuse of this map.

July 1, 2005




JOHNSTON COUNTY NORTH • CAROLINA

COMPREHENSIVE PLAN UPDATE

## Development Capacity

### Legend

- Town Limits
- Town Planning Jurisdiction
- Sewer Lines
- Water Lines
- Future Water Service Area
- Residential Sewer Service Area
- Approved Residential Development
- Voluntary Agricultural District
- Residential Land Use
- Unsuitable Soil Types
- Agriculturial Land Use
- Undeveloped Land Use

Date Prepared:
August 14, 2008

Map Prepared By:
Johnston County Planning and Zoning Department

Map Prepared In Association With:
CLARION

Declaration of Map Intent:
Johnston County and its planning consultant do not warrant the accuracy of this displayed information and specifically disclaim any warranty for merchantibility or fitness for a particular purpose.

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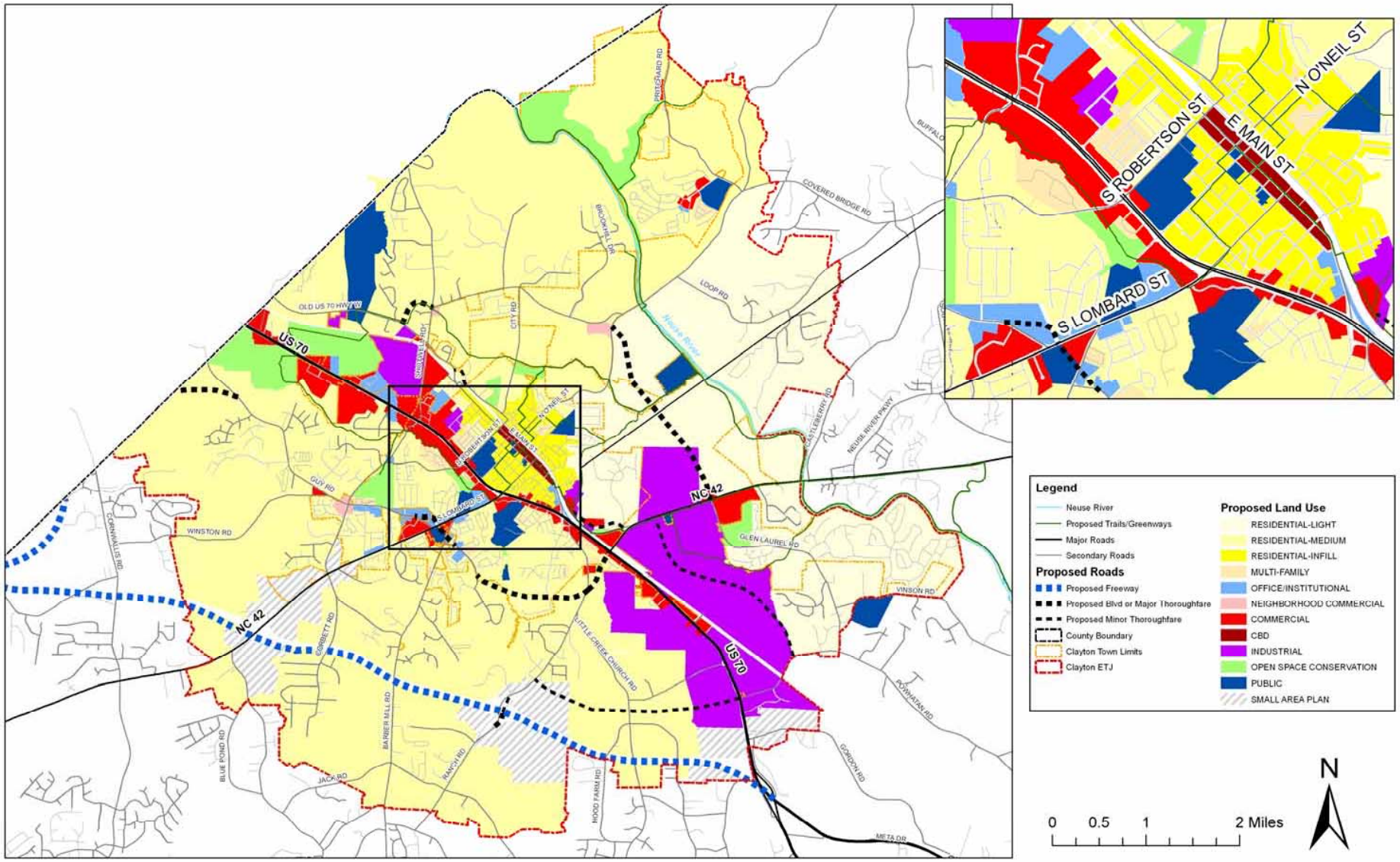


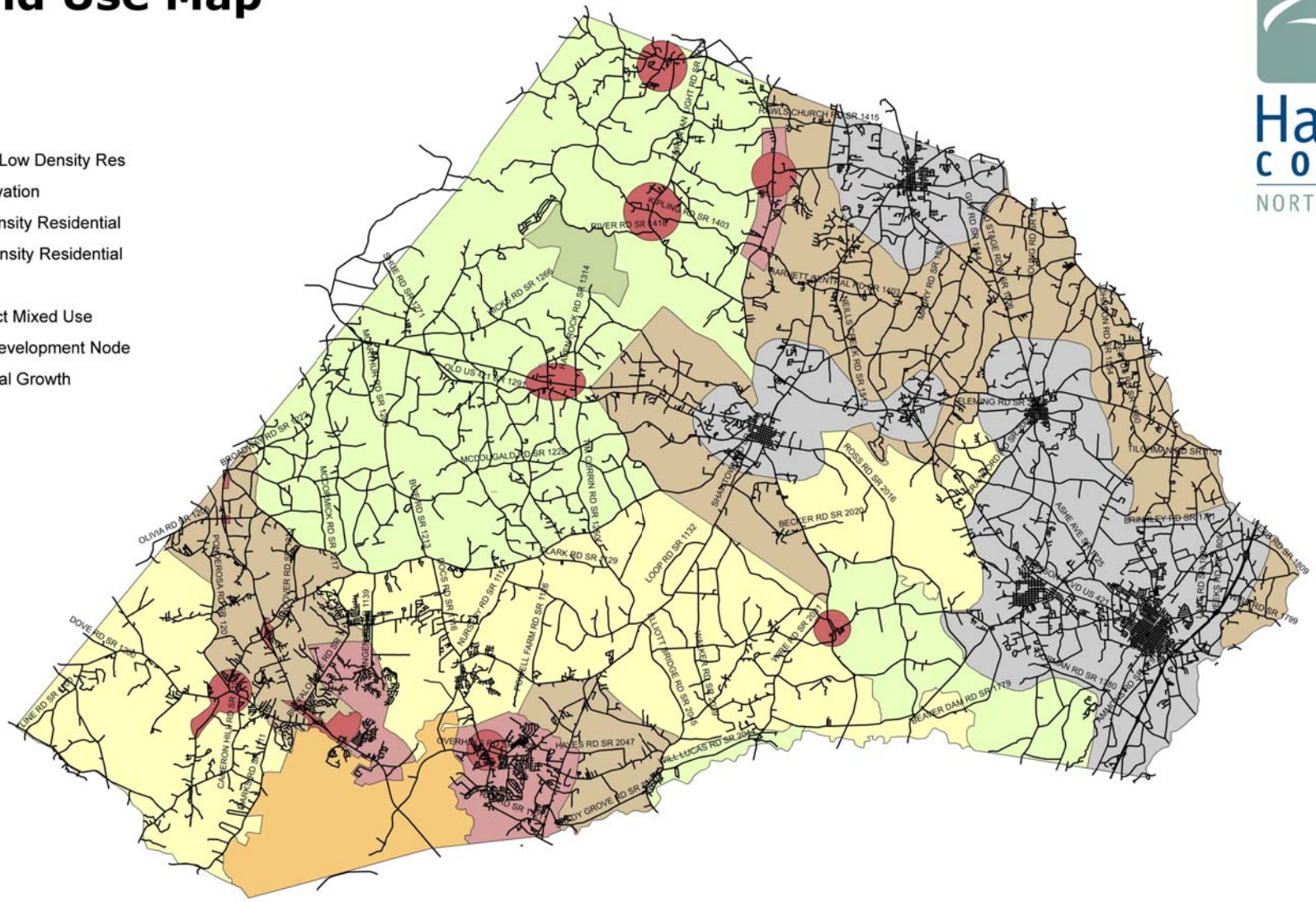



**Figure 6.4 Proposed Land Use**

# Land Use Map

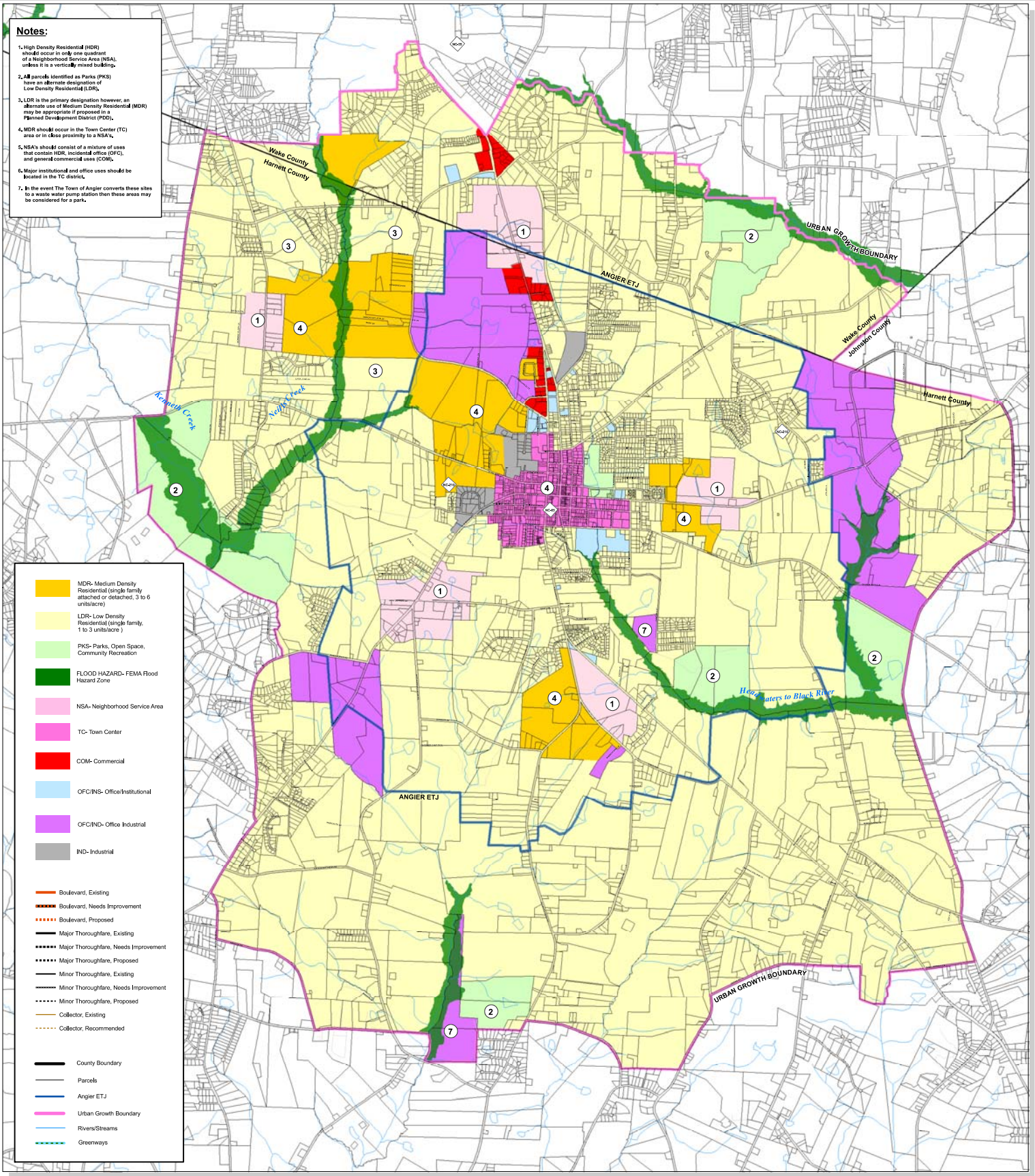
## Legend

- Ag and Low Density Res
- Conservation
- Low Density Residential
- Med Density Residential
- Military
- Compact Mixed Use
- Rural Development Node
- Municipal Growth




Harnett COUNTY NORTH CAROLINA

Prepared by Harnett County Planning Department
July 2008




# Draft Land Use Plan Map
# Angier, North Carolina

0 1,000 2,000 4,000 Feet

1 inch equals 1,000 feet

ETd
ELAM, TODD, d'AMBROSI
URBAN PLANNING • LANDSCAPE ARCHITECTURE
CIVIL ENGINEERING • GIS

As of July 16th, 2007

Map Information:

Map Created By: ETd PA Inc April 2007
Map Area: Harnett County North Carolina
Map Datum: NAD 1983 State Plane US Feet
Coordinate System: North Carolina 3200

Data:
Parcels and Street Centerlines provided by Harnett County GIS services, Data last updated 04/09/2007.
Wake County parcels provided by Wake County GIS services, Data last updated 04/09/2007.
Corporate Limits and UGB data provided by Harnett County GIS services, Data updated 10/06/2005.
Corporate Limits provided by CAMPO, Data last updated 03/2007.
Land Use Classification files provided by ETd.

This map is intended for planning purposes only. The accuracy and reliability of this map is dependent on the underlying data. The Town and its representatives shall not be responsible for the information displayed on this map.