Clayton Bypass
US 70 from I-40 in Wake County to US 70 Business in Johnston County
Federal Aid Project No. F-60-1(8)
State Project No. 8.T311001
TIP No. R-2552

INDIRECT AND CUMULATIVE EFFECTS ASSESSMENT

Prepared for:

North Carolina Department of Transportation

Prepared By:

URS Corporation - North Carolina
1600 Perimeter Park Drive
Morrisville, North Carolina 27613

September 2004

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Executive Summary

The North Carolina Department of Transportation (NCDOT) proposes to provide a bypass of existing US 70 from I-40 in Wake County to US 70 Business in Johnston County (project), a distance of approximately 10 miles. The proposed improvements would provide a minimum four-lane divided facility with full control access on new location bypassing the Town of Clayton. Interchanges are proposed with I-40, NC 42, SR 1560, and US 70 Business. The project's western terminus ties into an interchange with I-40 that may possibly be shared with the tie-in to the future Raleigh Outer Loop.

The purpose of this document is to provide an assessment of the indirect effects of the project and the combined or cumulative effects of the project and other past, present, or reasonably foreseeable future development activities. The focus of the assessment is on the project's potential to induce growth and change land use, which could in turn affect natural resources of the study area. Specifically, the project alignment crosses 21 streams and impacts 21.1 acres of wetlands in the Swift Creek Sub-Watershed, which lies within the Neuse River Watershed. The presence of Threatened and Endangered (T&E) mussel species has been identified within the Swift Creek Sub-Watershed. Information provided in this report will be used by NCDOT to conduct a quantitative assessment of indirect and cumulative impacts on water quality and to prepare a Biological Assessment of the project that will provide a detailed assessment of indirect and cumulative impacts to threatened and endangered species.

The project area is located in a bedroom community that supports regional employment centers of Raleigh, Durham and RTP (Research Triangle Park). Identifying regional commuting patterns helps to establish where future development is likely to occur. Overall county-to-county Triangle Region commuter flow shows that counties with a large employment base such as Durham and Wake attract workers from the adjacent counties of Chatham, Harnett, Johnston and Orange. Specific to this study, recent history has shown that increased highway access between Johnston County and the regional employment centers has stimulated growth in Johnston County. The 1989 opening of I-40 between US 70 near Garner and I-95 near Benson supports this occurrence as northwest Johnston County experienced rapid growth throughout the 1990s and continues to this day.

To better understand the likely magnitude and probability of project-induced development, a commute study was conducted between the study area and the regional employment center of RTP. Results of the commute study demonstrate the increased access and substantial timesavings the project will provide study area commuters. The project will also initially reduce congestion on the existing study area roadway network, thus improving traffic flow on currently congested roads and decreasing travel times for commuters. This improvement to the existing roadway network will also induce development beyond the current commuteshed.

Conditions within the study area were found to be conducive to growth and land use change, as the area has experienced rapid population increase throughout the last two decades; this growth is projected to continue through 2020. It was determined that the project will contribute to this future growth by moderately inducing development in the study area. By reducing highway travel time the study area becomes more accessible to employment and services, thereby increasing its attractiveness for development. The main indirect and cumulative effects the project will have on land use will be in

interchange catchment areas. Commercial development in these interchange areas will likely be in the form of highway related retail such as gas stations, hotels, fast-food restaurants and other convenience related services. Residential development pressure will increase within areas that, prior to the project did not have expedient access to the highway system. Interchange impacts are described as follows:

- *US 70 Business/US 70/Clayton Bypass* – Current land use in this proposed interchange area is a mix of commercial, forested/wetlands, residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels. Due to improved access to the highway system, increased commercial development is also likely in the corridors between this interchange and the Town of Clayton and between this interchange and the Town of Smithfield.

- *SR 1560/Clayton Bypass* – Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels as well as an increase in residential development intensity and density.

- *NC 42/Clayton Bypass* - Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels as well as an increase in residential development intensity and density.

- *I-40/I-540/Clayton Bypass* - Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. This proposed interchange is a fully directional system interchange; therefore, adjacent land use will not be affected to the same extent as the aforementioned interchanges. Although, some adjacent land uses will likely experience commercial development pressure due to the increased visibility of the land.

- *NC 42/I-40* - Current land use in this existing interchange area is primarily commercial uses with a mix of forested/wetlands, low density residential and agricultural uses surrounding the commercial area. Future land use with the project is likely to include an expanded commercial area to serve the proposed I-40/I-540/Clayton Bypass interchange approximately 2 miles to the north.

The effects of this development on ground water and surface water resources are complex. The increased proportion of the study area devoted to urban land uses will be accompanied by more wells that extract water, more impervious surfaces that block or redirect recharge, and more storm drains that divert precipitation into streams instead of aquifers. Over time, this can alter the availability and quality of hydrologic resources, both groundwater and surface water. Modifications in land use may also affect the proportions of ground water and surface runoff in rivers and streams, which can affect the chemistry, temperature, and general quality of the water for wildlife and for recreation.

Conclusions

- Due to past development trends and favorable growth potential for the region, the study area would likely experience considerable development regardless of whether or not the project is built.
- The potential for substantial growth generated by the project would mainly be limited to new interchange catchment areas within the study area. Although, locations to the south and east of the study area may also experience development pressure due to increased accessibility to regional employment centers.
- Project-induced growth is likely to occur in the form of highway-oriented retail and residential development, replacing agricultural and forested/green space areas.
- Potential cumulative impacts to the nutrient sensitive waters of the Neuse River Watershed from projected development activity will be limited through application of the North Carolina Division of Water Quality Neuse Rules, National Pollutant Discharge Elimination System permitting requirements, zoning ordinances implemented by the Town of Clayton, Town of Smithfield and Johnston County, and best management practices. These will benefit the project by being real-life solutions currently implemented throughout the area to protect water resources i.e. there are many cost-effective solutions to choose from that do not sacrifice other land uses - thus property owners, farmers and/or developers are more inclined to commit to using BMPs and improve local water quality.
- Watershed rules as they maintain and enhance the quality of water resources, allow no further degradation of water quality, while allowing limited watershed development in water supply watersheds. Thus having these measures in place will limit long-term cumulative impacts as growth is already regulated by the watershed rules.
- The magnitude of adverse cumulative impacts to natural resources as a result of the incremental effects of the project combined with those of other past, present, and future development activities, is to be determined upon completion of the Biological Assessment and Water Quality Modeling tasks.
- Should impacts to study area natural resources be identified as substantially adverse by the Biological Assessment and Water Quality Modeling, stricter regulatory controls and avoidance and mitigation strategies should be developed.

1. Introduction

The purpose of this document to the extent reasonable and practical is to assess the potential indirect and cumulative effects (ICE) that may result from the incremental effects of the Transportation Improvement Project (TIP) No. R-2552, proposed bypass of existing US 70 from I-40 in Wake County to US 70 Business in Johnston County (project), and other past, present, and future development activities in the same geographic region. Indirect effects are those effects that may result from activities induced by the proposed action. For example, providing improved access to rural areas could induce residential and commercial development. This in turn could induce changes in population, travel patterns, and economic conditions, which could consequently have indirect and cumulative impacts on air quality, ecosystems, protected species, water quality, quality of life, etc.

The Council on Environmental Quality (CEQ) for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) defines "indirect effects" (also referred to as "secondary effects") as "impacts on the environment, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 3 1508.8). The CEQ regulations further state that indirect effects "...may include growth-inducing effects and other effects related to induced changes in the patterns of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." The CEQ defines "cumulative impacts" as those "...which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 3 1508.7).

Much of the general background information for this document was obtained from the *US 70 Improvements from I-40 to Intersection of US 70 and US 70 Business in Wake and Johnston counties Final Environmental impact Statement*, 1998. The analysis of the indirect and cumulative effects associated with this project was conducted using the latest guidance available from federal and state regulatory agencies. These include:

NCDOT/NCDENR's Revised Draft "Indirect and Cumulative Impact Assessment Guidance: Integrated NEPA/SEPA/401 Eight-Step ICE Assessment Process" (May 2003).

CEQ Guidance "Considering Cumulative Effects Under the National Environmental Policy Act" (1997).

NCDOT's "Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina" (November 2001).

North Carolina Wildlife Resource Commission's "Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality" (August 2002).

NCDENR's Neuse River Basinwide Water Quality Plan, (July 2002).

The following sections of this document include a description of the project and its background, and the ICE assessment process. The NCDOT/NCDENR Guidance for

Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina entails a systematic approach to indirect and cumulative impacts that includes an eight-step assessment process. This ICE assessment and associated Biological Assessment and Water Quality Modeling (provided under separate cover) specifically incorporate procedures to address impacts from a water quality perspective by evaluating the relationship between the percentage of a watershed's area covered by impervious surfaces and the hydrology, channel stability, water quality, and biodiversity of affected streams.

2. Project Description and Background

The information presented in this section is summarized from the *US 70 Improvements from I-40 to Intersection of US 70 and US 70 Business in Wake and Johnston counties Final Environmental impact Statement (FEIS)*. The Planning and Environmental Branch of the NCDOT completed this FEIS in 1998.

2.1. Description

The proposed project will provide a bypass of existing US 70 from I-40 in Wake County to US 70 Business in Johnston County, a distance of approximately ten miles. The proposed improvements would provide a minimum four-lane divided facility with full control of access on new location bypassing the Town of Clayton.

2.2. Purpose and Need

The purpose of the proposed project is to construct a highway that will serve the growing transportation needs of Wake and Johnston counties and also provide an important connection in the North Carolina Intrastate System. The North Carolina Intrastate System of Highways was established in 1989 to provide high-speed, safe travel service, connecting major population centers both inside and outside of the state. The system is designed to support statewide growth and to connect major highways of adjoining states.

Traffic levels are projected to exceed capacity of existing US 70 and will result in long traffic delays along the project area corridor. In addition, the opening of I-40 from US 70 to the east has stimulated growth in this part of Wake and Johnston counties, which contributes to the traffic on US 70 within the project area.

The proposed project will:

- Satisfy the requirements for an intrastate corridor
- Provide safe, rapid transportation through the project area connecting to other existing and planned major highways, including I-40 and the Future Raleigh Outer Loop
- Relieve existing and future traffic congestion on existing US 70 through and near Clayton
- Provide good local access to the rapidly growing areas of Wake and Johnston Counties served by the project

- Reduce the overall accident rate in the corridor by providing a freeway facility for much of the traffic and by reducing traffic volumes and accident exposure on existing US 70

- Enhance the economic growth in the area and region by providing rapid access to Raleigh and Research Triangle Park

- Fulfill a transportation need that will not be provided by other modes of transportation

- Accommodate the growing number of commuters between Wake and Johnston Counties.

3. Eight Step ICE Assessment Process

The assessment of indirect and cumulative effects is identified as a requirement under the National Environmental Policy Act (NEPA) of 1969, the North Carolina Environmental Policy Act (SEPA), and under the Council on Environmental Quality (CEQ) regulations implementing NEPA. The purpose of the NCDOT Eight Step ICE Assessment Process is to provide a standardized procedure for implementing the rules and legislation required for analysis and assessment of indirect and cumulative effects of transportation projects as part of the NEPA/SEPA process. The eight steps in the assessment process are:

1. Defining the Study Area Boundaries

2. Identify the Study Area's Directions and Goals

3. Inventory Notable Features

4. Identify Impact-Causing Activities

5. Identify Potential Indirect/Cumulative Impacts for Analysis

6. Analyze Indirect/Cumulative Effects

7. Evaluate Analysis Results

8. Assess the Consequences and Develop Appropriate Mitigation and Enhancement Strategies

This document applies the eight-step assessment process to the Clayton Bypass ICE project. Work products of each step are provided in the form of supporting text, tables, figures, technical memorandums, and comprehensive checklists.

3.1. Step 1 – Study Area Boundaries

3.1.1. Overview/Background

A study area was developed to serve as a basis from which to gather specific demographic, socioeconomic, land use, and environmental data for identification of potential indirect and cumulative effects. The methods used to identify the study area

included consideration of the project's purpose and need, service area of the proposed transportation improvement, regional and local travel patterns, county and municipal boundaries, drainage basins and water supply watershed/subwatershed boundaries. Interviews conducted with local agency officials were also helpful in defining the study area.

3.1.1.1. TIP R-2552 Setting

The Clayton Bypass, Transportation Improvement Project (TIP) No. R-2552 is located in Johnston and Wake counties within the Raleigh-Durham-Chapel Hill Metropolitan Statistical Area (Figure 1). Existing US 70 in the project area is a four-lane facility with a mixture of commercial, residential, institutional, and retail business fronting the road. The segment of US 70 from I-40 to Clayton has relatively few driveways, as well as long sections of sparsely developed commercial and institutional land. The section of US 70 through Clayton is heavily developed with a mixture of residential, retail, and commercial business. East of Clayton, the development along US 70 is moderate with an industrial park near the eastern terminus of the project. Most of the new development along US 70 is commercial or retail business.

The project corridor is characterized by rolling terrain with well-defined drainage channels. There is a mixture of wooded and open land with some active farmland, particularly near the east end of the corridor. White Oak Creek, Little Creek, Swift Creek, Cooper Branch, and several unnamed tributaries to these streams drain southward across the project corridor.

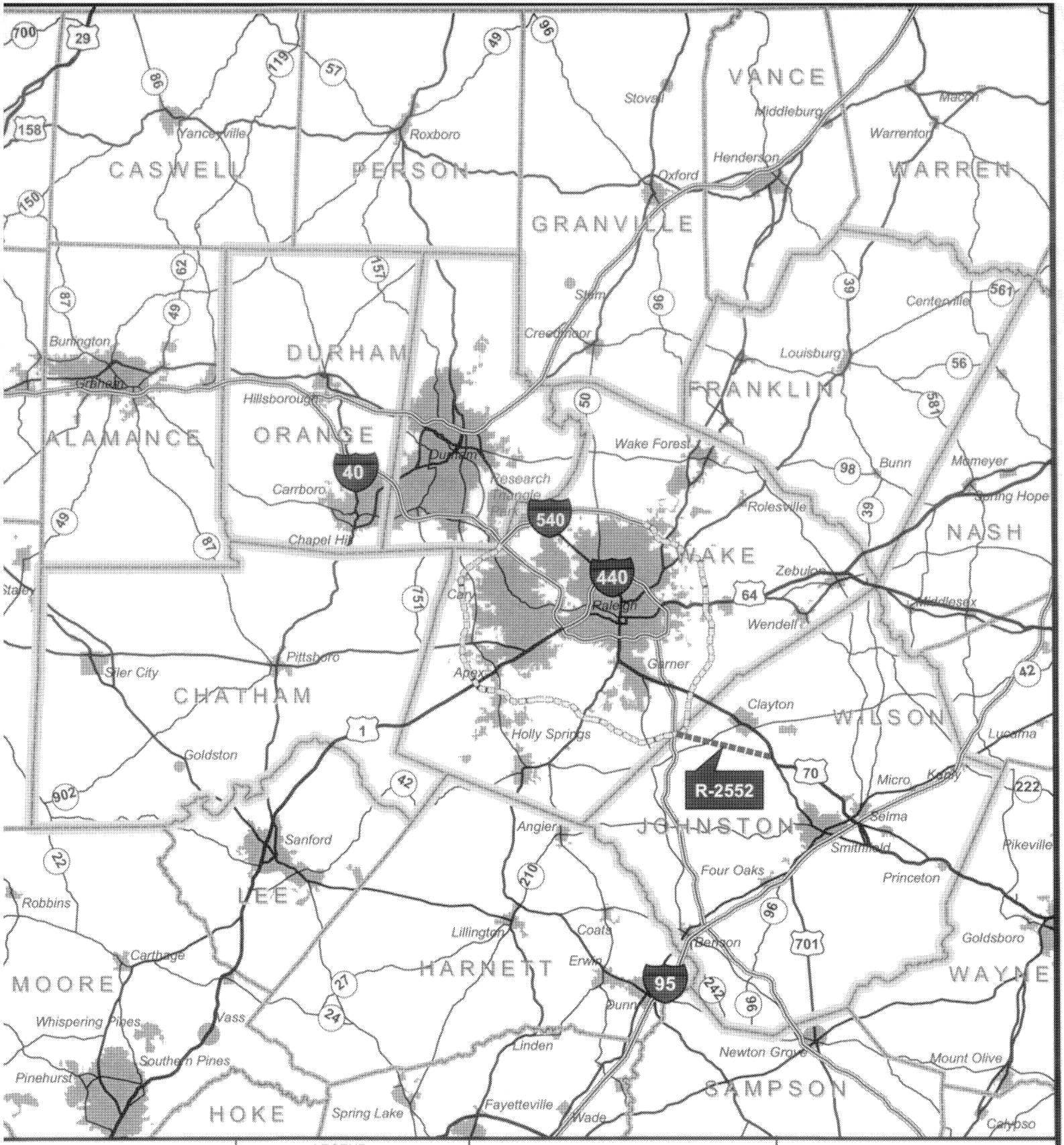
New residential subdivisions are in evidence throughout the project area, and additional ones are in the planning stage. Commercial or retail business is primarily located along US 70. There are three existing schools (Clayton High School, Clayton Primary School, and Clayton Middle School) in the project area. All three of these schools are located in the northern portion of the project area near existing US 70. In addition, there are several churches and cemeteries in the project area.

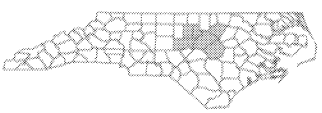
3.1.2. ICE Study Area Delineation

The project team consisting of NCDOT, NCDWQ, and a consulting team of URS and EcoScience considered project impacts to the surrounding physical, social, and natural resources in the study area delineation process. Delineation of the boundaries resulted in the western boundary at Lake Benson Dam and the Town of Garner, the eastern boundary at the Town of Smithfield, and the northern and southern boundaries mostly congruent with the Swift Creek Watershed. A natural areas mitigation site was also identified within the western end of the study area. Figure 2 shows the ICE assessment study area. This study area lies within the Crabtree Creek, Walnut Creek, Marks Creek and Swift Creek Watershed (DWQ Subbasin 03-04-02) of the Neuse River Basin (Figure 3). See Appendix A for a brief technical memorandum describing the delineation of the study area.

3.2. Step 2 – Study Area Characteristics, Directions, and Goals

The purpose of this section is to describe the setting of the study area, which will serve as a basis on which to evaluate potential indirect and cumulative effects associated with the project. The information developed in this section will also support the future growth assumptions used to assess the projects potential to induce growth and development.





LEGEND

- Urban Area
- Proposed Clayton Bypass
- Proposed I-540
- State Highway
- US Highway
- Interstate Highway
- Raleigh-Durham-Chapel Hill MSA
- County Boundary

N

0 3 6 12 18 24

Miles

TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE COUNTIES, NC

URS

URS Corporation - North Carolina
Morrisville, NC

Map Data Sources:
Johnston County, NC
ESRI Inc., NCDOT
Date: November 2003

Figure 1
TIP Setting

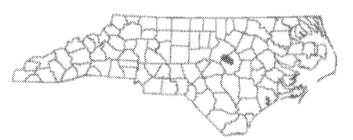
TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE
COUNTIES, NC

Figure 2
ICI Study Area

- Proposed Clayton Bypass
- Proposed I-540
- Stream
- TIP R-2552 Study Area
- Subwatershed
- Water Body
- County Boundary
- Urban Area
- Environmentally sensitive Area District (ES)

N

0 0.5 1 2 3
Miles



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Map Data Sources: Johnston County, NC; ESRI Inc.
Date: November 2003

TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE
COUNTIES, NC

Figure 3
Neuse River Watershed

2000 Population

- 11138 - 75000
- 75001 - 150000
- 150001 - 225000
- 225001 - 300000
- Proposed Clayton Bypass
- TIP R-2552 Study Area
- Subbasin
- Water Body
- Neuse River Watershed
- County Boundary

N

0 5 10 20 30

Miles

North Carolina Counties
Neuse River Watershed

URS

URS Corporation - North Carolina
Morrisville, NC

Map Data Sources: Johnston County, NC; ESRI Inc.
Date: November 2003

To derive perspective and develop a comprehensive understanding of the issues in the evaluation of indirect/cumulative effects, it is necessary to identify the growth and development trends affecting the study area.

3.2.1. Overview

Understanding characteristics of the study area such as community, municipality, and agency goals and directions and demographic, economic, social, transportation and ecological trends provides essential context for understanding project-induced growth. Of particular interest to this assessment are water resource related needs, directions, and goals as determined by local policies and planning processes of potentially affected hydrologic units.

3.2.2. Land Use

3.2.2.1. Existing Land Use

Land use in the project area is mostly comprised of forestland, grassland and agricultural fields interspersed with urban areas of low-density residential, commercial, and industrial uses. Existing land uses include successional areas that were previously agricultural and are now primarily characterized by grass and forestlands. Residential areas consist largely of single-family home subdivisions, low density residential, and scattered trailer-home parks. Commercial and industrial areas are mostly located adjacent to US 70, with scattered gas stations and convenience stores throughout the study area. Figure 4 shows existing project area land uses.

3.2.2.2. Population Growth and Land Use Change

Population growth directly impacts land use and consumption of resources. As population increases, more living spaces are required and more urban infrastructure is required to meet the increased demand for public utilities. As communities change from rural to urban, disparate land uses compete with one another and can result in degradation of notable features such as future agricultural productivity and overall environmental quality.

Nationwide, land consumed for building far outpaces population growth as urban areas expand at about twice the rate as the population is growing[i]. In North Carolina, a census tract's prior growth and current density are critical in determining its future growth. Near urban regions growth occurs primarily in tracts that have room for it. In rural areas, prior density has less impact in slowing growth[ii]. Future land use in the project area (presented in section 3.7) is primarily based on official Capitol Area Metropolitan Planning Organization (CAMPO) population and employment projections.

3.2.3. Population, Development, and Employment

3.2.3.1. Overview

The following sections illustrate characteristics of the study area and surrounding municipalities. The information presented in these sections establishes baseline conditions and also provides projections of future conditions.

3.2.3.2. Population

Johnston and Wake counties were the two fastest growing counties in North Carolina between 1990 and 2000 increasing in population by 50.0 and 48.3 percent respectively[iii].

WAKE

JOHNSTON

Proposed I-540

50

42

40

42

210

Unit: Parcel

TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE
COUNTIES, NC

Figure 4
Study Area
Current Land Use

- PROPOSED I-540
- COUNTY
- COMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

N

0 0.5 1 2 3

Miles

TIP R-2552

North Carolina Counties

URS

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Morrisville, NC

Map Data Sources: Johnston County, NC; ESRI Inc.
Date: November 2003

According to the Johnston County Director of Planning, the northwestern part of Johnston County is experiencing the most rapid growth (interview, May 14, 2003). Between 1990 and 2000, the majority of Wake County experienced substantial population growth with the highest rates occurring in west and southwestern Wake County. Table 1 presents population trends from 1980 to 1990 and 1990 to 2000 for the State of North Carolina, Johnston County, Wake County, and several municipalities within close proximity to the study area.

Table 1: Population Trends

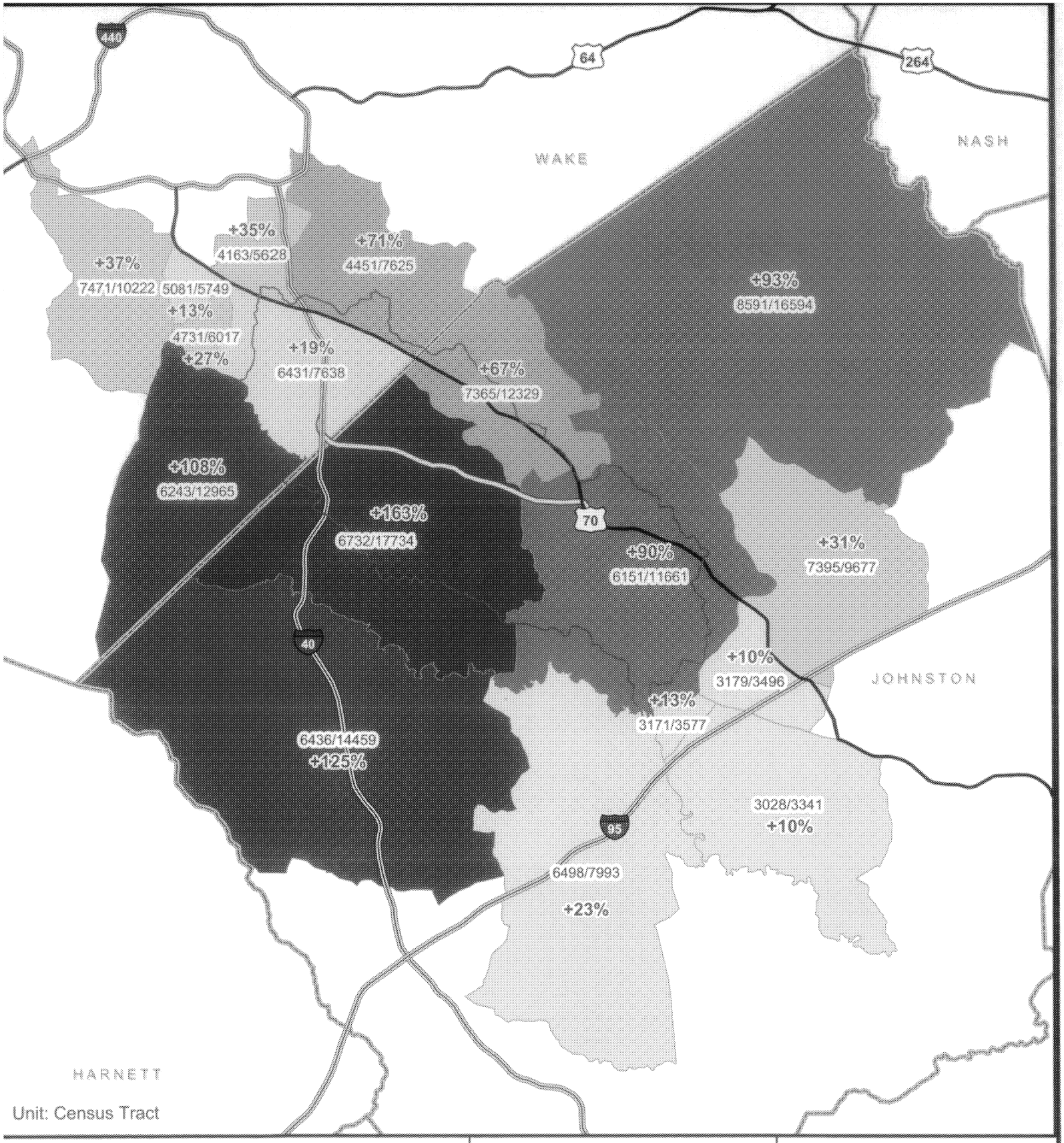
	1980	1990	2000	Change (%)	
				1980-1990	1990-2000
North Carolina	5,880,095	6,632,448	8,049,477	12.8	21.4
Johnston County	70,599	81,306	121,965	15.2	50.0
Wake County	301,429	423,380	627,846	40.5	48.3
Garner	10,182	14,967	17,757	47.0	18.6
Smithfield	7,288	7,540	11,510	3.5	52.7
Selma	4,762	4,600	5,914	(3.4)	28.6
Wilson's Mills	N/A	587	1,291	N/A	119.9
Four Oaks	1,049	1,308	1,424	24.7	8.9
Clayton	4,091	4,756	6,973	16.3	46.6

Source: North Carolina State Data Center, 2003

Figure 5 shows 1990-2000 study area population growth by census tract. The highest growth rate occurred in the central portion of the study area, increasing by 163 percent. Study area census tracts encompassing portions of Garner in the northwest, Clayton in the northeast, and Smithfield in the south experienced more modest growth rates of 19, 67, and 90 percent respectively. The primary influence of this growth is proximity to the I-40 and US 70 travel corridors, which provide access to the urban employment centers of the Triangle region (Chatham, Durham, Johnston, Lee, Orange, and Wake Counties), which also includes Research Triangle Park (RTP).

3.2.3.2.1. Population Projections

Projected population growth from 2000 to 2020 for project study area counties is presented in Table 2. Johnston and Wake counties experienced a high rate of growth during the 1990s, this trend is expected to continue over the next 20 years as the employment centers of Raleigh and RTP continue to prosper; almost all of this growth will occur in the Neuse Basin.



Percent Growth by Census Tract, 1990 - 2000

- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- 101 - 125%
- 126 - 150%
- 150 - 175%

- Clayton Bypass Centerline
- TIP R-2552
- County

N

0 1 2 4 6 8
Miles

TIP R-2552 CLAYTON BYPASS JOHNSTON & WAKE COUNTIES, NC

Figure 5
Population Growth, 1990-2000

URS
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Morrisville, NC

Map Data Sources:
Wake and Johnston Counties, NC
ESRI Inc., US Census 1990 & 2000
Date: November 2003

Table 2: Projected Populations 2000-2020

	% County In Neuse Basin	2000	2010	2020	2000-2020 % Change
North Carolina	NA	8,049,313	9,491,372	10,966,139	36%
Johnston	98%	121,965	167,240	215,863	77%
Wake	85%	627,846	851,771	1,088,545	73%

Source: North Carolina State Demographics, 2003; North Carolina Center for Geographic Information and Analysis, 2002. Note: The numbers reported reflect county and state population; however, these counties are not entirely within the basin. The intent is to demonstrate growth for counties located wholly or partially within the basin.

3.2.3.3. Development

The area forming the Wake County / Johnston County border has recently developed as a vibrant commercial and housing market attracting retail and residential development. The Johnston County Department of Economic Development estimates that over 70% of all new (2003) county building permits occur within this northwestern portion of the County[iv]. New single-family home building permits issued by Johnston County townships in 2001 are shown in Figure 6.

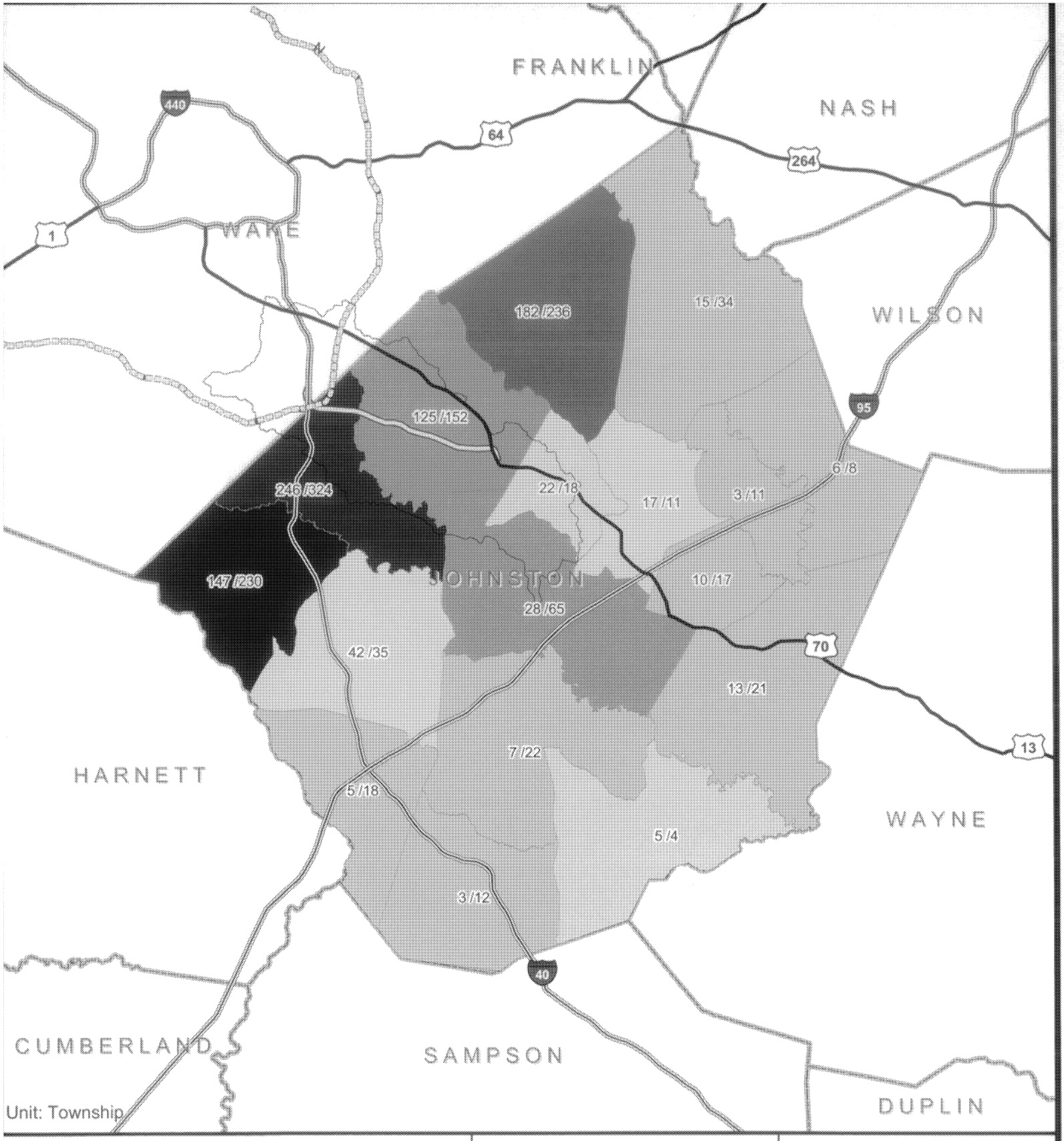
3.2.3.4. Employment

Manufacturing is the major economic activity in Johnston County comprising 16% of its workforce[v]. Industries include: Bayer Corporation, Caterpillar, Chiquita Banana North America, and John Deere as well as many smaller local manufacturers.

Attracting industry is important to Johnston County as local officials try to balance rapid residential growth while broadening tax revenue bases. An economic development zone was established in 2003 by the North Carolina legislature along the US 70 and US 70 Business corridors between the Clayton and Smithfield city limits. Several pharmaceutical and manufacturing companies are located off of US 70 between the Towns of Clayton and Wilson's Mills. It is expected that this part of the County will continue to attract companies due to the relatively low taxes, proximity to transportation corridors, employee base and incentives (e.g., provision of water and sewer service, financial assistance) provided by the County.

Located in the geographic center of the County, Smithfield is the Johnston County Seat and therefore contains a large number of government and public services as well as specialized retail businesses.

Currently under development southeast of Johnston County near Kinston, the Global TransPark (GTP) is a manufacturing complex built around an airport. When completed, the GTP will be a major employment center providing industries with direct access to multimodal transportation facilities in a designated foreign trade zone. US 70 is the primary surface transportation facility that will connect the GTP to Raleigh and to the port at Morehead City, thus increasing its importance as a transportation corridor.



2000 to 2001 Change in Permits

- -7 - 0
- 1 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100

- Proposed Clayton Bypass
- Proposed I-540
- TIP R-2552
- County

0 2.5 5 10

Miles

TIP R-2552 CLAYTON BYPASS JOHNSTON & WAKE COUNTIES, NC

Figure 6
Building Permits in Johnston Co., 2000-2001

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Map Data Sources:
Johnston County, NC
ESRI Inc.
Date: November 2003

Encompassing the capitol City of Raleigh, Wake County is a major employment destination for over 23,000 State of North Carolina employees. Integral to the regional economy, RTP is located in both Durham and Wake counties and is home to major technology and medical based institutions and companies. Table 3 shows the top 20 employers in the Triangle region. This table shows that the vast majority of the region's largest employers are located in Durham and Wake Counties. These employers attract workers from throughout the Triangle region and beyond.

Table 3: Major Triangle Employers

Employer	County	Employees
State of North Carolina	Wake	23,230
Duke University and Medical Center	Durham	17,421
International Business Machines (IBM)	Durham	13,500
Wake County School System	Wake	12,500
University of North Carolina – Chapel Hill	Orange	10,698
North Carolina State University	Wake	7,787
UNC Hospitals	Orange	5,473
GlaxoSmithKline	Durham and Wake	5,000
Wake Medical Center	Wake	5,000
Durham Public Schools	Durham	4,500
Rex HealthCare	Wake	3,779
SAS Institute	Wake	3,600
Progress Energy (CP&L)	Wake	3,428
Wake County Government	Wake	3,300
Nortel Networks	Durham	3,000
City of Raleigh	Wake	3,000
Verizon	Durham and Wake	2,800
Blue Cross and Blue Shield of North Carolina	Durham and Wake	2,700
Cisco Systems	Wake	2,500
Durham Regional Hospital	Durham	2,263

Source: *Major Triangle Employers*, www.triangle.com, 2003

3.2.4. Transportation System Characteristics and Trends

3.2.4.1. System Linkage and Transportation Demand

Within the Raleigh-Durham-Chapel Hill Metropolitan Statistical Area (MSA), the project provides an integral link in the metropolitan area transportation system. Also, by connecting the southeastern Piedmont region with the central Coastal region, the project is integral to intrastate travel providing access to the Morehead City port and to the Bogue Bank beaches. The project connects Raleigh, Smithfield, Goldsboro, Kinston,

New Bern, Havelock/Cherry Point Military Air Station, Morehead City, and serves as a link between I-40, I-95, and US 17.

The US 70 Bypass will interface with two major traffic carriers (I-40 and the future Raleigh Outer Loop I-540) near the west end of the project. I-40 is a four-lane limited access facility that runs east west from Wilmington, North Carolina to Barstow, California. The proposed future Raleigh Outer Loop will form a circumferential route around the City of Raleigh. By connecting the US 70 corridor to I-40 and the Future Raleigh Outer Loop, the US 70 traveler will experience greater flexibility traveling into or around the City of Raleigh and the RTP area.

3.2.4.2. Intermodal Relationships

The general project area has limited railroad, airport, and bus service to supplement the transportation system provided by US 70, I-95, I-40, and other major roadways.

The Norfolk-Southern Railroad parallels the US 70 corridor from Raleigh to Goldsboro and interfaces with the CSX Railroad in Selma. There is Amtrak service from Raleigh to Selma and then north to Richmond. Connections south to Florida can be made in Selma. There is no Amtrak service east of Selma in the US 70 corridor.

Freight trains operate between Raleigh and Goldsboro. There are no freight depots in Selma, Clayton, or Garner, but there are railroad sidings in each of the three towns where carload deliveries may be stored for customer unloading.

The project area is served by the Johnston County Airport, which is located along US 70, approximately one mile west of Smithfield. This airport is currently designated as a general aviation airport and no common carrier, passenger, or air cargo service is offered. Due to the proximity to Raleigh-Durham International Airport, it is unlikely these services will be offered in the future. The proposed project will complement the use of the Johnston County Airport by providing rapid safe surface transportation to Raleigh, Garner, and connections to I-95.

There is intercity bus service provided by Greyhound along the US 70 corridor from Raleigh to Goldsboro and points east. These buses currently stop in Selma, interfacing with north-south traffic along the I-95 corridor. There are no local bus services currently serving the project area. Capital Area Transit has city bus service available to Garner; however, this service has little impact on the project area. Vanpool transportation is available through social services for elderly and disabled persons.

3.2.5. River Basin Overview/Water Quality Plans and Programs

Basinwide water quality planning is a nonregulatory watershed-based approach to restoring and protecting the quality of North Carolina's surface waters prepared by the NC Division of Water Quality (DWQ) for each of the 17 major river basins in the state.

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters yet allow for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Better evaluate cumulative effects of pollution.
- Improve public awareness and involvement.

3.2.5.1. Existing Federal, State and Local Regulatory Mechanisms Related to Limiting Potential Cumulative Effects to Nutrient Sensitive Waters of the Neuse River Basin

EPA National Pollution Discharge Elimination System (NPDES) - Phase II Stormwater Rules

NPDES permits are required for municipal stormwater systems under the Phase II Stormwater Rules published by the EPA in 1999. To obtain an NPDES permit each municipality must provide a five-year plan that outlines the management practices and measurable goals that will be implemented in the areas of:

- Public education and outreach
- Public participation and involvement
- Illicit discharge detections and elimination
- Construction site runoff control
- Post construction site runoff control
- Pollution prevention for municipal operations.

An annual report is required that lists the achievement of stormwater management goals as included in the plan, additional goals achieved in that year and new measures to be undertaken in the upcoming year.

North Carolina – Neuse River Basin Nutrient Sensitive Waters Management

The Neuse River Basin Nutrient Sensitive Waters Management Strategy was established by the Environmental Management Commission (EMC) and codified as state law in 1996.[vi] Under these rules all waters in the Neuse River Basin, regardless of primary use classification, are also classified as Nutrient Sensitive Waters (NSW). The established rules relate to, among others, protection and maintenance of riparian areas, wastewater discharges, and urban stormwater management.

The Rules established protections regarding encroachment and impact to existing 50-foot wide riparian buffers directly adjacent to all intermittent streams, perennial streams, lakes, ponds, and estuaries in the Neuse River Basin to maintain their nutrient removal functions. Minimum nutrient control requirements applicable to all NPDES permitted wastewater treatment facilities that receive nitrogen-bearing wastewater were

established to maintain and restore water quality in the Neuse River Estuary and protect its designated uses.

In addition, under the Neuse Rules local governments within the Neuse River Basin, including Raleigh, Garner, Smithfield, and Johnston and Wake Counties, were required to develop and implement local stormwater management program plans that address nitrogen reductions for both existing and new development, including the stipulation that the nitrogen load contributed by new development activities is held at 70 percent of the average nitrogen load contributed by the 1995 land uses of the non-urban areas of the Neuse River Basin. Based on population growth and other factors, the Town of Clayton and/or other incorporated areas in the project planning area may be required by the EMC to comply with these stormwater requirements by establishing a stormwater management plan.

North Carolina – Water Supply Watershed Protection Act

The North Carolina General Assembly adopted the Water Supply Watershed Protection Act, in 1989[vii]. The resulting Water Supply Watershed Protection Rules, adopted in 1992, required that all local governments having land use jurisdiction within water supply watersheds adopt and implement water supply watershed protection ordinances, maps, and a management plan. State water supply protection rules describe five protective classifications for surface water supplies: WS-I, WS-II, WS-III, WS-IV, and WS-V[viii]. The State uses these classifications to determine the type of point source discharges it will permit in each water supply watershed. The classifications are also used to determine what set of water supply watershed standards local governments must implement to control non-point source pollution (mainly storm water runoff). Each water supply watershed, however classified, has a "critical area," which is that part of the watershed closest to the water supply source, where it is most important to minimize the discharge, and maximize the filtration, of potential pollutants.

The project planning area includes a portion of Swift Creek, which is classified as WS-III and nutrient sensitive waters (NSW). WS-III waters are defined as waters used as sources of water supply for drinking, culinary, or food processing purposes for those users where a more protective WS-I or WS-II classification is not feasible. WS-III waters are generally located within low to moderately developed watersheds.

DWQ adds supplemental classifications to the primary to provide additional protection to waters with special uses or values. The NSW supplemental classification is intended for waters needing additional nutrient management due to the presence of excessive growth of microscopic or macroscopic vegetation. In general, management strategies for point and nonpoint source pollution control require control of nutrients such that excessive growths of vegetation are reduced or prevented and there is no increase in nutrients over target levels. Management strategies are site-specific.

Within the ½ mile critical area draining to the water supply, only general permits are allowed. General permits cover relatively insignificant wastewater discharges such as swimming pool filter backwashes. The remainder of the watershed allows domestic and non-process industrial discharges only. DWQ also requires specific nutrient removal strategies (Best Management Practices) to protect these fragile surface `water systems.

Wake County – Land Use and Development Regulations

As previously mentioned, the state Water Supply Watershed Protection Act makes local governments primarily responsible for controlling non-point source discharges within water supply watersheds, by requiring local governments to adopt land use regulations that meet the state's minimum water supply watershed requirements. Wake County's water supply watershed protection regulations are intended to meet all of the state's minimum requirements, and to exceed those requirements as needed, based on past County practices and policies, which predated the State's Water Supply Watershed Protection Act.

Wake County protects water quality in water supply watersheds by applying land use and development regulations that are designed to keep impervious surface coverage low and to provide adequate infiltration of runoff water into the ground. They do so through the following measures:

- Limiting the density of residential development to a maximum gross density of 0.5 lot/acre in critical areas and 1.0 lot/acre in the remainder of the watershed,

- Limiting the impervious surface coverage of nonresidential development to a maximum of 6 percent in critical areas and 24 percent in the remainder of the watershed,

- Requiring vegetated buffers along perennial streams as well as along other streams that drain at least 25 acres, these buffers vary in width from 50 to 100 feet in width dependent on the location,

- Limiting nonresidential land uses to those with characteristics less likely to adversely affect water quality,

- Controlling the storage and use of hazardous materials, and

- Applying design standards to minimize adverse water quality impacts.

Wake County requires new development in all water supply watersheds to maintain watershed buffers along perennial streams (as shown on U.S.G.S. topographic maps) as well as along any other streams that drain at least 25 acres. It also requires new development to maintain drainageway buffers along drainageways, or around water impoundments, that drain at least five (5) acres, but less than twenty-five (25) acres. Further, Wake County also helps ensure protection of water supply sources by applying certain design standards to all development within a water supply watershed. Those standards require all new development, to the maximum extent practicable, to minimize impervious surface coverage, direct storm water runoff away from surface waters, incorporate Best Management Practices (BMPs) to minimize water quality impacts, and transport storm water runoff by vegetated conveyances.

Wake County also participates in the 10/70 Provision, where a local government can use 10% of the non-critical area of each watershed within its jurisdiction for new development and expansions to existing development up to a 70% built-upon area limit -- without stormwater control -- if using the low-density option throughout the remainder of the watershed. The 10/70 Provision is available within WS-II, WS-III and those WS-IV

water supplies where the local government allows only development using the low-density option. Local governments can use this technique to "swap" publicly owned, flood-prone, or otherwise undevelopable land in order to target growth at a higher density elsewhere within the watershed. The 10/70 Provision is considered a "high density" option, and therefore requires a 100-foot buffer along all perennial streams when being utilized.

Wake County implements and enforces land use and development regulations with the goal being to maintain water quality and direct more dense growth out of water supply watersheds and into urbanizing areas.

Johnston County – Development Ordinance

The existing Johnston County Development Ordinance includes provisions designed to manage development in a manner that supports economic growth while simultaneously preserving the quality of the County's rural character and natural resources, to include the nutrient-sensitive waters of the Neuse River Basin.[ix] Specific, applicable provisions are detailed below.

Water Supply Watershed Protection District

The provisions established under the water supply watershed protection district (WSW) apply to areas designated as public water supply watersheds. The intent is to provide a higher level of control from activities and situations that could degrade the quality of the water entering the Neuse River. As previously discussed, the project planning area includes a portion of Swift Creek classified as a WS-III NSW water supply watershed.

The maximum allowable area to be built upon for all residential development (unless expressly established elsewhere within the ordinance) and nonresidential development within a WSW shall be:

- 24 percent built-upon area with a curb and gutter roadway system, or
- 36 percent built-upon area without a curb and gutter system, or
- 70 percent built-upon area in the protected area with a county approved best management practice.

Additionally, the provisions require all new development activities that exceed the maximum 24 or 36 percent built-upon area thresholds to maintain a minimum 100-foot vegetative buffer along both sides of all perennial and intermittent streams, as indicated on the most recent versions of USGS 1:24,000 (7.5 minute) quadrangle topography maps. Otherwise, 50-foot-wide vegetative buffers shall be maintained along both sides of all perennial and intermittent streams, rivers or other water bodies as required by the Neuse River Basin: Nutrient Sensitive Waters Management Strategy. No new development shall be allowed in the required vegetative buffer with the exception of:

- Water dependent structures,
- Other minor structures (i.e., flag poles, signs and security lights) which result in only diminutive increases in impervious area, and
- Public works projects such as road crossings and greenways where no practical alternative exists.

Environmentally Sensitive Area District

The environmentally sensitive area district (ES) (shown in Figure 2) is a zoning overlay that covers areas deemed environmentally sensitive. Development within the ES must comply with stricter regulations regarding the protection and maintenance of riparian buffers, as well as development in flood hazard areas. Three ES Districts exist within Johnston County:

- The Little River ES,
- The Swift Creek ES, and
- The White Oak Creek ES.

These environmentally sensitive areas were created in relation to concerns regarding the protection of the endangered Dwarf Wedgemussel (*Alasmidonta heterodon*) and its habitat. Two of these ES areas, the Swift Creek ES and the White Oak Creek ES, exist within the project planning area.

Development within an ES district must comply with the following provisions:

1. 100-foot riparian buffers along all perennial streams shall remain undisturbed. If currently forested, it shall remain so and if not forested, it shall be maintained in a natural state and allowed to revegetate.
2. Intermittent streams shall have 50-foot buffers, consisting of a 30-foot wide Zone 1 adjacent to the water body and a 20-foot wide Zone 2 landward of Zone 1. Both zones shall be maintained to the maximum extent practical to provide for stormwater sheet flow resulting in the diffusion and infiltration of stormwater runoff and filtering of pollutants.
3. No residential or nonresidential structures, including improvements or additions to existing such structures, shall be allowed within the areas of special flood hazard as defined in the county flood damage prevention ordinance. However, specifically allowed improvements include public utility structures, buried utilities, roadways and accessways, and recreational facilities as long as no structures are involved.

Stormwater Management

The existing Johnston County Stormwater Management Ordinance applies to all areas within the planning jurisdictional limits of the County. It establishes minimum criteria to:

- Control and minimize quantitative and qualitative impacts of stormwater runoff from development within the County, and

- A nutrient management program for new development in accordance with 15A NCAC 2B .0235 Neuse River Basin - Nutrient Sensitive Waters Management Strategy: Basinwide Stormwater Requirements.

The County Stormwater Ordinance and its associated Design Manual are intended to minimize and mitigate, to the extent feasible, development-related impacts on surface water resources by promoting the design, construction, management, and maintenance of stormwater systems for the purposes of:

- Preserving natural drainage ways,

- Maximizing infiltration,
- Slowing stormwater runoff from individual sites in route to streams and rivers by use of
    - Effective runoff management,
    - Structural and non-structural best management practices,
    - Drainage structures, and
    - Stormwater facilities.

Open Space

The existing Johnston County Planning Ordinance includes provisions related to open space preservation or development. These provisions require all new residential developments to provide or dedicate open space or recreation areas equal to at least ten percent of the total gross land area of the development. Fifty percent of these dedicated areas may consist of existing wetlands and /or riparian or stream buffer areas, if they are contained within the development area. Such open space shall be recorded on the final property plat and protected by a permanent conservation easement or similar open space/recreational land dedication. In lieu of this open space dedication, the developer may make a payment (equal to the total number of lots or dwelling units multiplied by $800.00) to the County for its use in acquiring or developing open space, recreation, or park sites elsewhere within the County.

3.2.5.2. Neuse River Basin

The Neuse River originates in north central North Carolina and flows southeasterly through Wake and Johnston counties until it reaches tidal waters where it changes from a free flowing river to a tidal estuary, eventually flowing into the Pamlico Sound (Figure 2, Figure 3).

Throughout the 1980s and 1990s, urban and built-up land cover in the basin increased substantially by 227,000 acres. Uncultivated cropland and pastureland also increased by 60,000 acres. Forest and cultivated cropland cover substantially decreased by 128,000 and 180,000 acres respectively. The majority of land cover change is accounted for in the upper Neuse hydrologic unit that includes rapidly growing areas in Wake, Durham, and Johnston counties.[ix]

The overall population of the basin based on the Triangle J Council of Governments analysis is 1,353,617, with approximately 211 persons per square mile (2002). The watersheds with the highest population densities are near Raleigh, Durham, Goldsboro, Kinston, New Bern and Wilson. These populations are expected to grow rapidly through 2020, outpacing most areas of the state. With the increased population there will be increased drinking water demands and wastewater discharges as well as a loss of natural areas and increases in impervious surfaces associated with development[x].

The long-range mission of the *Neuse River Basinwide Water Quality Plan* is to "provide a means of addressing the complex problem of planning for increased development and economic growth while maintaining, protecting and enhancing water quality and intended

uses of the Neuse River basin's surface waters". Within this basinwide plan are management strategies and recommendations for those waters considered impaired or problematic.

3.2.5.3. Neuse River Subbasin 03-04-02

Figure 7 depicts Subbasin 03-04-02 including the local monitoring stations used to annually gather existing data and assess various water quality elements. Population growth and density in subbasin 03-04-02 is one of the highest in the state. New development is evident throughout the subbasin, especially along the I-40/US 70 corridors and US 64 corridor. There are 52 wastewater discharge permits in this subbasin; the largest are the Raleigh Neuse, Central Johnston, Cary North, Little Creek, and Wake Forest. Raleigh has a Phase I stormwater permit, and Cary, Apex, Garner, Durham County and Wake County will be required to develop a stormwater program under Phase II. Smithfield, Johnston County, and all the above communities, have also submitted model stormwater ordinances as required by the Neuse Nutrient Sensitive Waters (NSW) strategy stormwater rules. There are also nine registered animal operations in this subbasin.[xi] Table 4 gives an overview of Subbasin 03-04-02.

Table 4: Subbasin 03-04-02

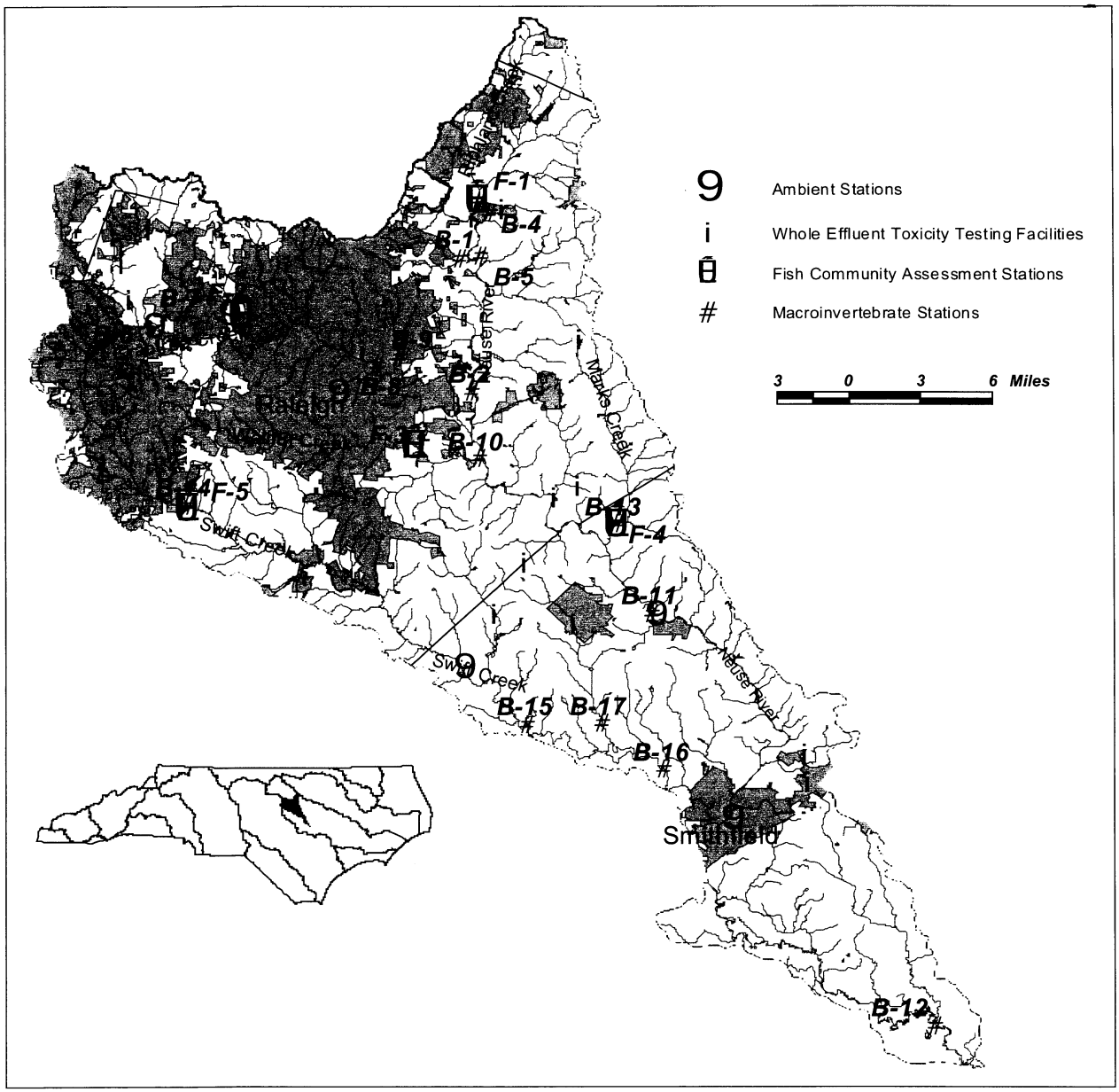
Land and Water Area	
Total area:	726 mi^2
Land area:	724 mi^2
Water area:	2 mi^2
Population Statistics	
2000 Estimated Population:	547,580
Pop. Density:	808 persons/mi^2
Land Cover (%)	
Forest/Wetland:	53.5
Surface Water:	0.7
Urban:	29.5
Cultivated Crop:	13.1
Pasture/Managed Herbaceous:	3.0
Counties	
Durham, Franklin, Johnston and Wake	
Municipalities	
Raleigh, Wake Forest, Cary, Garner, Clayton, Smithfield, and Knightdale	

Source: NCDENR's *Neuse River Basinwide Water Quality Plan,* (July 2002)

Appendix B.1 provides an organization and tabulation of study area goals checklist. Appendix B.2 provides a study area directions and goals checklist.

This subbasin contains the most urbanized areas in the entire basin, including the greater Raleigh metropolitan area (Figure 32). Significant tributaries to the Neuse River in this subbasin are Crabtree Creek, Walnut Creek (including Lakes Johnson and Raleigh) and Swift Creek (including Lakes Wheeler and Benson).

This subbasin contains primarily piedmont streams. The piedmont section is subdivided into two geologic areas: the headwaters of Crabtree Creek lie within the Raleigh Belt and most of the middle section lies within the Eastern Slate Belt. Smaller streams in these two geological areas have a tendency to dry up under low flow conditions. A small portion of the inner coastal plain can be found east of Clayton.



Source: NCDENR, Division of Water Quality

3.3. Step 3 – Notable Features Inventory

3.3.1. Overview

The notable features inventory describes baseline environmental conditions within the indirect/cumulative effects analysis study area against which the project may be assessed. The term *notable features* depends on perspective and scale; this document assesses various geographic scales in accordance with the CEQ regulations (40 CFR 1500-1508). Consideration of the project's indirect and cumulative effects from encroachment-alteration, project-induced, or in combination with other actions, helps to establish the degree of change. Acceptance of the degree of change differs depending on the affected locale or population.

3.3.2. Ecosystem Conditions

Documentation of ecosystem conditions depends upon the characteristics of the project's setting as defined by the following notable features.

- *Sensitive species and habitats* - US EPA uses the term sensitive species and habitats to describe ecologically valuable species and habitat and those vulnerable to impact.

- *Valued environmental components* – Are defined as a "characteristic or attribute of the environment that society seeks to use, protect, or enhance."[xii]

- *Relative uniqueness, recovery time, and unusual landscape features* – Relative uniqueness is a "measure of how many comparable examples of this landscape element exist at different levels of scale, from the local area to the nation, even the globe". Recovery time is "a measure of how long it would take to replace the existing landscape element in comparable form if it were disturbed or destroyed." [xiii]

Ecosystems of the study area bridge the border between northwestern Johnston and southeastern Wake counties. Johnston County is at the intersection of the Piedmont and Coastal Plain. The Neuse River and Little River run north south the length of the county through predominantly rural landscape. Wake County is located at the edge of the Piedmont and is marked by rolling terrain that is cut periodically by ravines. Most of the land in the county drains to the Neuse River. The western part of the county is covered by soft sedimentary rock of the Triassic Basin, while the igneous granite of the Rolesville Pluton marks the eastern third. Some notable features of the study area are described below:

Farming

Johnston County has more farms and farmland than any other county in the Triangle. Farm parcels are located throughout the entire project area. Farmers take advantage of the flat terrain to grow traditional row crops such as tobacco, sweet potatoes, soybeans, cotton and corn. Hogs, poultry, and cattle are also raised in the project area (*Smithfield Herald*, 1992). The pastures in the project area are actively grazed by cattle and are dominated by grasses and low growing herbs.

Little Creek

Little Creek is currently impaired because of a Fair bioclassification. This stream drains the rapidly urbanizing watershed west of Clayton and has a considerable lack of habitat. DWQ management policies recommend sedimentation and erosion control plans be followed during construction to minimize impacts. In 2000, Little Creek was classified C NSW (*aquatic life propagation/protection of secondary recreation and nutrient sensitive waters classification*) and, as of 2002 DWQ was in the process of identifying problem parameters that may be causing biological impairment in Little Creek.

Swift Creek

The Swift Creek corridor includes bottomland forests, important marsh habitats for wintering waterfowl in Lake Wheeler and Lake Benson, and two north-facing bluffs of state significance. Swift Creek includes some of the roughest topography in Johnston County. Parallel and adjacent to Middle Creek, it supports rare mussel and fish species and forms one larger natural area near its confluence with the Neuse River; all of the rare animals live in the creek below Lake Benson, where there are no lands protected along the banks of the stream. Thus protection efforts are greatly needed downstream of Lake Benson. Monitored by the DWQ, Swift Creek is considered an impaired waterbody and was classified WS-III NSW (water supply watershed and nutrient sensitive waters classification) in 2000.[xiv], [xv]

Study area ecosystem characteristics are inventoried in Appendix B.3.

3.3.3. Socioeconomic Conditions

Basic socioeconomic conditions are inventoried through identification of characteristics of the human social environment. As recognized by the field of social impact assessment (ICOGP, 1993), v*ulnerable elements of the population* include the elderly, children, the disabled, and members of low-income or minority groups (Table 5). “Social impacts" refer to the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society.[xvi]

Table 5: Vulnerable Elements of the Population

Vulnerable Elements of Population	Johnston County	Wake County	North Carolina
Population, 2000	121,965	627,846	8,049,313
Persons under 5 years old, percent, 2000	7.8%	7.2%	6.7%
Persons under 18 years old, percent, 2000	26.1%	25.1%	24.4%
Persons 65 years old and over, percent, 2000	9.8%	7.4%	12.0%
Black or African American persons, percent, 2000 (a)	15.7%	19.7%	21.6%
American Indian and Alaska Native persons, percent, 2000 (a)	0.4%	0.3%	1.2%
Asian persons, percent, 2000 (a)	0.3%	3.4%	1.4%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	Z	Z	Z
Persons reporting some other race, percent, 2000 (a)	4.5%	2.5%	2.3%
Persons reporting two or more races, percent, 2000	1.0%	1.6%	1.3%
Persons of Hispanic or Latino origin, percent, 2000 (b)	7.7%	5.4%	4.7%
White persons, not of Hispanic/Latino origin, percent, 2000	75.3%	69.9%	70.2%
Persons with a disability, age 5+, 2000	24,361	77,784	1,540,365
Persons below poverty, percent, 1999	12.8%	7.8%	12.3%

(a) Includes persons reporting only one race
(b) Hispanics may be of any race, so also are included in applicable race categories
Source: US Census Bureau State & County QuickFacts, 2003

3.3.3.1. Community Characteristics

General community characteristics identified by project area surveys conducted during the EIS are presented below:

Emergency Services - The Garner Fire Department, located north of US 70, provides fire protection and the Garner Rescue Squad provides rescue service within the Wake County portion of the project area. The Wake County Sheriff's Department and the North Carolina Police provide police protection. Emergency medical care is available at the Wake Medical Center, Rex Hospital, and the Raleigh Community Hospital.

The Johnston County portion of the project area is located within the Clayton Fire District. Fire and rescue service is located within the Town of Clayton. The Johnston County Sheriff's Department and the North Carolina State Police provide police protection. Johnston Memorial Hospital in Smithfield provides emergency medical care.

Educational Facilities - Public schools located within the project area include Clayton Elementary, Cooper Middle School, and Clayton High School, located north of US 70, and Clayton Primary School located south of US 70 on Lombard Street.

The North Carolina State University Central Crop Research Station is located west of Clayton. The Research Station was bisected by the construction of US 70 and farm equipment must cross US 70 to reach some fields.

Community Services - There is one library located within the Town of Garner (Southeast Wake County Regional Library) and one library located within the Town of Clayton (Johnston County Hocutt-Ellington Memorial Library). There are two day care centers and two retirement homes located within the project area. Churches located within the project area include: Amelia United Church of Christ, Camelot Congregational Church, Mt. Pleasant Adventist Church, Mount Calvary Baptist Church, and Clayton Assembly Church.

Park and Recreation Areas - There are no county-subsidized parks or recreation areas in Johnston County. Recreational facilities within the project area consist of one private swimming pool and two public tennis courts in Clayton. There are two privately owned golf courses within the project area: Meadowbrook County Club, located in Wake County west of I-40, and Plantation Golf Club, which is south of US 70. The Clemmons Educational State Forest is located adjacent to the project area off of East Garner Road. The Forest provides interpretive trails, exhibits and picnic areas.

3.3.3.2. Community Cohesion

Community cohesion is crucial to promoting greater knowledge, respect and contact between various cultures and to establish a greater sense of citizenship. Within the project area, interaction among residents within subdivisions and between adjacent subdivisions is likely. Table 6 shows subdivisions located within the EIS project area:

Table 6: Project Area Subdivisions

Subdivision	Number of Lots
Stonebrook	535
Brittany Woods	285
White Oak Ridge	241
Lafayette Place	225
Stephanie Woods	122
Landmark	76
White Oak Plantation	74
St. Johns Woods	33
Cox Woods	26
Amelia Acres	18
Eagle Chase	7
Quail Acres	7

Source: *FEIS US 70 Improvements from I-40 to Intersection of US 70 and US70 Business in Wake and Johnston Counties*, 1998

3.3.3.3. Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Population and Low Income Populations, directs federal agencies to identify and address as appropriate disproportionately high and adverse human health or

environmental effects of its programs, policies, and activities on minority and low-income populations. Percent minority and low-income populations for North Carolina and Johnston and Wake counties are shown in Table 7.

Table 7: State/County Racial Characteristics and Poverty Levels

Race	% Wake County	% Johnston County	% North Carolina
White	72.4	78.1	72.1
Non-White	27.6	21.9	27.9
Below Poverty	7.8	12.8	12.3

Source: NC Department of Commerce, 2004 and US Census Bureau, 2004

North Carolina's Hispanic population has seen enormous growth throughout the 1990s due to higher birth rates and a continued influx of immigrants looking for jobs (Table 8). The Census Bureau estimates that North Carolina's Hispanic population is continuing to surge, increasing 16 percent from April 2000 to July 2002[xvii]. Concentrations of Hispanic populations can be found throughout the project area, specifically in the northern outskirts of the Town of Clayton off of Old US 70 and in the general vicinity of the intersection of NC 42 and US 70[xviii].

Table 8: Hispanic Population Growth

County	Hispanic/Latino Origin Population			
			Difference	
	2000	1990	Amount	Percent
JOHNSTON	9,440	1,262	8,178	648.0
WAKE	33,985	5,396	28,589	529.8
NORTH CAROLINA	378,963	76,726	302,237	393.9

Source: US Census, 2004

Concentrations of minority and/or low-income households are also located in the northern portion of the Town of Clayton off of Old US 70, in the general vicinity of the intersection of NC 42 and US 70, and in a trailer park located in the western portion of the project area[xix].

Additional analysis at the Census block level was completed as part of the EIS to aid in the evaluation of environmental justice impacts to racial minority populations and low-income populations in the study area. This analysis showed that the study corridor is lower in the percentage of minorities and in percentage of persons having low-incomes than the State of North Carolina, Wake County, and Johnston County.

Appendix B.4 provides a socioeconomic conditions inventory illustrating details of economic, demographic, social, and physical conditions and their connection to notable features.

3.3.4. Notable Features Inventory Summary

The notable features inventory facilitates planning of transportation systems by considering features notable on a broad scale, typically less detailed than information suitable for project evaluation. Appendix B.5 provides a notable features checklist in

which major types of ecosystem and socioeconomic features are outlined. Appendix B.6 lists substantial federal and state statutes that place value on certain resources or determine that certain resources require special consideration.

3.4. Step 4 – Impact-Causing Activities

Impact-causing activities consist of impacts of the proposed transportation project as well as other existing and potential activities that may affect study area notable features. The two major types of indirect/cumulative effects caused by project impacts are:

- Encroachment-Alteration Effects – Effects that alter the behavior and functioning of the physical environment are related to project design features but are indirect in nature because they can be separated from the project in time or distance. These effects can be considered cumulative in nature when they are additive over time or have an interactive (non-linear) net effect on the environment.

- Access-Alteration Effects (Project-Induced Growth) – Changes in traffic patterns and the alteration of accessibility attributable to the design of the project can induce residential and commercial growth in the study area.

The general types of project impact causing activities (existing, potential, and proposed) include:

- Modification of Regime – alteration of habitat, flora, hydrology, and other features;

- Land Transformation and Construction – construction method, ancillary elements;

- Resource Extraction – excavation and dredging;

- Processing – storage and supplies;

- Land Alteration – landscaping, erosion control;

- Resource Renewal Activities – remediation, reforestation;

- Changes in Traffic – traffic patterns on project and adjoining facilities;

- Waste Emplacement – landfill, waste discharge;

- Chemical Treatment – fertilization, deicing; and

- Access Alteration – substantial changes in access, circulation patterns, travel demand and travel times between major attractors/generators (employment, housing, and commercial development, etc.).

Appendix B.7 documents other activities (existing and proposed) that may cumulatively affect notable features. Appendix B.8 documents project impact-causing activities.

3.5. Step 5 – Potential Indirect/Cumulative Impacts

3.5.1. Overview

The objective of Step 5 is to identify the effects of the project that require detailed analysis. This is done by comparing the lists of impact-causing activities developed in Step 4 with the inventory of goals, trends and notable features that make up the baseline conditions identified in Steps 2 and 3. The comparison is designed to explore cause-effect relationships and to establish which effects merit subsequent detailed analysis or, conversely, which effects are not potentially noteworthy and require no further assessment. The following sections review main categories of effects; Step 5 concludes with an evaluation matrix of effects for analysis in Step 6.

3.5.2. Encroachment – Alteration Effects

Alteration of the behavior and functioning of the affected environment caused by project encroachment can be characterized into two broad categories: ecological effects and socioeconomic effects. These effects can be linked to project impact-causing activities identified in the previous step. The two main effects are discussed below.

3.5.2.1. Ecological Effects

The ecosystem approach embodied in CEQ's biodiversity document (1993) recognizes the "fundamental interconnections within and among various levels of ecological organization." Reduction of diversity at any level will have effects at the other levels. Therefore, an understanding of the interconnections can help reveal the chain of events delayed in time or space from the original transportation project action of disturbance on or within a particular level of ecological organization.

The following indirect and cumulative effects of transportation project actions can have important consequences for ecosystems:

- Habitat fragmentation from physical alteration of the environment;
- Lethal, sublethal and reproduction effects from pollution;
- Degradation of habitat from pollution;
- Disruption of ecosystem functioning from direct mortality impacts; and
- Disruption of natural processes (e.g., hydrology, species competition, predator-prey relations, etc.) from altered energy flows.

3.5.2.2. Socioeconomic Effects

Socioeconomic effects of transportation projects are the result of a change in the physical nature of a community. The two major changes are:

- Alteration of traffic patterns and access; and
- Relocation of homes and business, or relocation or alteration or public facilities.

These direct effects can result in indirect/cumulative effects that can be magnified by the cumulative impacts of other actions and include alterations to:

- Neighborhood cohesion;
- Neighborhood stability;
- Travel patterns of commuters and shoppers;
- Recreation patterns at public facilities;
- Pedestrian dependency and mobility;
- Perceived quality of the natural environment;
- Personal safety and privacy; and
- Aesthetic and cultural values.
- Environmental Justice – disproportionate effects to vulnerable elements of the population.
- Perceived quality of life.

3.5.3. Induced Growth Effects

Transportation project improvements often reduce the time-cost of travel, enhancing the attractiveness of surrounding land to developers and consumers. Development of vacant land, or conversion of the existing environment to more intensive uses, is often a consequence of transportation projects. Increases in employment and population attributable to a project are indirect effects that, in turn, produce their own effects on the environment.

Induced growth effects fall into three general categories: effects of projects planned to serve specific land development; effects of projects likely to stimulate complementary development, and effects of projects likely to influence interregional location decisions. These induced growth types are discussed in detail below.

3.5.3.1. Land Development

Transportation projects designed specifically to serve existing or planned large land development projects or groups of projects require a thorough analysis of induced growth and related effects. This is because:

- Land development is not just probable but highly likely;
- The magnitude and timing of the development are known or generally predictable; and
- Details of development projects are known and can be analyzed for environmental effects.

Since details of the land development projects are known, analysis of this type of growth is of considerable importance to indirect/cumulative effects analysis and can focus on

impacts related to the magnitude and timing of development rather than its probability of occurrence.

3.5.3.2. Complementary Land Development

Complementary land development, such as highway-oriented businesses (e.g. gas stations, rest stops, motels), is more likely near interchanges in rural areas where property values were originally low. Interchanges in suburban or urban areas where property values were higher before project planning and implementation are more likely to support a greater proportion of higher density uses, as well as a greater mix of uses. Factors influencing the likelihood and rate of development near rural interchanges include:

- Distance to major urban area or regional center
- Traffic volume on the intersecting road
- Presence of frontage road
- Availability of water and sewer and other infrastructure

3.5.3.3. Intraregional Location Decisions

Apart from the complementary development described above, on a regional basis, the impact of transportation projects is generally minimal. The localized effect of such projects on land use can be substantial; however, if the conditions for development are generally favorable in a region, then transportation projects can become one of the major factors that influence where development will occur.

Where transportation projects do influence land development, the general tendency is toward relatively high-density commercial or multi-family residential development near facility nodes in urban and suburban areas and single-family residential development in the urban fringe.

3.5.4. Project Evaluation Context

To evaluate potential indirect and cumulative effects of the Clayton Bypass, the Project Team considered all information set forth in this report as well as background information and base conditions established in the FEIS. Table 9 and Table 10 give examples of indirect and cumulative effects; these tables, together with all previously discussed background information, are used as the basis for decisions made in the Table 11 evaluation matrix. This matrix lists potential effects under major categories and presents indirect/cumulative effects that warrant further analysis.

Table 9: Examples of Direct and Indirect Effects

	DIRECT EFFECT	INDIRECT EFFECT	INDIRECT EFFECT	INDIRECT EFFECT	INDIRECT EFFECT
Socioeconomics and Land Use	Improved access to suburban/rural land suitable for development.	Highway-oriented business locates on land adjacent to new interchanges	Business declines in older downtown area which was bypassed	Residential Development	Loss of farmlands
Water Quality	Improved access	Land use development	Increased non-point source water pollution	Decline in surface water quality, contaminants enter water supply aquifer	Health problems, contamination of groundwater
Wetlands	Improved access, alteration of surface water drainage patterns	Land use development, elimination or degradation of downstream wetlands	Many small wetlands eliminated during development	Substantial aggregate loss of wetlands due to development	
Ecology	Improved access, removal of vegetation and habitat	Fragmentation of large habitat area	Elimination of species which require this large habitat		
Air Quality	Improved access	Concentrated development adjacent to new interchanges	Creation of air quality contamination "hot spot" exceeding standards	Reduction in available increment for future highway projects	
Noise	Increase in noise due to construction	Additional traffic on collector roads producing noise above standards	Nearby residential property values are lowered		
Cultural Resources	Improved access to nearby rural area	Development of land uses in vicinity of interchange	Substantial visual impact to historic farm property		
Transportation	Improvement of traffic flow, stabilization of vehicular speeds	Reduce fuel usage for vehicles using new highway	Reduce utilization of fossil fuels	Improves freight movement	

Source: *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina*, 2001

Table 10: Examples of Cumulative Effects

TYPE	MAIN CHARACTERISTICS	EXAMPLE
1. Time Crowding	Frequent and Repetitive Effects on an Environmental System	Forest Harvesting Rate Exceeds Regrowth
2. Time Lags	Delayed Effects	Exposure to Carcinogens
3. Space Crowding	Highly Spatial Density of Effects on an Environmental System	Pollution Discharges into Streams from Nonpoint Sources
4. Cross-Boundary	Effects Occur Away from Source	Acidic Precipitation
5. Fragmentation	Change in Landscape Pattern	Fragmentation of Historic District
6. Compounding Effects	Effects Arising from Multiple Sources or Pathways	Synergism Among Pesticides
7. Triggers and Thresholds	Fundamental Changes in System Behavior or Structure	Global Climate Change

Source: *Considering Cumulative Effects Under the National Environmental Policy Act*, Council on Environmental Quality, 1997.

Table 11: Evaluation Matrix

Indirect and Cumulative Effects Requiring Detailed Analysis

Indirect / Cumulative Effect Type		Potential Effect? (*Check Below*)		Potential Manifestation(s) in Study Area (*List Below or Under Separate Coveret*)
		No (*Assessment Complete*)	Yes (*Evaluation Required*)	
Encroachment – Alteration Indirect Effects Single Source Additive (Type 1) and Interactive (Type 2) Cumulative Effects	*Ecosystem Related:* Habitat Fragmentation/Degradation Ecosystem Disruption Natural Process Disruption Air Quality Water Quality Noise Other	 ✓ ✓	 ✓ ✓ ✓ ✓ 	Mussels – see Biological Assessment for this project. See water quality modeling for project.
	Socioeconomic / Land Use Related: Community Cohesion / Stability Alteration of Travel Patterns Quality of Life Effects Historic Resources Aesthetic Effects Other	 ✓ ✓ ✓ 	 ✓ ✓ 	Project decreases commute times from study area to RTP and Raleigh employment centers. Loss of farmland and open space
Induced Growth (Access – Alteration Indirect Effects)	Serves Specific Development	✓		
	Stimulates Complementary Development		✓	Highway oriented retail
	Influences Location Decisions		✓	Residential development
Indirect Effects Related to Induced Growth Multiple Source Additive (Type 3) and Interactive (Type 4) Cumulative Effects	*Ecosystem Related:* Habitat Fragmentation / Degradation Ecosystem Disruption Natural Process Disruption Air Quality Water Quality Noise Other	 ✓ ✓	 ✓ ✓ ✓ 	See Biological Assessment and water quality modeling for this project under separate cover.
	Socioeconomic / Land Use Related: Conflict with Goals / Plans Economic / Fiscal Impacts Community Cohesion / Stability Alteration of Travel Patterns Quality of Life Effects Historic / Cultural Resources Aesthetic Effects Other	 ✓ ✓ ✓ ✓ ✓	 ✓ ✓ ✓ 	Induced development will add to area's tax base. Project, added to existing roadway network decreases commute times from study area to RTP and Raleigh employment centers. Change from rural to suburban lifestyle.

3.6. Step 6 – Indirect/Cumulative Effects Analysis

3.6.1. Overview

The purpose of Step 6 is to assess the significance of the effects identified in the previous step by determining magnitude; probability of occurrence; timing and duration; and degree to which the effect can be controlled or mitigated. This Section includes the first two of the four activities involved in the Delphi Process/Expert Panel Survey. Delphi is a survey research technique directed toward the systematic solicitation and organization of expert intuitive thinking from a group of knowledgeable people (Linstone, 1975). The logical sequence of a typical Delphi study involves four main activities:

1. Data and Information – Identify Trends
2. Inquiry – Timing; Conditions; Likelihood and Severity of Consequences
3. Analysis – Analysis of Consequences, Evaluate Results (Step 7)
4. Suggestions – Assess the Consequences; Develop Mitigation Strategies (Step 8)

To collect data and information interviews were conducted with local officials from throughout the study area. In addition, a panel of NCDOT OHE staff and the consultant team was assembled on September 24, 2003; data and trends considered and results of the process are included throughout Steps 6, 7, and 8. Minutes from the panel survey and Power Point slides presenting data, information, and trends are located in Appendix C.

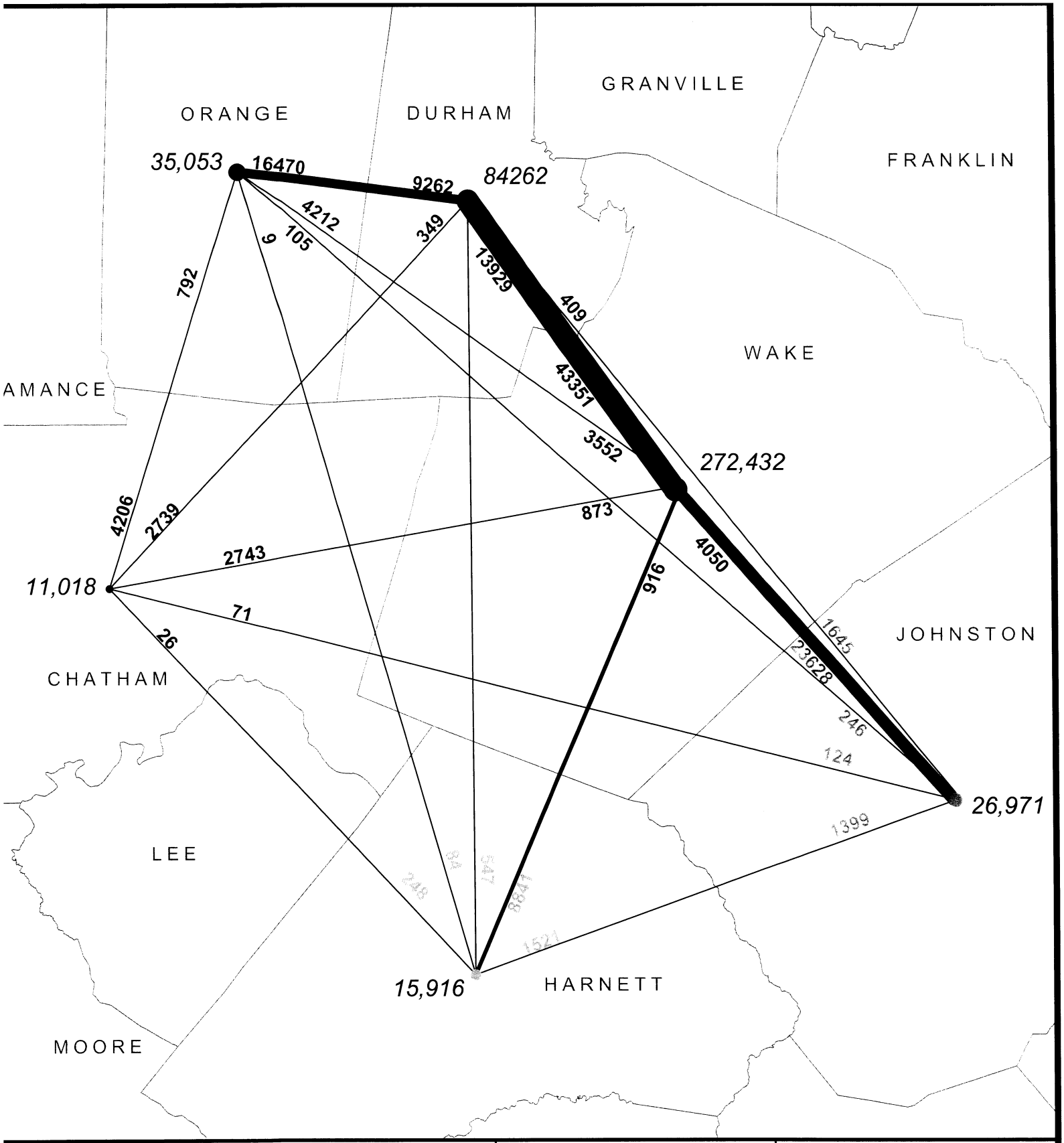
3.6.2. Induced Development Analysis

The study area has experienced rapid growth throughout the last two decades with this growth projected to continue through 2020. By reducing highway travel time and making the project area more accessible to employment and services, the project is a contributing factor in this projected growth. The following sections provide an understanding of how project characteristics contribute to induced development.

3.6.2.1. Commuter Proclivity

Identifying regional commuting patterns helps to establish where future development is likely to occur. Figure 8 shows overall county-to-county Triangle area commuter flow. Counties with large employment bases such as Durham and Wake attract workers from Orange and Johnston counties, and to a lesser extent from Chatham and Harnett counties.

Recent history has shown that increased highway access between Johnston County and the employment centers of Raleigh and RTP has stimulated growth in Johnston County. The 1989 opening of I-40 between US 70 near Garner and I-95 near Benson is evidence of this occurrence as northwest Johnston County experienced rapid growth throughout the 1990s and continues to this day. Figure 9 demonstrates the growth in traffic from 1997 to 2001 along the I-40 corridor in Johnston County.



County Center with Intra-County Count

- Chatham Co. - 11,018
- Harnett Co. - 15,916
- Johnston Co. - 26,971
- Orange Co. - 35,053
- Durham Co. - 84,262
- Wake Co. - 272,432

Commuter Flow Counts

- 0 - 5000
- 5001 - 10000
- 10001 - 15000
- 15001 - 20000
- 20001 - 25000
- 25001 - 30000
- 30001 - 35000
- 35001 - 40000
- 40001 - 45000
- County

N

0 2.5 5 10 15

Miles

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JOHNSTON & WAKE COUNTIES, NC

Figure 8
County-to-County Commuter Flow Map

URS
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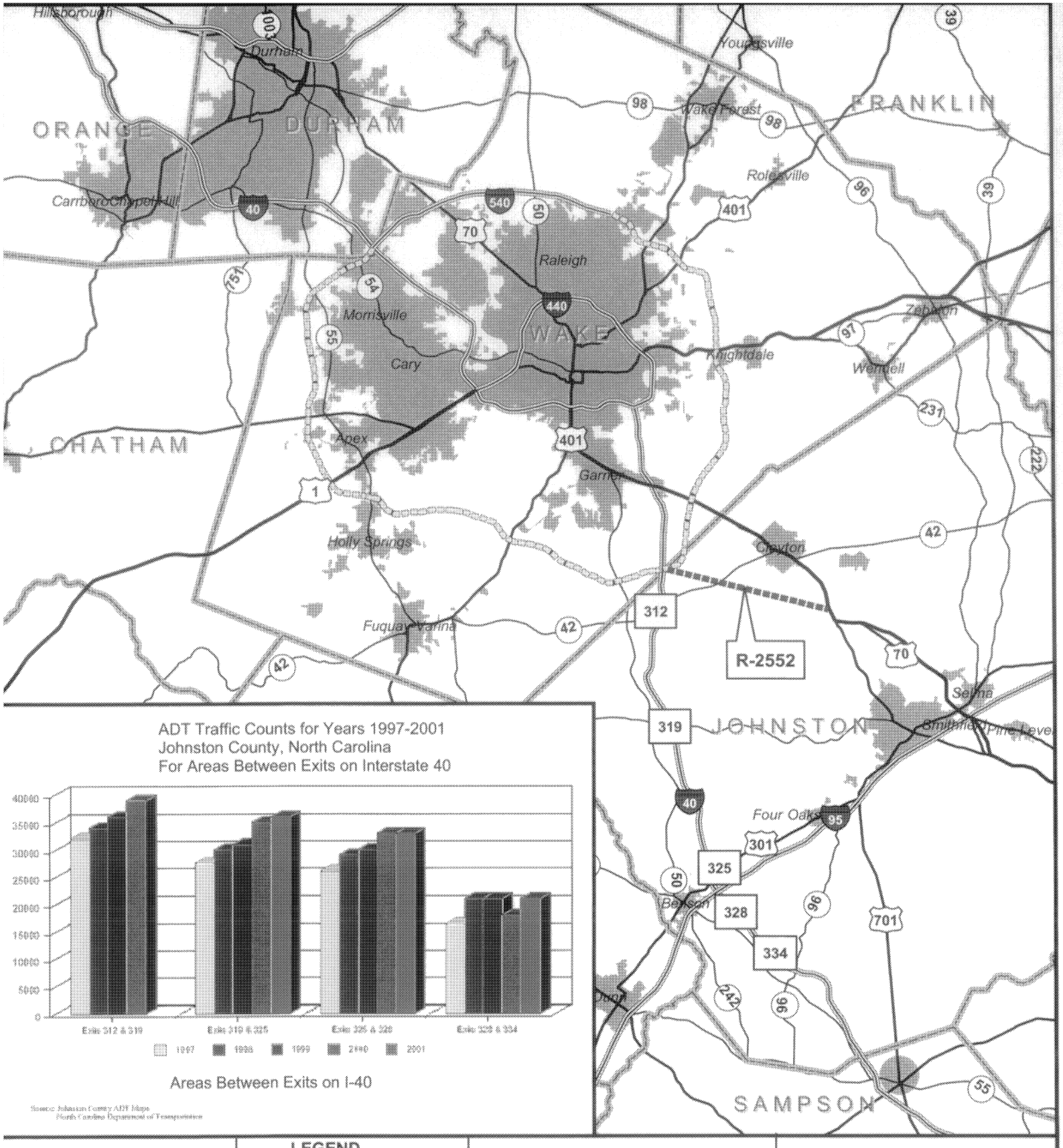
Morrisville, NC

Map Data Sources:
CAMPO, Raleigh, NC
ESRI Inc.
Date: November 2003



URS
URS Corporation - North Carolina
Morrisville, NC

Map Data Sources:
Johnston County, NC
ESRI Inc.
Date: November 2003

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JOHNSTON & WAKE COUNTIES, NC

Figure 9
1997-2001 I-40 ADT

It is notable that along this corridor, as distance from Wake County increases, the ADT (Average Daily Traffic) yearly counts decrease. Also, between 1997 and 2001 ADT increased successively for areas between exits 312 and 319, 319 and 325, and 325 and 328, although, between exits 328 & 334, ADT has remained fairly constant.

Net commuting and commuting ratios for the Triangle are shown in Table 12 for the years1980, 1990, and 2000. Between 1980 and 2000, Johnston County's commuting ratio decreased from 0.799 to 0.658, this movement is evident as bedroom communities see increasing residential development occurring further away from established employment centers. Also supporting Johnston County's designation as a bedroom community, in year 2000, 23,628 workers commuted daily from Johnston to Wake County; one of the highest worker flows in the state[xx].

Table 12: Net Commuting and Commuting Ratio, Triangle Counties

County	2000		1990		1980	
	Net Commuting	Commuting Ratio	Net Commuting	Commuting Ratio	Net Commuting	Commuting Ratio
Chatham	-7,756	0.685	-5,539	0.732	-3,804	0.751
Durham	53,615	1.477	33,910	1.356	11,375	1.168
Franklin	-10,067	0.548	-8,627	0.500	-4,711	0.592
Johnston	-20,044	0.658	-12,882	0.687	-5,867	0.799
Orange	-1,711	0.972	-1,294	0.974	-1,109	0.968
Wake	21,565	1.064	12,762	1.054	12,196	1.087

Net Commuting – The difference between persons working in the county and employed residents of the county. Also, the difference between in-commuters and out-commuters.
Commuting Ratio – The ratio of persons working in the county to employed residents of the county. A value of one implies zero net commuting; a value greater than one corresponds to net in-commuting; less than one, to net out -ommuting.
Source: North Carolina State Data Center

Average commuting (work trip) travel time in the United States has remained fairly constant over the last three decades with a 15.9 percent (3.5-minute) increase in one-way travel time between 1969 and 2000 although, within the Raleigh-Durham MSA travel time to work has increased by 23.1 percent (4.7 minutes) in just ten years (1990-2000)[xxi]. This relatively rapid increase in travel time is indicative of travel demand outpacing capacity, sprawling development patterns, and correlates with population growth in the area. With population projected to increase by over 70 percent in Johnston and Wake counties between 2000 and 2020, travel time can also be expected to increase.

Table 13 shows commuter characteristics for municipalities within the study area. Located in northern Johnston County, 71.7 percent of workers living in the Town of Clayton commute outside their county of residence. This is in contrast to the Town of Smithfield, approximately 12 miles south of Clayton, where only 28.2 percent of workers worked outside of Johnston County. Although other factors may exist, this difference can ostensibly be attributed to proximity (as measured in travel time) to Durham and Wake counties' employment centers.

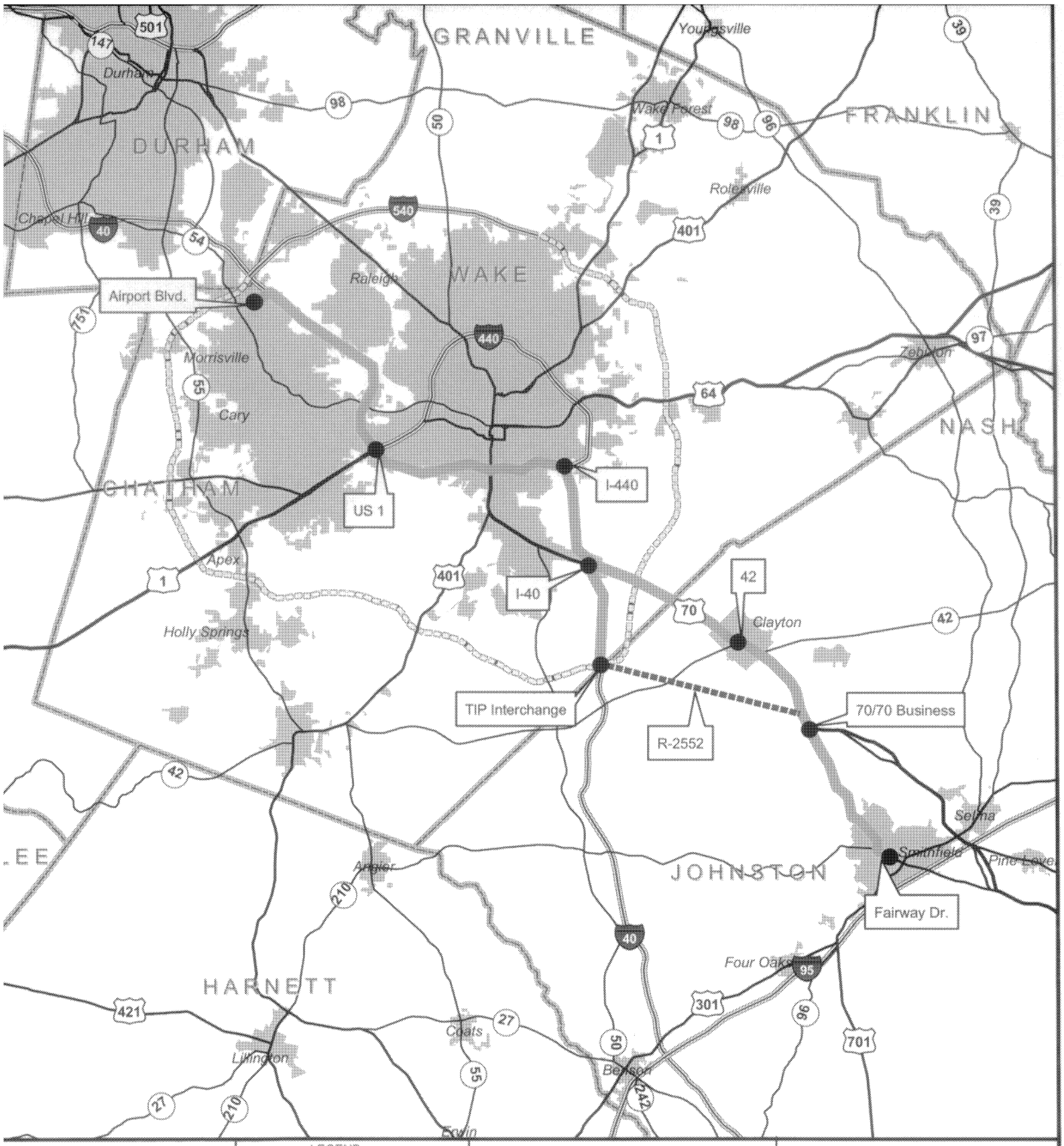
Table 13: Commuter Characteristics

Geography	Workers 16 years and over; Who did not work at home-mean travel time to work (minutes)	Workers 16 years and over; Percent worked outside county of residence
Garner, Wake County	24.9	14.1
Clayton, Johnston County	33.4	71.7
Wilson's Mills, Johnston County	28	45
Smithfield, Johnston County	22.8	28.2

Source: 2000 US Census, American Fact Finder

3.6.2.2. ICE Commute Study

To better understand the likely magnitude and probability of induced development a commute study was conducted between the study area and the regional employment center of RTP; Figure 10 shows the commute study route. Table 14 shows results from the commute study.



LEGEND

- Proposed Clayton Bypass
- Proposed I-540
- US Highway
- State Highway
- Interstate Highway
- Study Route
- Route Checkpoint
- Urban Area
- Boundary, County

Johnston and Wake Counties

North Carolina Counties

N

0 1.252.5 5 7.5 10

Miles

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Morrisville, NC

Map Data Sources:
Johnston County, NC
ESRI inc.
Date: November 2003

Figure 10
Commute Study Route

Table 14: Commute Study Results

Intersection/Checkpoint*	9/16/03 AM			9/16/03 PM			9/17/2003 AM			9/17/2003 PM			9/23/2003 PM			9/30/2003 AM			9/30/2003 PM		
	Time	Min.	Mile	Time	Min.	Mile	Time	Min.	Mile	Time	Min.	Mile	Time	Min.	Mile	Time	Min.	Mile	Time	Min.	Mile
Fairway Dr.	7:00 AM	0	0	5:54 PM	7	40.1	7:00 AM	0	0				6:03 PM	7	40.2	7:00 AM	0	0	5:47 PM	7	40.2
70/70 Business	7:07 AM	7	4.9	5:47 PM	4	34.6	7:06 AM	6	4.9				5:56 PM	4	34.6	7:06 AM	6	4.9	5:40 PM	3	35
NC 42	7:11 AM	4	8.7	5:43 PM	23	31.6	7:10 AM	4	8.7	"MAJOR ACCIDENT"			5:52 PM	21	31.5	7:10 AM	4	8.6	5:37 PM	20	31.9
I-40	7:28 AM	17	17	5:20 PM	7	18	7:31 AM	21	17	5:32 PM	14	18.5	5:31 PM	8	18	7:28 AM	18	16.8	5:17 PM	8	18.7
I-440	7:33 AM	5	20.6	5:13 PM	1	9.9	7:36 AM	5	20.6	5:18 PM	0	10.1	5:23 PM	1	10.3	7:32 AM	4	21.1	5:09 PM	0	10.6
US 1	7:43 AM	10	29.5	5:12 PM	12	9.7	7:47 AM	11	29.5	5:18 PM	18	10	5:22 PM	22	9.5	7:40 AM	8	29.6	5:09 PM	9	9.9
Airport Blvd.	7:57 AM	14	40	5:00 PM	0	0	8:02 AM	15	40.1	5:00 PM	0	0	5:00 PM	0	0	7:56 AM	16	40.2	5:00 PM	0	0
Travel Time**		57			54			62						63			56			47	
Miles			40			40.1			40.1						40.2			40.2			40.2
Average Travel Time		56.5																			

*Route: 70 Business-70-40-Airport Blvd. (Between Smithfield and RTP)
**9/16/03 AM 70 stop and go through Clayton to 40; 3 light cycles at Auburn Knightdale, 40 stop and go before 440 and US1 (overall average delays, no known accidents, sunny)
**9/16/03 PM Auburn Knightdale slow and/or stop and crawl to Guy Rd; 2 light cycles at Guy Rd; stop and go through Clayton to NC 42 (overall average delays, no known accidents, sunny)
**9/17/03 AM 70 stop & go through Clayton; 2 light cycles at Amelia Church Rd; stop & crawl Guy Rd to Auburn Knightdale; 3 to 4 light cycles at Auburn Knightdale; stop & crawl just before Gorman St to Wade Ave split (overall average delays, no known accidents, sunny)
**9/17/03 PM Major accident at 40/70 interchange causing gridlock, aborted survey.
**9/23/03 PM Minor accident I-40 just before Wade Ave; 2 light cycles at Shotwell in Clayton; stop and go Clayton; sunny conditions.
**9/30/03 AM Stop and go through Clayton; 3 light cycles at Auburn-Knightdale; slow US 1 to Wade Avenue; sunny conditions.
**9/30/03 PM Free flowing traffic throughout commute.

Intersection/ Checkpoint*	9/15/03 AM			9/15/03 PM		
	Time		Mile	Time		Mile
I-40/Wake/Jhnst Brdr.	7:15	0:00	0	5:35	0:05	4.4
70	7:20	0:05	4.4	5:30	0:00	0
Travel Time**		0:05			0.05	
Miles			4.4			4.4

*Along I-40
**9/15/03 AM: Free flowing traffic at posted speed limit
9/15/03 PM: Free flowing traffic at posted speed limit

Source: URS

The commute study demonstrates the increased access the project will provide. Table 15 shows current travel times plus the estimated timesavings provided by the bypass. As shown in Table 15, the bypass will provide substantial timesavings to commuters. The bypass will also initially relieve congestion on 70 through the Clayton area, thus improving traffic flow and travel times. The results of this commute study are considered in the GIS land use analysis in conjunction with likely bypass interchange catchment areas.

Table 15: Estimated Commute with Clayton Bypass

Segments of Commute*	Min.**	Miles
Fairway Dr. - Clayton Bypass/70	6.7	4.9
70 - 40	9.5	9.5
40-40/70	5.0	4.4
40/70 - 440	6.2	3.6
40/440 -1	5.2	8.9
40 - Airport Blvd.	14.7	10.6
Travel Time	47.2	
Miles		41.9

Source: URS

* Route: 70 Business - Clayton Bypass - 40/440 - Airport Blvd.

** Average travel times from URS Commute Study; Clayton Bypass segment estimated at 60 mph.

Major accidents causing substantial delays not factored in.

Survey of commuters showed major accidents or other substantial delays occurred on average once a week.

SUMMARY

Commute existing roadways	47 to 63 + min.
Avg. commute existing roadways	56.5
Estimated commute time with Clayton Bypass	47.2

3.6.3. Encroachment Alteration Effects Analysis

Encroachment-alteration effects can be classified into three basic categories:

- Effects related to characteristics of the proposed project; and
- Effects related to other actions in the study area; and
- Effects related to induced development.

Analysis of encroachment alteration effects involved a combination of cartographic techniques and carrying capacity analysis discussed below and presented in mapping throughout this report:

- *Cartographic Techniques* – Successive layers of map overlays depicting notable features and areas where effects are anticipated are used in evaluating encroachment- alteration effects attributable to proposed actions or induced activity.

- *Carrying Capacity Analysis* - This analysis involves determining capacity of resource systems and the thresholds beyond which sustainability becomes threatened. Combined with GIS cartographic techniques, land use was evaluated by density, uses permitted, and the likelihood of change in future land use plans in response to development pressures. This technique is also used in the water quality and biological assessment studies for the Clayton Bypass Indirect and Cumulative Effects Analysis.

3.6.4. Indirect/Cumulative Effects Analysis Summary

Table 16 presents a summary of direct, indirect, and cumulative effects of the project.

Table 16: Summary of Direct, Indirect, and Cumulative Effects

Impact Type	No-Action Future Conditions (*Conditions Without the Proposed Action*)		Impacts of the Proposed Action (*Incremental Effect of the Proposed Action*)			Cumulative Effect (*Future Conditions with the Proposed Action*)
	Other Past / Present Action	Other Future Actions	Direct Impacts	Indirect Effects: Encroachment Alteration Effects	Indirect Effects: Effects Related to Induced Growth	
Habitat Fragmentation / Degradation	TBD	TBD	TBD	TBD	TBD	TBD
Ecosystem Disruption	TBD	TBD	TBD	TBD	TBD	TBD
Natural Process Disruption	TBD	TBD	TBD	TBD	TBD	TBD
Water Quality	TBD	TBD	TBD	TBD	TBD	TBD
Community Cohesion	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Alteration of Travel Patterns	Positive	Positive	Positive	Positive	Negligible	Positive

KEY: Low Adverse Effect Moderate Adverse Effect High Adverse Effect
Positive Effect Negligible Effect
TBD To Be Determined as part of Biological Assessment and Water Quality Modeling

3.7. Step 7 – Analysis Results Evaluation

3.7.1. Overview

Long-range population and employment projections at the sub-county level are conducted by metropolitan planning organizations (MPOs). The Capital Area Metropolitan Planning Organization's (CAMPO) Triangle Regional Travel Demand Model (TRTDM) measures regional travel demand for the project area. Employment, housing, household size and median household income growth models and projections were developed by CAMPO for the TRTDM study areas including all, or portions of Wake, Chatham, Franklin, Harnett, and Johnston Counties. Figure 11 shows 2025 housing (dwelling unit) density by Traffic Analysis Zone (TAZ) and new dwelling units projected. Figure 12 shows 2025 employment density by TAZ and new employees projected. Both figures show considerable new development projected in the project area. Project area commute characteristics and regional travel demand are interdependent forces that both react to and influence regional development. Greater accessibility of one geographic area relative to other areas in the metropolitan region makes it more attractive for development. In projecting this future development, the TRTDM considered the increased access the project would provide to the northwest sections of Johnston County.

3.7.2. Future Land Use Analysis

GIS analysis used in evaluating effects attributable to proposed actions or induced activity provides cartographic representation of effects and associated land use data. The methodology used for determining future (2025) land use (Appendix D) uses CAMPO population and employment projections together with results from this study's Delphi panel. Figure 13 shows future land use without the bypass; Figure 14 shows future land use with the bypass.

Although the project will generally accelerate growth in the study area by providing improved access to the highway network, due to existing growth trends, the study area would likely experience substantial development regardless of the project. Projected increases in population will result in the expansion of residential areas accompanied by decreases in agricultural land, pastureland, and forestland.

The main indirect and cumulative effects the project will have on land use will be in interchange catchment areas. Commercial development in these interchange areas will likely be in the form of highway related retail such as gas stations, hotels, fast-food restaurants and other convenience related services. Residential development pressure will increase within areas that, prior to the project did not have expedient access to the highway system. Interchange impacts are described as follows:

- *US 70 Business/US 70/Clayton Bypass* – Current land use in this proposed interchange area is a mix of commercial, forested/wetlands, residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels. Due to improved access to the highway system, increased commercial development is also likely in the corridors between this interchange and the Town of Clayton and between this interchange and the Town of Smithfield. Current and potential future land use with Clayton Bypass is shown in Figure 15.

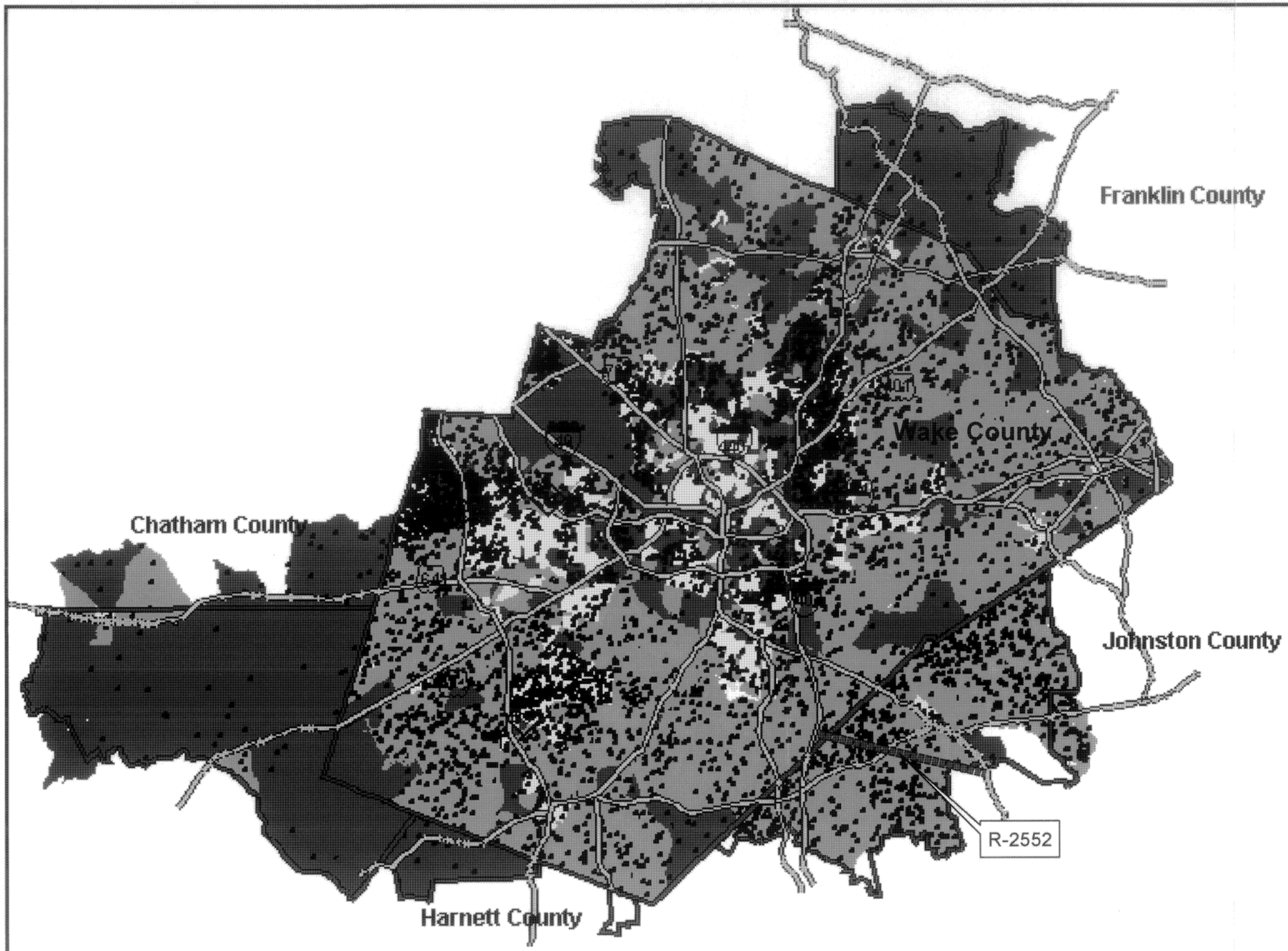

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FIGURE 11
2025 HOUSING
(DWELLING UNITS)

TRIANGLE REGIONAL
TRAVEL DEMAND MODEL

Proposed Highway *

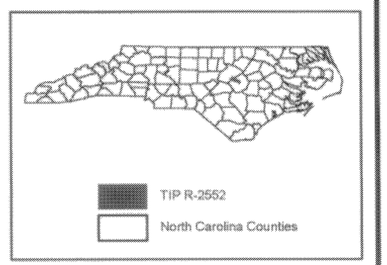
DU Difference 2025-1995
● = 50 New Dwelling Units

DU Density 2025

- 0.00 to 0.18
- 0.18 to 0.50
- 0.50 to 1.19
- 1.19 to 2.30
- 2.30 to 50.00

N

Not to Scale



URS

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Map Data Sources: Source: Capital Area Metropolitan Planning Organization (CAMPO), 2004

* Proposed highway considered in housing projections.

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FIGURE 12
2025 EMPLOYMENT

TRIANGLE REGIONAL
TRAVEL DEMAND MODEL

Proposed Highway *

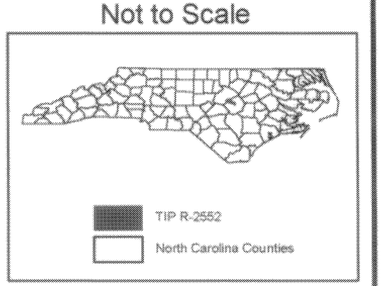
EMP Difference 2025-1995
● = 100 New Employees

Employment Density 2025

- 0.00 to 0.06
- 0.06 to 0.20
- 0.20 to 0.86
- 0.86 to 3.80
- 3.80 to 500
- Other

N

Not to Scale



URS

URS Corporation - North Carolina
Morrisville, NC

Map Data Sources: Source: Capital Area Metropolitan Planning Organization (CAMPO), 2004

* Proposed highway considered in housing projections.

TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE
COUNTIES, NC

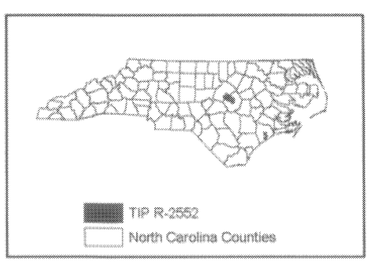
Figure 13
Study Area
Future 2025 Land Use
Without Bypass

- COUNTY
- COMMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

N

0 1 2 3

Miles



URS

URS Corporation - North Carolina
Morrisville, NC

Map Data Sources: Johnston County, NC; ESRI Inc.
Date: November 2003

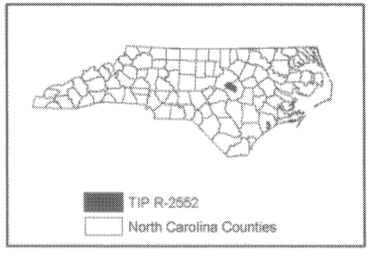
TIP R-2552
CLAYTON BYPASS
JOHNSTON & WAKE
COUNTIES, NC

Figure 14
Study Area
Future 2025 Land Use
With Bypass

PROPOSED CLAYTON BYPASS
PROPOSED I-540
COUNTY
COMMMERCIAL
CROPLAND
HOUSE20
HOUSE25
HOUSE30
HOUSE38
HOUSE65
INDUSTRIAL
PATURE
WATER
WOODG
WOODS
ROAD

N

0 0.5 1 2 3
Miles



URS

URS Corporation - North Carolina
Morrisville, NC

Map Data Sources: Johnston County, NC; ESRI Inc.
Date: November 2003

CURRENT LAND USE

US 70

US 70

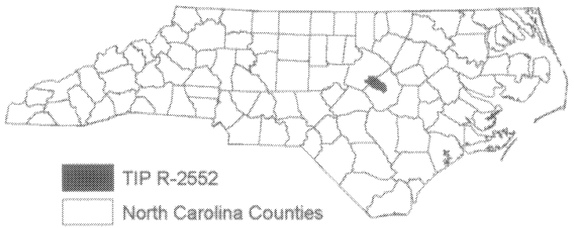
US 70 BUSINESS

FUTURE LAND USE WITH BYPASS

US 70

US 70

US 70 BUSINESS



PROPOSED CLAYTON BYPASS
PROPOSED I-540
COUNTY

LAND USE BY PARCEL

- COMMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

Map Data Sources: Johnston County, NC; ESRI Inc., November 2003

0 0.125 0.25 0.5
Miles

N

URS

URS Corporation - North Carolina
Morrisville, NC

FIGURE 15

US 70 BUSINESS/US 70/ CLAYTON BYPASS CURRENT AND FUTURE 2025 LAND USE WITH BYPASS TIP R-2552 JOHNSTON & WAKE COUNTIES, NC

- *SR 1560/Clayton Bypass* – Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels as well as an increase in residential development intensity and density. Current and potential future land use with Clayton Bypass is shown in Figure 16.

- *NC 42/Clayton Bypass* - Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. Future land use with the project is likely to include a change to commercial development in various adjacent land parcels as well as an increase in residential development intensity and density. Current and potential future land use with Clayton Bypass is shown in Figure 17.

- *I-40/I-540/Clayton Bypass* - Current land use in this proposed interchange area is a mix of forested/wetlands, low density residential and agricultural uses. This proposed interchange is a fully directional system interchange; therefore, adjacent land use will not be affected to the same extent as the aforementioned interchanges. Although, some adjacent land uses will likely experience commercial development pressure due to the increased visibility of the land. Current and potential future land use with Clayton Bypass is shown in Figure 18

- *NC 42/I-40* - Current land use in this existing interchange area is primarily commercial uses with a mix of forested/wetlands, low density residential and agricultural uses surrounding the commercial area. Future land use with the project is likely to include an expanded commercial area to serve the proposed I-40/I-540/Clayton Bypass interchange approximately 2 miles to the north. Current and potential future land use with Clayton Bypass is shown in Figure 19.

The effects of this development on ground water and surface water resources are complex. The increased proportion of the study area devoted to urban land uses will be accompanied by more wells that extract water, more impervious surfaces that block or redirect recharge, and more storm drains that divert precipitation into streams instead of aquifers. Over time, this can alter the availability and quality of hydrologic resources, both groundwater and surface water. Modifications in land use may also affect the proportions of ground water and surface runoff in rivers and streams, which can affect the chemistry, temperature, and general quality of the water for wildlife and for recreation[xxii].

CURRENT LAND USE

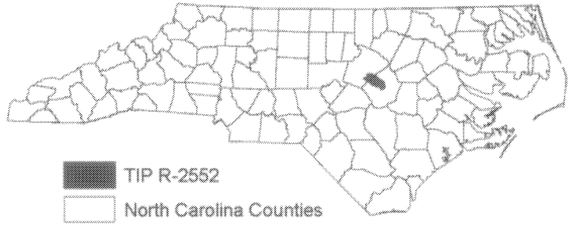
SR 1560

SR 1560

FUTURE LAND USE
WITH BYPASS

SR 1560

SR 1560



PROPOSED CLAYTON BYPASS
PROPOSED I-540
COUNTY

LAND USE BY PARCEL
COMMMERCIAL
CROPLAND
HOUSE20
HOUSE25
HOUSE30
HOUSE38
HOUSE65
INDUSTRIAL
PATURE
WATER
WOODG
WOODS
ROAD

Map Data Sources: Johnston County, NC; ESRI Inc., November 2003

0 0.125 0.25 0.5
Miles

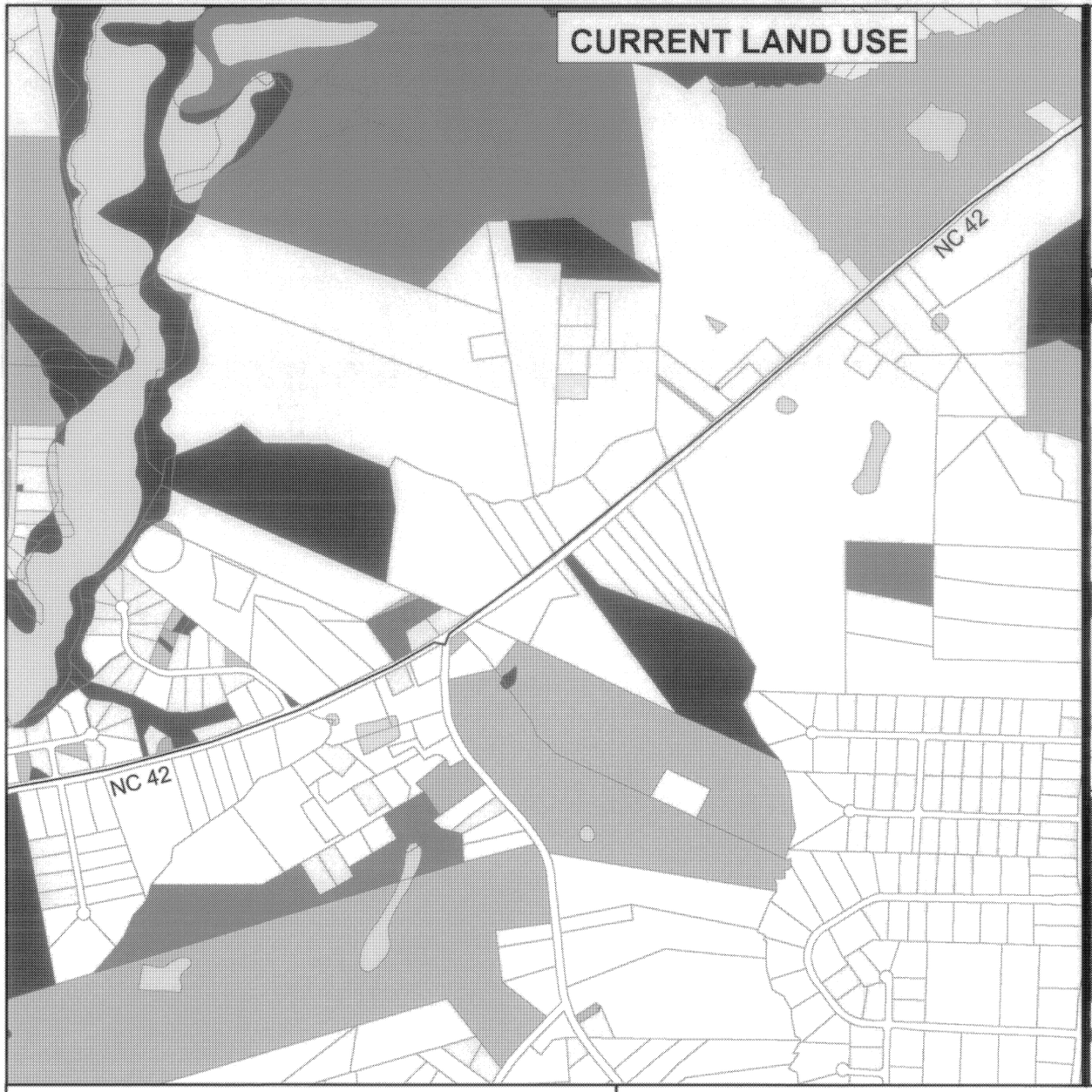
N

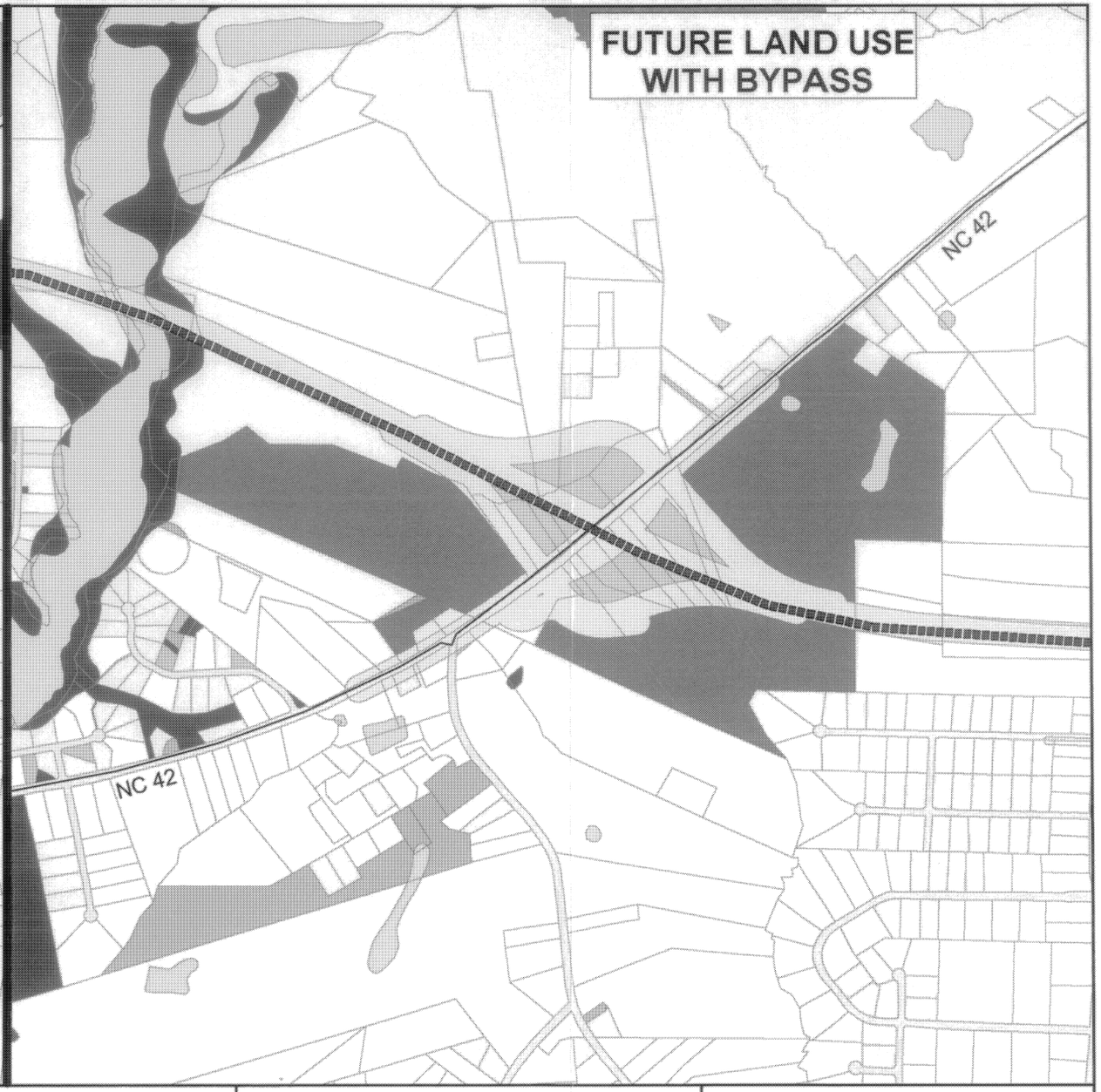
URS

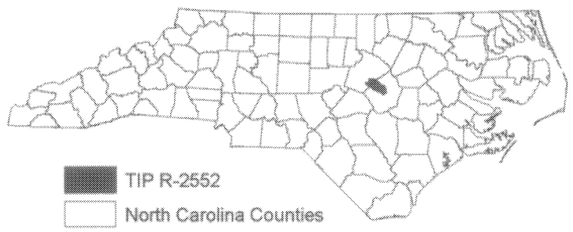
URS Corporation - North Carolina
Morrisville, NC

FIGURE 16

**SR1560/
CLAYTON BYPASS
CURRENT AND FUTURE 2025
LAND USE WITH BYPASS
TIP R-2552
JOHNSTON & WAKE
COUNTIES, NC**







PROPOSED CLAYTON BYPASS
PROPOSED I-540
COUNTY

LAND USE BY PARCEL

- COMMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

Map Data Sources: Johnston County, NC; ESRI Inc., November 2003

0 0.125 0.25 0.5
Miles

URS

URS Corporation - North Carolina
Morrisville, NC

N

FIGURE 17

**NC 42/
CLAYTON BYPASS
CURRENT AND FUTURE 2025
LAND USE WITH BYPASS
TIP R-2552
JOHNSTON & WAKE
COUNTIES, NC**

CURRENT LAND USE

FUTURE LAND USE WITH BYPASS

I-40

I-540

WAKE COUNTY

JOHNSTON COUNTY

TIP R-2552

North Carolina Counties

PROPOSED CLAYTON BYPASS

PROPOSED I-540

COUNTY

LAND USE BY PARCEL

- COMMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

Map Data Sources: Johnston County, NC; ESRI Inc., November 2003

0 0.125 0.25 0.5

Miles

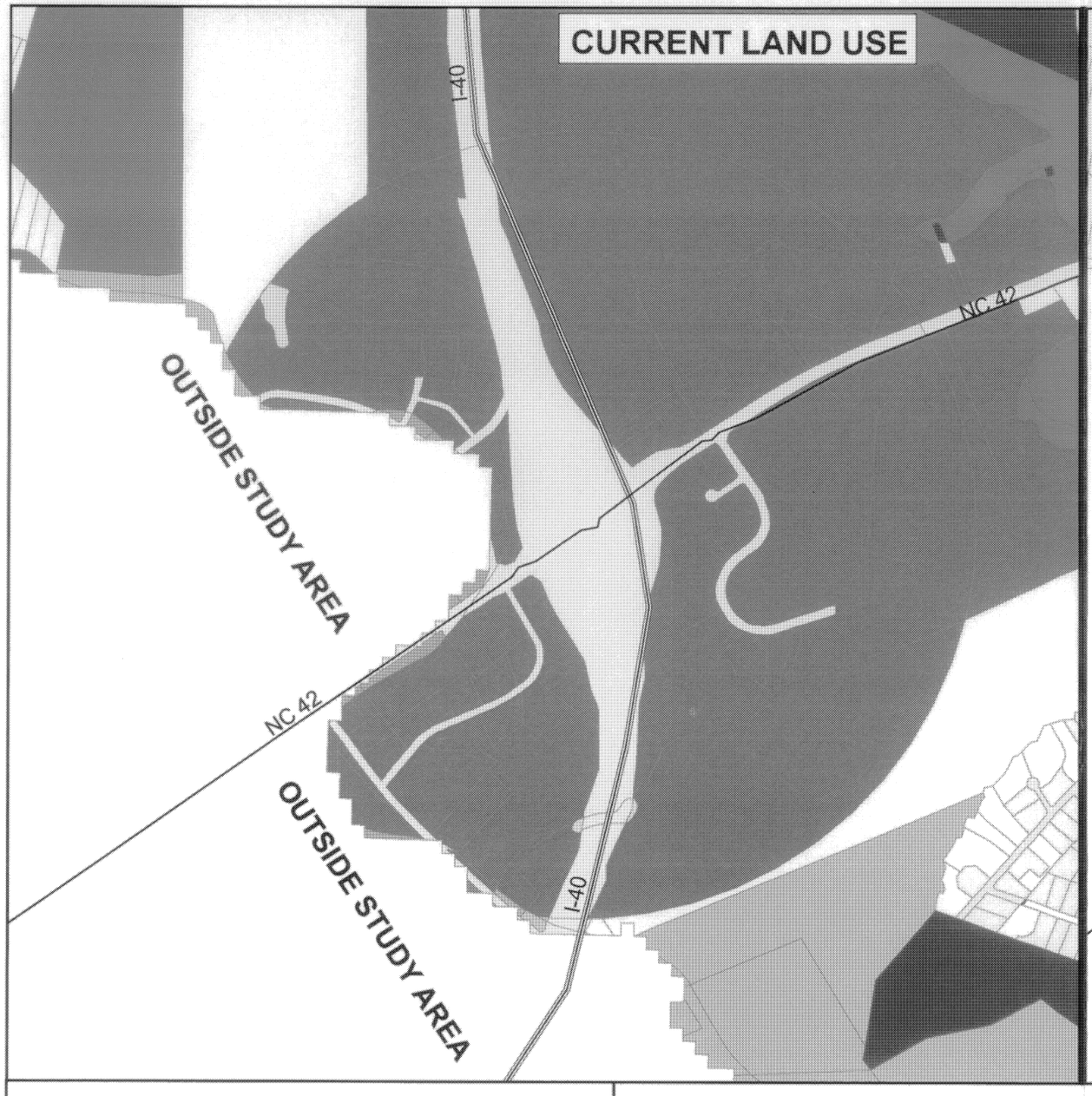
N

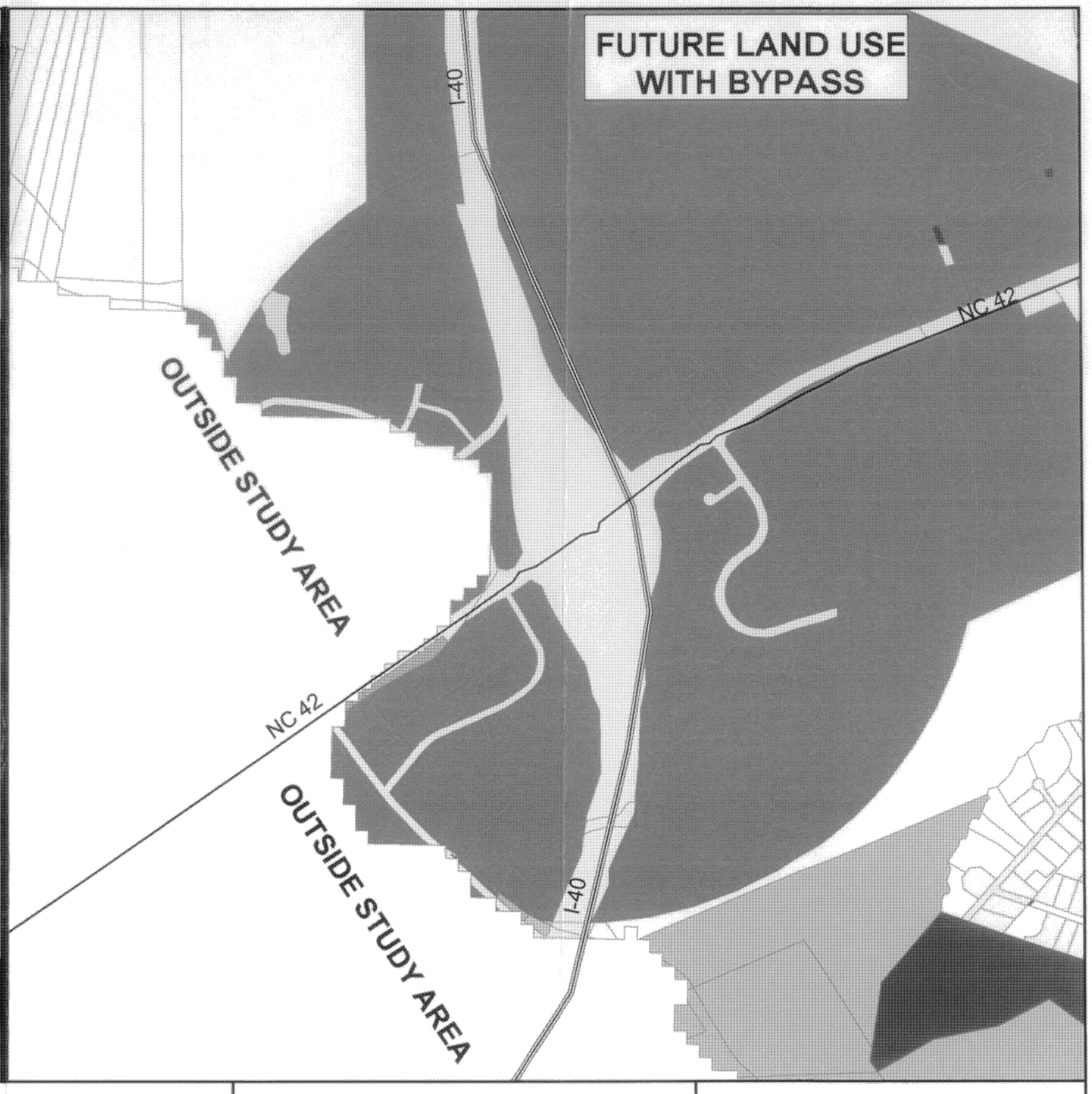
URS

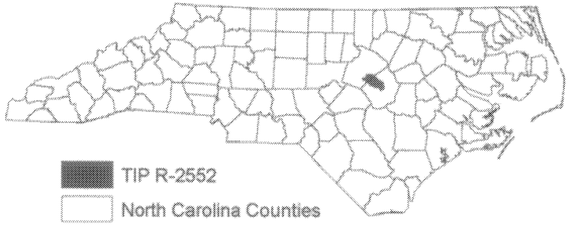
URS Corporation - North Carolina
Morrisville, NC

FIGURE 18

I-40/I-540/ CLAYTON BYPASS CURRENT AND FUTURE 2025 LAND USE WITH BYPASS TIP R-2552 JOHNSTON & WAKE COUNTIES, NC







PROPOSED CLAYTON BYPASS
PROPOSED I-540
COUNTY

LAND USE BY PARCEL

- COMMMERCIAL
- CROPLAND
- HOUSE20
- HOUSE25
- HOUSE30
- HOUSE38
- HOUSE65
- INDUSTRIAL
- PATURE
- WATER
- WOODG
- WOODS
- ROAD

Map Data Sources: Johnston County, NC; ESRI Inc., November 2003

0 0.125 0.25 0.5
Miles

N

URS

URS Corporation - North Carolina
Morrisville, NC

FIGURE 19

**NC 42/I-40/
CLAYTON BYPASS
CURRENT AND FUTURE 2025
LAND USE WITH BYPASS
TIP R-2552
JOHNSTON & WAKE
COUNTIES, NC**

3.7.3. Conclusions

- Due to past development trends and favorable growth potential for the region, the study area would likely experience considerable development regardless of whether or not the project is built.
- The potential for substantial growth generated by the project would mainly be limited to new interchange catchment areas within the study area. Although, locations to the south and east of the study area may also experience development pressure due to increased accessibility to regional employment centers.
- Project-induced growth is likely to occur in the form of highway-oriented retail and residential development, replacing agricultural and forested/green space areas.
- Potential cumulative impacts to the nutrient sensitive waters of the Neuse River Watershed from projected development activity will be limited through application of the North Carolina Division of Water Quality Neuse Rules, National Pollutant Discharge Elimination System permitting requirements, zoning ordinances implemented by the Town of Clayton, Town of Smithfield and Johnston County, and best management practices. These will benefit the project by being real-life solutions currently implemented throughout the area to protect water resources i.e. there are many cost-effective solutions to choose from that do not sacrifice other land uses - thus property owners, farmers and/or developers are more inclined to commit to using BMPs and improve local water quality.
- Watershed rules as they maintain and enhance the quality of water resources, allow no further degradation of water quality, while allowing limited watershed development in water supply watersheds. Thus having these measures in place will limit long-term cumulative impacts as growth is already regulated by the watershed rules.
- The magnitude of adverse cumulative impacts to natural resources as a result of the incremental effects of the project combined with those of other past, present, and future development activities, is to be determined upon completion of the Biological Assessment and Water Quality Modeling tasks.
- Should impacts to study area natural resources be identified as substantially adverse by the Biological Assessment and Water Quality Modeling, stricter regulatory controls and avoidance and mitigation strategies should be developed.

3.8. Step 8 – Assessing the Consequences/Mitigation Development

The purpose of this step is to assess the consequences of effects and determine the need for modifications to avoid effects, or strategies to mitigate unavoidable effects. Step eight is also the fourth activity of the Delphi process.

General direction for assessing consequences and mitigation development is provided in the *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Volume II: Practitioners Handbook*. When the Biological Assessment and Water Quality Modeling tasks are completed and a comprehensive understanding of likely effects of the project is available, this guidance should be utilized by participating

agencies and affected municipalities to develop appropriate avoidance and mitigation strategies.

[i] "The State of the Cities 2000," U.S. Department of Housing and Urban Development.
[ii] *Highways and Sprawl in North Carolina*,
http://www.johnlocke.org/acrobat/policyReports/highways-report-summary.pdf, January 2004.
[iii] US Census 2000, www.census.gov visited August 2003
[iv] Information for Developers, www.co.johnston.nc.us.com, visited August 2003
[v] Bureau of Economic Analysis (accessed through LINC),
http://data.osbm.state.nc.us/pls/linc/dyn_linc_topic_reports.show accessed August 2003
[vi] 15A NCAC 2B .0223, .0234, .0235 *(1995 (Reg. Sess., 1996) N. C. Session Laws, c. 572)*
[vii] NCGS 143-214.5 *(1989, c. 426, s. 1; 1991, c. 342, s. 9; c. 471, s. 2; c. 579, s. 1; 1991 (Reg. Sess., 1992), c. 890, s. 14; 1998-215, s. 62.)* and 143-214.6 *(1989, c. 426, s. 2, c. 603, s. 2, c. 727, s. 159; 2001-452, s. 1.2.)*
[viii] 15A NCAC 02B .0100 & .0200 *(Amended Effective: April 1, 2003)*
[ix] Johnston County, North Carolina - Code of Ordinances, Chapter 14 (Codified through Amendment of Nov. 3, 2003. Supplement No. 3, Update 3)
[x] NCDENR's *Neuse River Basinwide Water Quality Plan,* (July 2002)
[xi] NCDENR's *Neuse River Basinwide Water Quality Plan,* (July 2002)
[xii] Irwin and Rodes (1990)
[xiii] Forman and Godron (1986)
[xiv] NCDENR's *Neuse River Basinwide Water Quality Plan,* (July 2002)
[xv] *Triangle Greenprint Project: Open Spaces in the Triangle,* www.trianglegreenprint.org, visited September 2003.
[xvi] *Guidelines and Principles For Social Impact Assessment*, The Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994
[xvii] *US Hispanic population keeps surging after census*,
http://newsobserver.com/news/story/2878702p-2654054c.html, January 2004.
[xviii] Phone interview with Keri Reed, Town of Clayton Planner, January 2004.
[xix] Phone interview with Keri Reed, Town of Clayton Planner, January 2004.
[xx] North Carolina State Data Center, 2003.
[xxi] *National Personal Transportation Survey* (US Department of Transportation),
www.publicpurpose.com,
visited September 2003 and US Census 2000, www.census.gov , visited September 2003.
[xxii] USGS, http://water.usgs.gov/pubs/circ/circ1186/html/intro.html, January 2004.

APPENDIX A

Study Area Delineation

URS

M E M O R A N D U M

To: Project File (Q31823363_Clayton)

From: Duane Verner

CC: Attendees (see list below)

Date: August 20, 2003

Subject: ***Clayton Bypass ICI (TIP No. R-2552)***
Project Kick-Off Meeting/Study Area Identification, August 20, 2003, 9:30 A.M., NCDOT Office of Human Environment, Raleigh, NC

ATTENDEES:

Bob Deaton, AICP – NCDOT
Matt Haney – NCDOT
Teresa Townsend – NCDOT
Gordon Cashin – NCDOT
Alice Gordon - NCDOT
Matt Cusack - EcoScience
Jeff Weisner, AICP – URS
Duane Verner - URS

The subject meeting was held to kick-off the Clayton Bypass Indirect and Cumulative Impact (ICI) project and to identify the primary ICI assessment study area.

Opening discussion revolved around identifying a study area for water quality modeling. The watershed subbasins within a five-mile radius surrounding the Clayton Bypass was introduced as the initial/general study area. Delineation of the boundaries resulted in refining the initial study area to have a western boundary at Lake Benson Dam and the Town of Garner, and the eastern boundary at the Town of Smithfield. Northern and southern boundaries are mostly congruent with the Swift Creek Watershed. A natural areas mitigation site was also identified within the western end of the study area.

Other issues discussed:

- Army Corps of Engineers must be on board with all ICI projects

Memorandum/Project File
August 20, 2003

- Possible use of LIDAR mapping
- ICI projects as partnership between DOT and DWQ
- Coordination with other agencies that may have interest in the project, i.e. USFWS, WRC

Actions required:

Matt Cusack will:

- Create USGS study area map for submittal to DWQ and distribution to study team

DOT will:

- Schedule meeting with DWQ

URS will:

- Proceed with demographic and land use analysis under the assumption that the study area delineated during the meeting will be accepted by DWQ

DRV

URS

M E M O R A N D U M

To: Project File (Q31823363_Clayton)

From: Duane Verner

Date: September 24, 2003

Subject: ***Clayton Bypass ICI (TIP No. R-2552)***
Study area Confirmation Meeting
NCDOT Office of Human Environment, NC

ATTENDEES:

Bob Deaton, AICP - NCDOT
Teresa Townsend – NCDOT
Matt Haney - NCDOT
Jeff Weisner, AICP - URS
Duane Verner - URS
Matt Cusack – Ecoscience
John Hennessy - DWQ

The subject meeting was held to confirm that the Clayton Bypass Indirect and Cumulative Impact (ICI) project study area meets with DWQ goals and objectives for the study.

Opening discussion revolved around the underlying logic used to delineate the study area for water quality modeling. Watershed subbasins within a five-mile radius surrounding the Clayton Bypass was reiterated as the initial/general study area. Delineation of the boundaries resulted in refining the initial study area to have a western boundary at Lake Benson Dam and the Town of Garner, and the eastern boundary at the Town of Smithfield. Northern and southern boundaries are mostly congruent with the Swift Creek Watershed. A natural areas mitigation site was also identified within the western end of the study area. These boundaries also proved to be appropriate for land use projection tasks as they conformed to likely commuteshed expansion as a result of the Clayton Bypass.

The meeting adjourned with consensus between the agencies and consultant team regarding the study area boundaries as previously agreed to at the project kick-off meeting of August 20, 2003.

Memorandum/Project File
September 24, 2003

Actions required:
URS will:

- Proceed with ICI report/mapping according to aforementioned agreements.
- Work with NCDOT and study area municipalities to develop mitigation strategies.

DRV

Q:\31823363_Clayton\Correspondence\File-ROM 9-24-03.doc

URS

M E M O R A N D U M

TO: Project File

FROM: Duane Verner

DATE: January 21, 2004

SUBJECT: Clayton Bypass(R-2552) ICE and Water Quality Studies

ATTENDEES

Jamie Adrignola,– NCDOT
Travis Totten - NCDOT
John Hennessy - DWQ
Alice Gordon – NCDOT
Kim Leight, - URS
Duane Verner – URS

The purpose of this meeting was to present the new Ecoscience/LIDAR derived Clayton ICE study area to John Hennessy of DWQ.

Jamie opened the meeting by briefing John on the study. Duane presented study area maps and explained the study boundary evolution that has taken place over the course of this ICE; specifically, the dropping of the Little Poplar Creek Subwatershed to the Neuse River Basin portion of the study area from the water quality modeling task. Duane also introduced information (as submitted by Ecoscience via email) that there were no 303d streams in the Neuse River Basin portion of the study area.

After some discussion, it was agreed that there would be two separate study areas: a water quality modeling study area focusing exclusively on the Swift Creek LIDAR derived boundary and a larger study area for indirect and cumulative effects assessment that includes the Little Poplar Creek Subwatershed to the Neuse River Basin. Discussion ensued regarding a proper level of assessment of the Neuse River Basin portion of the study area. Alice suggested that Ecoscience, as a result of their data collection and modeling, would have ample information to address indirect and cumulative impacts to the Neuse River Basin. It was then agreed that Ecoscience would address these impacts within their water quality report. This portion of Ecoscience's water quality report is to provide a scientific narrative of probable indirect and cumulative impacts to the Neuse River Basin as a result of the proposed Clayton Bypass. By

addressing the impacts in this manner the entire ICE study area will be addressed in two separate deliverables – one from a land use perspective, and one from a water quality perspective.

Actions Required:

- Ecoscience will address indirect and cumulative effects to the Neuse River Basin portion of the study area through a scientific narrative that utilizes and extrapolates from information attained through the water quality modeling process.
- URS will provide Ecoscience with land use mapping to assist in the abovementioned task.
- URS will change mapping within the ICE document to include the Neuse River Basin portion of the study area and, submit ICE study to NCDOT in a timely manner.

DRV

APPENDIX B

Checklists, Condition Inventories, & Evaluation Matrices

B-1

ORGANIZATION AND TABULATION OF GOALS CHART

(Check where applicable)

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

Social Health and Well-Being Goals	Notes
✓ Achieve adequate, appropriate and accessible open space and recreation.	Clayton's Strategic Growth plan sets forth the following goals: – to be the safest, healthiest city in the Triangle area; – downtown as the community hub; – regional service center; – a place for fun and leisure; – business community diverse and profitable; and – value for taxes and public fees.
___ Comply with state and federal water and air quality laws.	
___ Preserve or create multi-cultural diversity.	
___ Preserve heritage.	
___ Provide choice of affordable residential locations	
___ Provide urban environment for those with special needs.	
___ Promote land use patterns with sense of community.	
___ Provide a range of services accessible to all.	
✓ Promote a healthy and safe environment.	
___ Provide sound management of solid and hazardous waste.	
___ Other.	
Economic Opportunity Goals	Johnston County does not have a Comprehensive or Strategic Growth Plan.
✓ Support activities to meet changing economic conditions.	
___ Provide energy-efficient transportation.	
___ Provide developments with transit-supported capabilities.	Smithfield's Comprehensive Growth Management Plan compiles and inventory of existing land use patterns and recommends goals and objectives for future development that are compatible with the general character of the Town.
___ Target economic export activities.	
✓ Attract and maintain work force.	
___ Promote infill of smaller, passed-over sites.	
___ Encourage redevelopment of older areas for new purposes.	The Clayton Bypass is included in study area thoroughfare plans.
___ Other.	
Ecosystem Protection Goals	
___ Protect ecosystems.	Neuse River Basin Plan – Protect unimpaired waters yet allow of reasonable economic growth. – Restore full use to impaired waters. – Protect high value resource waters.
___ Minimize fragmentation.	
___ Promote native species.	
___ Protect rare and keystone species.	
___ Protect sensitive environments.	
___ Maintain natural processes.	
___ Maintain natural structural diversity.	
___ Protect genetic diversity.	
___ Restore modified ecosystems.	
___ Other.	

	Name	Affiliation	Date
Reviewed by:			

B-2
STUDY AREA DIRECTIONS AND GOALS CHECKLIST

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

1. Generalized Setting

Within Metropolitan Statistical Area (Identify MSA)	✓	Raleigh-Durham-Chapel Hill MSA
Outside of MSA		
Both Inside and Outside MSA		Indicate Distance to Nearest Metropolitan Center _____

2. Characteristics of Transportation System (Note: These items are not intended to cover entire transportation need, but rather to use information from more detailed assessments to provide a preliminary indication of existing accessibility, service and modal interrelationship characteristics, i.e., factors relevant to subsequent indirect effects analysis).

- Identify missing links in transportation system _____
- Map and describe existing level of service on minor and principal arterials and their access characteristics.
- Indicate distance to nearest interstate highway if not in study area.
- Map and describe existing transit routes and demand.
- Map and describe major concentrations of existing and planned development.
- Describe modal interrelationships including competing and complementary characteristics.

3. Population

	Trend	Projection
Declining		
Static (± 1%/10 years)		
Slow Growth		
Rapid Growth (>10%/10 years)	✓	✓

4. Planning Context

	Yes	No	If Yes, identify by title, agency and date
Zoning	✓		Clayton, Wake, and Johnston
State Master Plan		✓	
County / Regional Master Plan		✓	
Municipal Master Plan	✓		Clayton
Water Quality Management Plan	✓		NCDENR, DWQ
Other Natural Resources Management Plan			

5. Describe known plans for major new or expanded activity centers including public facilities. Johnston County Economic Development Zone (US 70 between Clayton and Smithfield). Zone includes manufacturing and a community college.

Is the activity center dependent on transportation system improvement? **Yes** _____ **No** ✓

6. Is the transportation need linked to economic growth and land development? **Yes** ✓ **No** _____

If yes, is the nature of the linkage to:

Serve the needs of planned growth _____ or
Channelize growth _____ or
Stimulate growth _____ or

7 Based on information obtained, are there any apparent conflicts between transportation and other needs that could result in controversy? (Describe)

Yes _____ Possible _____ No ✓

	Name	Affiliation	Date
Reviewed by:			

B-3

ECOSYSTEM CONDITIONS INVENTORY

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

	Setting	Describe/Characterize (Map Locations
	Suburban	
	Landscapes	
	Remnant Communities	
	Greenways	
	Remnant Populations	
	Wetlands and Riparian Zones	
	Drainage Patterns	
	Natural Vegetation Diversity	
✓	Rural	See Figure 2, ICI Study Area and Figure 3, Neuse River Watershed
	Watersheds	.
	Local Ecosystem Integrity	
	Riparian Corridors	
	Endemics and Migratory Species	
	Riparian and Forest Corridors	
	Hydrology	
	Landscape Pattern Diversity	
	Dispersal Routes	
	Wildland	
	Regional Ecosystems	
	Remote Habitat	
	Contiguous Habitat	
	Habitat Interior Species	
	Unique Environments	
	Structural Components of Interior Habitat	
	Sub-Population Movements	

	Name	Affiliation	Date
Reviewed by:			

B-4

SOCIOECONOMIC CONDITIONS INVENTORY

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

	Describe/Characterize
Economic	See Section 3.2.3 Development and Employment. Manufacturing is the major economic activity in Johnston County. Government, educational, and professional services dominate Wake County. In 2000, 23,628 workers that lived in Johnston County worked in Wake County. This is the 4th highest worker flow between counties in North Carolina. In 2000, Johnston County had a commute ratio of .658 and -20,044 net commuters. In 2000, Wake County had a commuting ratio of 1.064 and 21,565 net commuters. Mean travel time to work was 24.7 min. for Wake and 31.3 min for Johnston in 2000.
Residents' Occupational Mix	
Jobs in Community (Mix)	
Jobs/Housing Balance (Self-Containment)	
Income Distribution Mix	
Journey to Work (Length and Mode)	
Job Growth Rate	
Business Ownership and Services Characteristics	
Demographic	Johnston County was the fastest growing county in North Carolina from 1990-2000. Wake County was the second fastest growing.
Population Growth Rate	
Population Age Mix	
Household Types	
Retired Population Percent	
Social	See Section 3.3.3 Socioeconomic Conditions. In 2000, 29.6% of Wake County and 12.3% of Johnson County residents held bachelors degrees compared to 15.3% for the state overall.
Community Cohesion	Housing stock within the study area is mix of newer middle class housing in rural cul de sac developments, low density residential, and early 1900s farms.
Crime Rates	
Clubs, Sports and Organizations Participation	
Education Levels Mix	
Sense of Control Over Change	
Balance of Old Timers and Newcomers	
Physical	See Section 3.2.4.3 Traffic. See Section 3.3.2 Ecosystem Conditions.
Housing Stock Mix and Values	
Open Space Percent	
Town Area and Form	
Separation from Other Activity Centers	
Residential Density	
Mix of Land Uses	
Town Edge Activity	
Historic Structures and Places	
Circulation and Traffic Characterizations	
Neighborhood Design Characteristics	
Infrastructure Character	
Commercial Building Scale	
Town Entrance Setting	
Scenic Character	
Trees and Vegetation Presence	
Noise Levels and Timing	1
Lighting Influence	

	Name	Affiliation	Date
Reviewed by:			

B-5

NOTABLE FEATURES CHECKLIST

(Check where applicable)

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

	Specify
Ecosystem Features	
✓ Regional Habitats of Concern / Critical Areas	Wetland mitigation area streams are important to the survival of threatened and endangered mussels. Water quality is critical to their survival.
✓ Rare, Threatened or Endangered Species and Associated Habitat	
____ Species Requiring High Survival Rates	
____ Species Whose Intrinsic Rates of Increase Fluctuate Greatly	
____ Communities with Vulnerable Keystone Predators or Materialists	
____ Other _____	
Socioeconomic Features	
✓ Substandard Amounts of Open Space and Recreation	Johnston County lacks open space and recreation areas to serve growing population. See *News & Observer* article of 9-16-03: County Studies Dearth of Fields
____ Non-Compliance with State and Federal Environmental Laws	
____ High Concentration of Uncontrolled Solid and Hazardous Waste Sites	
____ Inadequate Affordable Housing	
____ Inadequate Access to Amenities	
____ Economically Distressed Area	
✓ Lack of Institutional Land Use Controls	Johnston County has no adopted Land Use Plan in effect.
____ High Proportion of Population Consisting of:	
____ _____ Minorities	
____ _____ Low-Income Residents	
____ _____ Elderly	
____ _____ Young	
____ _____ Disabled	
____ Low Proportion of Long-Term Residents	
✓ Locations of Poor Traffic Flow	See Section 3.2.4.3 Traffic Capacity, Volumes, and LOS. Also see commuted study in Section 3.6.2.2.
____ Other _____	

	Name	Affiliation	Date
Reviewed by:			

B-6

NOTABLE FEATURES ADDRESSED BY FEDERAL AND NORTH CAROLINA STATUTUES

(Check where applicable)

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

Resource Type or Area or Issue	Statute/Order	Sources of Information, Data, Map Locations, Etc.
Section 4(f) Resources ____ Public Parks and Recreational Lands ___ Wildlife and Waterfowl Refuges ____ Historic Sites ____ Historic or Archaeological Districts ____ Archaeological Sites ____ Historic Structures	National Historic Preservation Act of 1966 [16 USC § 461-470; 36 CFR Part 800]; Transportation Equity Act for the 21st Century (TEA-21, 1998) [23 USC; PL 105-178 and as amended 105—206]; DOT Act [23 USC § 138, 49 USC § 303©, 23 CFR 771.135]; Act for the Preservation of American Antiquities [16 USC § 431-433]; American Indian Religious Freedom Act [42 USC § 1996]; Native American Grave Protection and Repatriation Act [25 USC § 3001-3013]; Historic Bridges [23 USC § 144(0)]; Wilderness Act [16 USC § 1131-1136]; Land and Water Conservation Fund Act [16 USC § 460-4 to 460-11]; National Trails Systems Act (16 USC § 1241-1249)	• US Department of the Interior, Fish & Wildlife Service (USFWS); US Department of the Interior, Bureau of Indian Affairs; US Department of the Interior, National Park Service (NPS); National Archives and Records Administration (NARA); US Department of Agriculture, Forest Service (USFS; Bureau of Land Management (BLM • North Carolina Department of Cultural Resources, Division of Archives and History; North Carolina Department of Environment and Natural Resources (NCDENR), Division of Parks and Recreation • Local Parks and Recreation Officials • Local historic preservation and genealogical organizations
____ Coastal Zone ___ Coastal Wetlands ____ Navigable Waters	Coastal Zone Management Act of 1972 [16 USC 33 § 1451-1465]; Clean Water Act [33 USC 1344]; E.O. 11990 – Protection of Wetlands; Rivers and Harbor Act of 1899 [33 USC 1344]; North Carolina Coastal Area Management Act 1974 (CAMA) [7 NCGS 113A-100-134.3]; North Carolina Water Quality Certification Rules [15A NCAC 2H.0500]; Coastal Barriers Resources Act [16 USC § 3501-3510]; CAMA Rules EIS NCAC 7H.0208]	• NCDENR, Division of Coastal Management; NCDENR, Division of Water Quality • US Army Corps of Engineers (USACE) • US Department of Commerce, Marine Fisheries Service • NCDENR, Division of Marine Fisheries
✓ Waters of the United States ✓ Jurisdictional Wetlands ____ Coastal Wetlands (See Coastal Zone) ____ Navigable Waters ✓ Wetland Mitigation	Clean Water Act [33 USC 1251-1376]; E.O 11990 – Protection of Wetlands; Rivers and Harbor Act of 1899 [33 USC 401 *et seq.*]; State Watershed Buffer Rules [15A NCAC 2B.0233, .0242, .0259 and .0260]; North Carolina Water Quality Certification Rules [15A NCAC 2H.0500]; Wetland Restoration Program Rules [15A NCAC 2R.100]	• USACE; US Coast Guard • NCDENR, Division of Water Quality • NCDENR, Division of Coastal Management • US Department of Commerce, Marine Fisheries Service • NCDENR, Division of Marine Fisheries

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NOTABLE FEATURES ADDRESSED BY FEDERAL AND NORTH CAROLINA STATUTUES (continued)

(Check where applicable)

Resource Type or Area or Issue	Statute/Order	Sources of Information, Data, Map Locations, Etc.
✓ Stream Buffers	State Watershed Buffer Rules [15A NCAC 2B .0233, .0242, .0259, and .0260]	• NCDENR, Division of Water Quality
✓ Sedimentation	Sedimentation Pollution Control Act [NCGS 113 A-50-66]	• NCDENR, Division of Water Quality
✓ Stormwater	NC Regulations 15A NCAC 2H.1000	• NCDENR, Division of Water Quality
___ Sole Source Aquifer	Safe Drinking Water Act [42 USC § 300F-300J-6]	• NCDENR, Division of Water Quality; NCDENR, Division of Environmental Health
✓ Floodplains	E.O. 11988, Floodplain Management (as amended by E.O. 12148); Flood Disaster Protection Act [42 USC § 4001-4128]; North Carolina Floodplain [NCGS § 143-215.51-215.61]	• Federal Emergency Management Agency (FEMA) • North Carolina Department of Transportation (NCDOT) • Counties and Municipalities
✓ Threatened and Endangered Species ✓ Rare / Unique Habitat	Endangered Species Act of 1973 [16 USC § 1531 *et seq*]; Fish and Wildlife Coordination Act [16 USC 661 *et seq*]; Marine Mammal Protection Act of 1972 [16 USC § 1361 *et seq*]; North Carolina Endangered Species Act [NCGS 113-331 to 113-337]; North Carolina Plant Protection and Conservation Act of 1979 [NCGS 106-202.12 to 106-202.22]	• USFWS; US Department of Commerce, Marine Fisheries Service; NCDENR, Division of Marine Fisheries • NCDENR, Division of Parks and Recreation, Natural Heritage Program, Wildlife Resources Commission; North Carolina Department of Agriculture
✓ Area of Know Contamination ___ Solid Waste	Comprehensive Environmental Response Compensation Liability Act (CERCLA) [42 USC § 9601-9675]; Resource Conservation and Recovery Act (RCRA) [42 USC 6901 *et seq* (40 CFR Parts 240-271)	• US Environmental Protection Agency (USEPA) • NCDENR, Division of Waste Management
___ Wild, Scenic or Recreational Waters	Wild and Scenic Rivers Act [16 USC § 1271-1287; Public Law 90-542]; Rivers and Harbor Act of 1899 [33 USC 403]	• US Department of the Interior, NPS; USACE • NCDENR, Division of Coastal Management
✓ Surface Water	Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina [15A NCAC 2B.0200]	• NCDENR, Division of Water Quality
✓ Ground Water	North Carolina Groundwater Classification and Standards [15A NCAC 2L.0100]	• NCDENR, Division of Water Quality
✓ Prime or Unique Farmland	Farmland Protection Act [7 USC § 4201-p4209]	• US Department of Agriculture, Natural Resource Conservation Service

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NOTABLE FEATURES ADDRESSED BY FEDERAL AND NORTH CAROLINA STATUTUES (continued)

(Check where applicable)

Resource Type or Area or Issue	Statute/Order	Sources of Information, Data, Map Locations, Etc.
✓ Sensitive Receptors	Noise Control Act [23 USC § 109(i)]	• USEPA • NCDOT
✓ Non-Attainment or Maintenance Areas ___ Sensitive Receptors	Clean Air Act [42 USC § 7609 {CAA § 309} 40 CFR Part 93]; North Carolina Clean Air Rules [15A NCAC 2D .0100-.2000]	• USEPA • Federal Highway Administration (FHWA) Southern Resource Center • NCDOT; NCDENR, Division of Air Quality
✓ Communities and Residential or Commercial Property	Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 [42 USC § 4602 *et seq*]; North Carolina Relocation Assistance Act [NCGS 133-5-18]; E.O. 12898-Environmental Justice	• US Department of Commerce, Census Bureau • Local Governments • Local Citizens Groups (Church, School, Social, Unions, Chambers of Commerce, Realtors), Individual Citizens
✓ Environmental Justice	Civil Rights Act [Title V1:42 USC § 2000D (60 FR 33896) *et seq*); E.O. 12898-Environmental Justice	• US Department of Commerce, Census Bureau • Local Governments • Local Citizens Groups (Church, School, Social, Unions, Chambers of Commerce, Realtors), Individual Citizens

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OTHER ACTIVITIES (EXISTING AND PROPOSED) THAT MAY CUMULATIVELY AFFECT NOTABLE FEATURES

Description / Responsible Party	Location *(Describe or Map)*	Status *(Existing/Proposed)*	Type of Potential Conflict with Notable Features
Residential			
Lions Gate	Downtown Clayton	Proposed	Access Alterations
Cobblestone	East of Boling Street & Candlewood off Robertson in Clayton	Existing, Within Proposed Expansion	Access Alteration
Industrial / Commercial			
Guy Road Subdivision	Guy Road, Clayton	Proposed	Access Alteration; Changes in Traffic
Government / Community Facility			
Johnston Community College 30-Acre Industrial Training Center	US 70 between Clayton and Smithfield	Proposed	Access Alteration, Changes in Traffic
Utilities			
Transportation			
NC 42 Widening R-3825	Johnston County	Proposed	Access Alteration, Changes in Traffic
Southern Connector 540	Johnston and Wake Counties	Proposed	Access Alteration, Changes in Traffic
Northern Industrial Connector	Clayton	Proposed	Access Alteration, Changes in Traffic
Booker Dairy Road U-3334	Smithfield	Proposed Access	Access Alteration, Changes in Traffic
Other			

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

B-8
PROJECT IMPACT-CAUSING ACTIVITIES CHECKLIST

Project Name: Clayton Bypass Location: Johnston Co. Analyst: D. Verner Date: Nov. 2003

Modification of Regime	Yes	No	If Yes, Describe Generally (Source, Breadth, Duration, Location and Type)
Exotic Flora Introduction		✓	
Modification of Habitat	✓		Increase runoff, degradation of water quality from sedimentation.
Alteration of Ground Cover		✓	
Alteration of Groundwater Hydrology		✓	
Alteration of Drainage		✓	
River Control and Flow Modification		✓	
Channelization			
Noise and Vibration		✓	
Land Transformation and Construction			
New or Expanded Transportation Facility	✓		9.5-Mile Clayton Bypass.
Service or Support Sites and Buildings		✓	
New or Expanded Service or Frontage Roads	✓		To serve any isolated properties.
Ancillary Transmission Lines, Pipelines, and Corridors		✓	
Barriers, Including Fencing	✓		Highway fencing.
Channel Dredging and Straightening		✓	
Channel Revetments		✓	
Canals		✓	
Bulkheads or Seawalls		✓	
Cut and Fill	✓		Roadbed grading.
Resource Extraction			
Surface Excavation			
Subsurface Excavation			
Dredging			
Processing			
Product Storage		✓	
Land Alteration			
Erosion Control and Terracing	✓		Standard highway landscaping and construction methods.
Mine Sealing and Waste Control			
Landscaping	✓		
Wetland or Open Water Fill and Drainage	✓		
Harbor Dredging		✓	
Resource Renewal			
Reforestation		✓	
Groundwater Recharge		✓	
Waste Recycling		✓	
Site Remediation		✓	
Changes in Traffic (including adjoining facilities)			
Railroad		✓	
Transit (Bus)		✓	
Transit (Fixed Guideway)		✓	
Automobile	✓		Traffic bypasses Clayton.
Trucking	✓		Traffic bypasses Clayton.
Aircraft		✓	
River and Canal Traffic		✓	
Pleasure Boating		✓	
Communication		✓	
Operational or Service Charge		✓	
Waste Emplacement and Treatment			
Landfill		✓	
Emplacement of Spoil and Overburden		✓	
Underground Storage		✓	
Sanitary Waste Discharge		✓	

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PROJECT IMPACT-CAUSING ACTIVITIES CHECKLIST (continued)

Modification of Regime	Yes	No	If Yes, Describe Generally (Source, Breadth, Duration, Location and Type)
Septic Tanks		✓	
Stack and Exhaust Emission		✓	
Chemical Treatment			
Fertilization		✓	
Chemical Deicing		✓	
Chemical Soil Stabilization		✓	
Weed Control		✓	
Pest Control		✓	
Access Alteration			
New or Expanded Access to Activity Center	✓		Access to Raleigh, RTP.
New or Expanded Access to Undeveloped Land	✓		Access to rural, undeveloped land.
Alter Travel Circulation Patters	✓		Bypass around Clayton.
Alter Travel Times Between Major Trip Productions and Attractions	✓		Expands commute shed.
Other			

	Name	Affiliation	Date
Reviewed by:			

APPENDIX C

Delphi Panel Process/Survey

URS

M E M O R A N D U M

To: Project File (Q31823363_Clayton)

From: Duane Verner

Date: September 4, 2003

Subject: ***Clayton Bypass ICI (TIP No. R-2552)***
Meeting with Town of Clayton Planner, GIS Tech.
Clayton Community Center, Clayton, NC

ATTENDEES:

Keri Reed, - Clayton Planner
Beth Franson, - Clayton GIS Tech.
Cara Stackpoole, - URS
Duane Verner, - URS
Jeff Weisner AICP - URS

To facilitate the meeting discussion and to document information for the Indirect and Cumulative Impacts Analysis, a survey was distributed to local officials prior to the meeting date.

The meeting was held to gain insight from local professionals into current and expected future conditions of the Subject project's study area in order to assess how the Clayton Bypass will affect future economic and physical development patterns.

Discussions revolved around current and future land uses and zoning and development ordinances. Maps were reviewed, growth patterns were identified, and GIS issues were discussed.

Finally, the Clayton Bypass Survey was reviewed; survey results are attached in the project file.

DRV

URS

M E M O R A N D U M

To: Project File (Q31823363_Clayton)

From: Duane Verner

Date: October 7, 2003

Subject: ***Clayton Bypass ICI (TIP No. R-2552)***
Meeting with NCDOT Planners,
URS Office, Morrisville, NC

ATTENDEES:

Bob Deaton, AICP - NCDOT
Teresa Townsend - NCDOT
Travis Totten - NCDOT
Jamie Adrignola - NCDOT
David Griffin, CEP - URS
Jeff Weisner, AICP - URS
Duane Verner - URS
Cara Stackpoole - URS

The purpose of this meeting was to conduct a Delphi process/expert panel survey of issues related to the Subject project with the ultimate goals of the process to:

- Allocate projected population increase to non-CAMPO portion of study area.
- Determine the magnitude of induced development from the Clayton Bypass.
- Identify cumulative impacts.
- Develop mitigation strategies.

Jeff began the meeting with a brief introduction and background of the project. Duane then gave a Power Point presentation of background data, current trends in the study area, and roadway induced growth research. This research was discussed in relation to the Subject project. Project mapping, including population projections, land use, and overall study area characteristics, were displayed throughout the conference room and referenced during the presentation. This mapping was then used, together with background data and trends from the presentation, to develop future land use in the project area.

As a result of this process, it was agreed that project induced growth should be adjusted

according to commuteshed thresholds. Furthermore, it was agreed that through 2025, between 5% and 15% of future study area growth would likely be attributed to (induced by) the project.

Finally, cumulative impacts were discussed. The foremost cumulative impact identified was the I-540 southern connector.

Actions required:
URS will:

- Proceed with ICI report/mapping according to aforementioned agreements.
- Meet with NCDOT OHE Staff to review mapping and report results from this meeting.
- Work with NCDOT and study area municipalities to develop mitigation strategies.

DRV

Q:\31823363_Clayton\clayton_swift_creek\ICI Doc\Correspondence\File-ROM 10-07-03.doc

Clayton Bypass
Indirect and Cumulative Impact Study

Overview

- EIS completed in 1998
- 9.5 mile long TIP connecting 70 Business and I-40
- Four lane divided facility with full control of access
- Between Johnston and Wake Counties
- Within Neuse Basin
- Impacts Swift Creek Watershed

Delphi Technique/Expert Panel Survey

Delphi is a survey research technique directed toward the systematic solicitation and organization of expert intuitive thinking from a group of knowledgeable people (Linstone, 1975).

Goal today is to obtain expert opinion on cause and effect relationships related to impacts of the Clayton Bypass; specifically:

- Allocation of projected population increase to study area.
- Magnitude of induced development from Clayton Bypass.
- Identify cumulative impacts
- Mitigation strategies

Delphi Process

1. Data Presentation/ Trends Analysis
2. Timing/ likelihood of trends
3. Analysis/ documentation of major consequences
4. Cumulative effects and mitigation

Population Trends

	1980	1990	2000	Change (%)	
				1980-1990	1990-2000
North Carolina	5,880,095	6,632,448	8,049,477	12.8	21.4
Johnston County	70,599	81,306	121,965	15.2	50.0
Wake County	301,429	423,380	627,846	40.5	48.3
Garner	10,182	14,967	17,757	47.0	18.6
Smithfield	7,288	7,540	11,510	3.5	52.7
Selma	4,762	4,600	5,914	(3.4)	28.6
Wilson's Mills	N/A	587	1,291	N/A	119.9
Four Oaks	1,049	1,308	1,424	24.7	8.9
Clayton	4,091	4,756	6,973	16.3	46.6

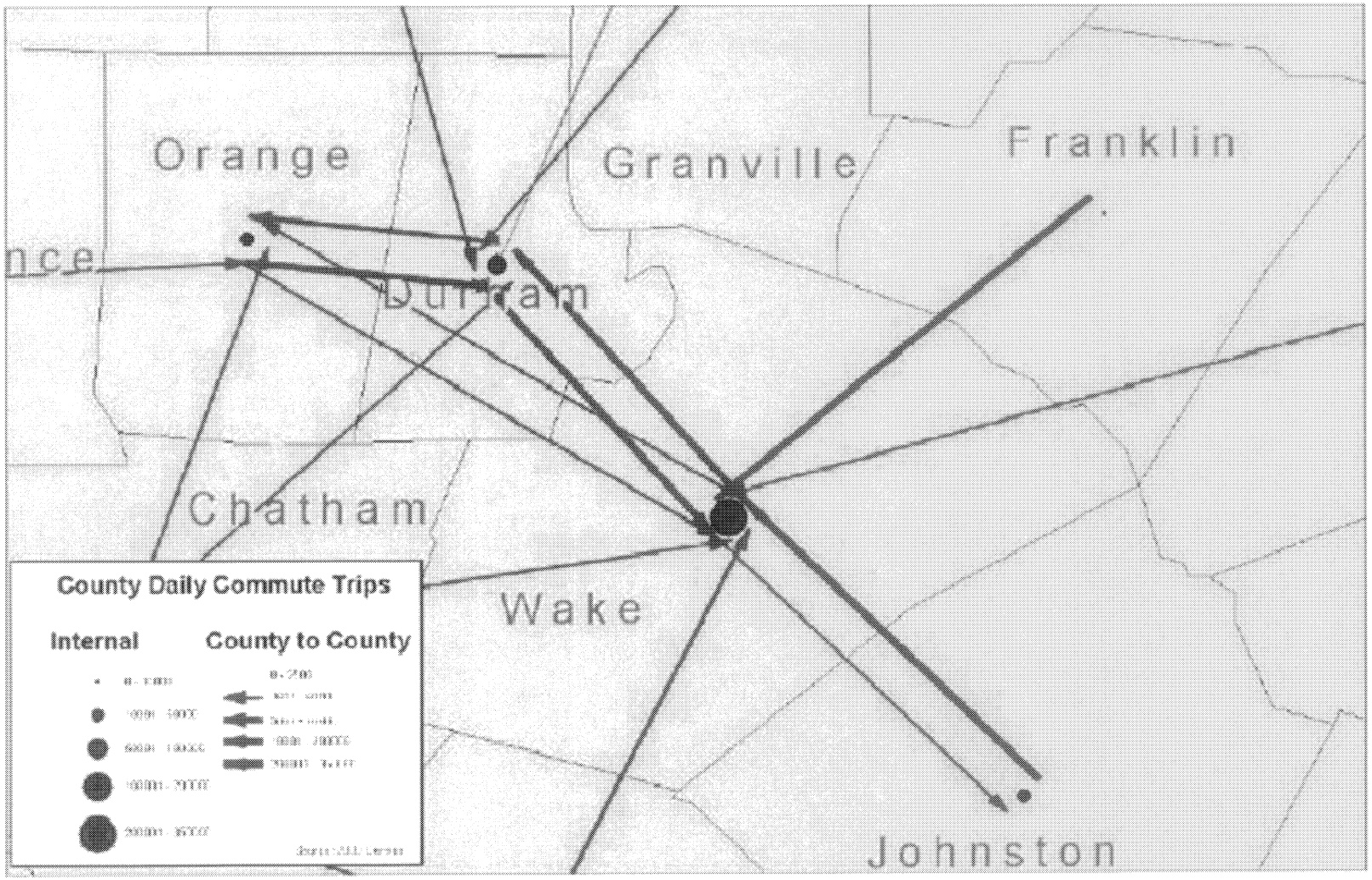
Source: North Carolina State Data Center, 2003

Population Projections

	% County In Neuse Basin	2000	2010	2020	2000-2020 % Change
North Carolina	NA	8,049,313	9,491,372	10,966,139	36%
Johnston	98%	121,965	167,240	215,863	77%
Wake	85%	627,846	851,771	1,088,545	73%

Source: North Carolina State Demographics, 2003; North Carolina Center for Geographic Information and Analysis, 2002. Note: The numbers reported reflect county and state population; however, these counties are not entirely within the basin. The intent is to demonstrate growth for counties located wholly or partially within the basin.

County to County Commuter Flow



Source: http://www.trbcensus.com/articles/nc_flowmaps.pdf

Commuter Characteristics

Geography	Workers 16 years and over; Who did not work at home-mean travel time to work (minutes)	Workers 16 years and over; Percent worked outside county of residence
Garner, Wake County	24.9	14.1
Clayton, Johnston County	33.4	71.7
Wilson's Mills, Johnston County	28	45
Smithfield, Johnston County	22.8	28.2

Source: 2000 US Census, American Fact Finder

Induced Growth

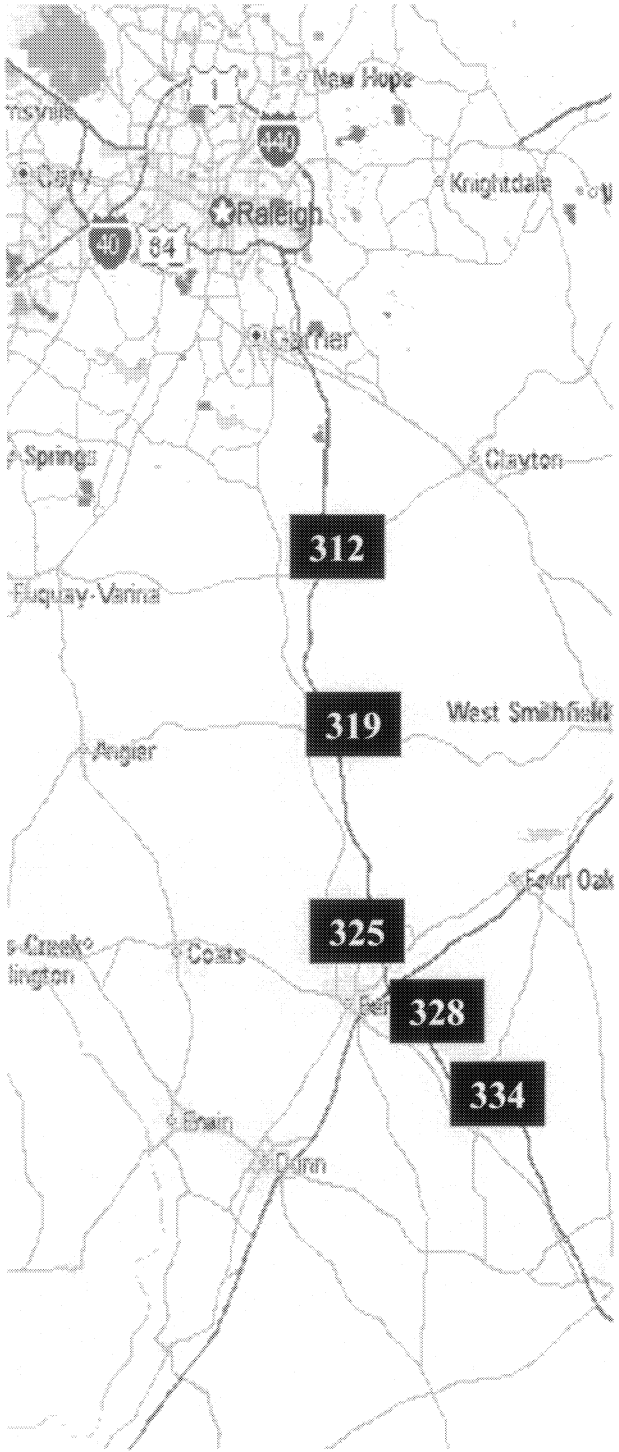
Most, if not all experts agree that roadway capacity expansion positively influences growth (Dwelling Units, ADT and VMT):

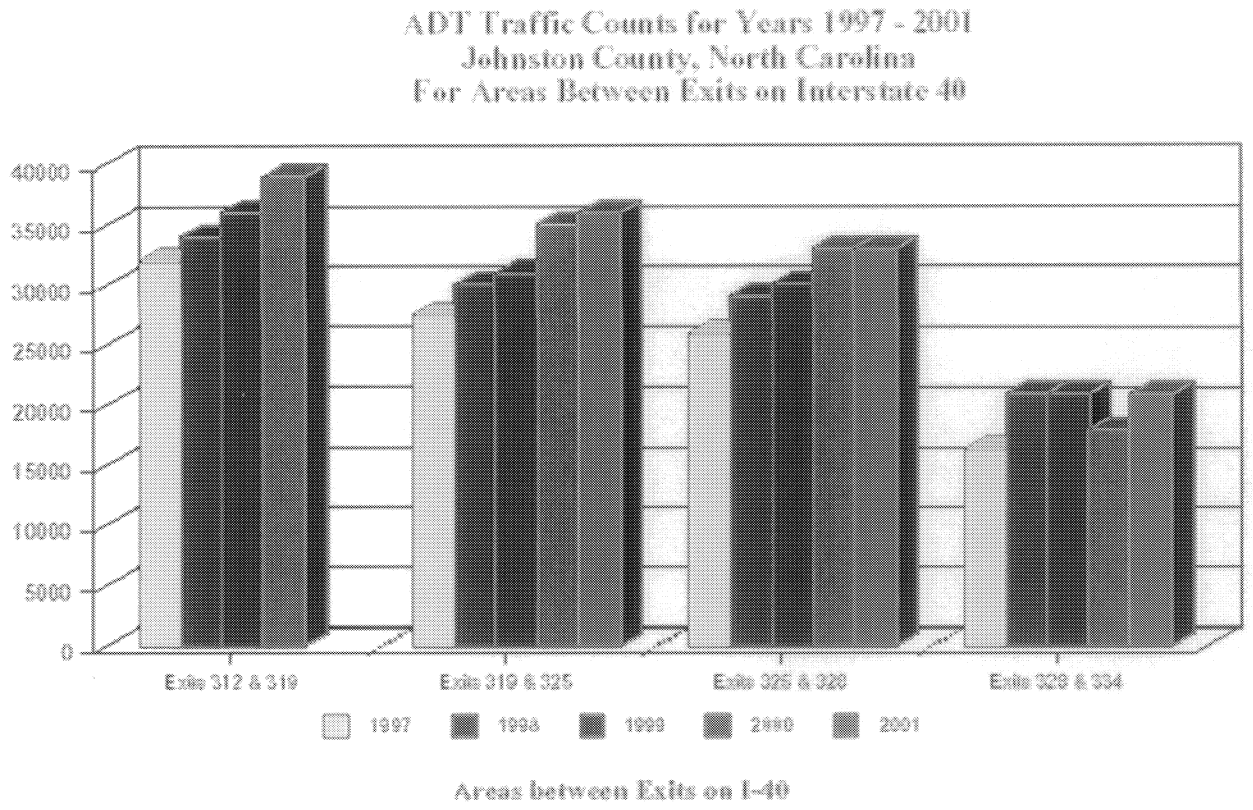
• The effect of urban and rural arterial widening, new arterials or new freeways is about a 2-14 percentage point increase, per mile of improvement, in the decade growth rate in most regions.

New Freeway 2.2 % (Asheville) to 8.4 % (Raleigh)
New Freeway Exit 0 (11 regions) to 120 % (Triad)
Source: *Highways and Sprawl in North Carolina*, 2003

• Capacity expansion accounts for for somewhere between 7% and 22% of VMT growth. (Heanue, 1998)

• "28% of the growth rate in VMT is attributable to lane miles" Source: *Relationships Between Highway Capacity and Induced Vehicle Travel*, 1999





Source: Johnston County ADT Maps
North Carolina Department of Transportation

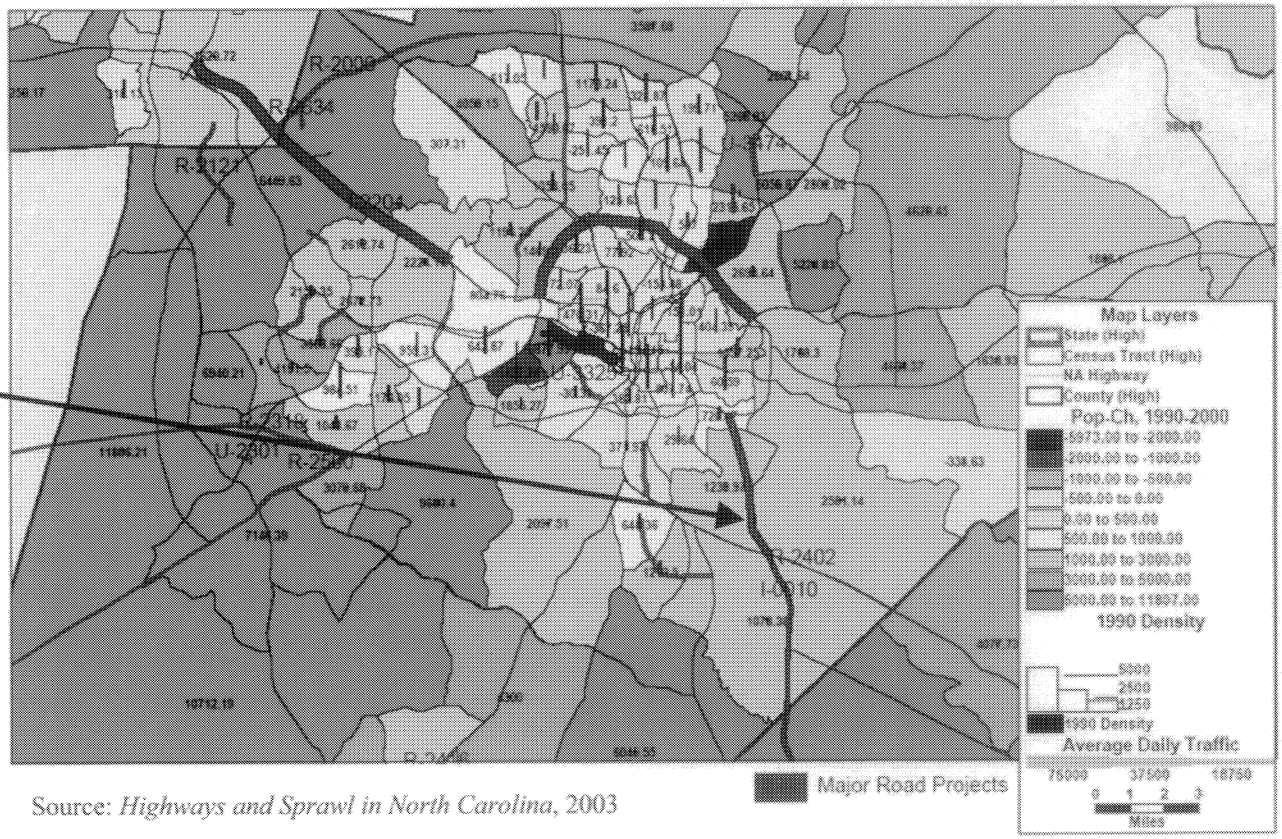
- 1989 opening of I-40 between Garner and I-95; 1990 I-40 opened to Wilmington
- Rapid development in northwest Johnston County throughout the 1990s
- 1997 – 2001 ADT increases within RTP area commuteshed

Road Effects on Growth

- **New Freeway:**
- **+354 persons/ mile (8%)**
- **Key is prior density**: Growth goes where there is room for it
- **Secondary factors:** Distance to City Center

Triangle Commuting Region (Inner)

Population Change, Density and Major Road Projects, 1990-2000



Source: *Highways and Sprawl in North Carolina*, 2003

Commute Study Results

Estimated Commute with Clayton Bypass		
Segments of Commute*	Min.**	Miles
Fairway Dr. - Clayton Bypass/70	6.7	4.9
70 - 40	9.5	9.5
40-40/70	5.0	4.4
40/70 - 440	6.2	3.6
40/440 -1	5.2	8.9
40 - Airport Blvd.	14.7	10.6
Travel Time	47.2	
Miles		41.9

*Route: 70 Business - Clayton Bypass - 40/440 - Airport Blvd.

**Avg travel times from URS Commute Study; Clayton Bypass segment estimated at 60mph.
Major accidents causing significant delays not factored in.
Survey of commuters showed major accidents occurred on average once a week.

SUMMARY

Commute existing roadways	47 to 63 + min.
Avg. commute existing roadways	56.5
Estimated commute with Clayton Bypass	47.2

Timing/ likelihood of trends

Analysis/documentation of major consequences

- Allocation of projected population increase to non-CAMPO study area.

- Magnitude of induced development from Clayton Bypass.

Cumulative effects and mitigation

Clayton Bypass Survey

PURPOSE

The purpose of this Survey is to gain insight from local and regional professionals into the study area's economic and development patterns in order to assess how future economic and physical development patterns will be affected by the Project. This Survey is being distributed as part of an Indirect and Cumulative Impacts Study being conducted by NCDOT, DWQ, and URS Corporation (Project Consultant).

Interviewee: **Edwin H. Davis, Jr.**
Title: **Planning & Zoning Manager**
Affiliation/Company: **Johnston County Planning Department**
Phone Number: **919.989.5150**

INFRASTRUCTURE & DEVELOPMENT

1. Please list what you perceive to be the potential significant development projects in the study area that will be constructed by 2018. Additionally, please indicate how each project's probability of development increases or decreases due to the completion of the Clayton Bypass. This list should include projects under construction, pending approval and other proposals you believe will have a reasonable chance of being constructed by the design year 2018.

2. Do you think that the study area's current zoning and land use plans sufficiently address future development needs, transportation improvements and environmental protection (specifically water quality)? If no, please explain what zoning and/or land use plans you think are necessary.

   No. Currently Johnston County has no adopted Land Use plan in effect. In order to properly address the issues recognized in this survey it will be necessary for the County to make a commitment to develop a Land Use Plan.

3. What issues and concerns regarding land use and transportation infrastructure development in the project area do you perceive as most important in the region? Additionally, do you interpret these issues and concerns as being sufficiently addressed in the comprehensive plans? Please specify.

   Traffic volume and commuting times are the most important issues that can and should be addressed when considering the type and amount of transportation infrastructure. With no Land Use Plan

these concerns are obviously not being addressed directly by Johnston County through a Land Use Plan. Traditionally there is no set rule for including a transportation element in Land Use Plans since most transportation issues are addressed through direct transportation planning functions. As transportation issues such as those described in question 4 become more of a concern in communities, Land Use Plans must directly and indirectly address these issues. The Transportation Improvement Program, the Thoroughfare Plan, inclusion in the recently established Rural Planning Organization and possible membership in the Capital Area Metropolitan Planning Organization all provide mechanisms to address critical transportation issues and data resulting from such studies will better enable decision makers to determine the proper improvements neessary to address the most important concerns. However it is imperative that local Land Use Plan developers recognize the impact plans and regulations and subsequent regulations based on these plans have on vital transportation issues.

4. Do you anticipate that there will be a future land use and development pattern scenario with the Project that differs from the future scenario without the Project? If yes, please describe below and indicate areas that may be affected.

Transportation infrastructure such as this Project inevitably influences development patterns. The volume and type of development will depend on the access status of the bypass that is established by NCDOT. Specifically if access is limited or not allowed at all will preclude heavy development along the course of the bypass and concentrate development at and near interchanges resulting from the construction of the Project. The type of access allowed by NCDOT may influence development regulations in Johnston County.

5. We would like to determine the potential for zoning changes or infrastructure changes in the event that the Project is implemented. In your opinion, how would the Project affect the future zoning or infrastructure plans in the study area?

As mentioned in number 4 above communities will determine zoning changes based on several factors, including but not limited to, land use philosophy, market influences and location elements. It is our opinion that elected officials will encourage development in areas conducive for such.

6. In your opinion, what areas of the study area, if any, would be first targeted for rezoning in order to accommodate future demand and need? Please indicate what types of changes (i.e, density or use type)?

Specifically the closer interchanges and other access points are to existing development, the more potential for development at these accesses. As most development over the past several years in Johnston County has been residential, we anticipate the market to meet the demand for residential development with supporting commercial development to accompany, specifically strip retail.

7. Do you anticipate that the Project will promote additional capital investments to support future development that otherwise would not be made? Please explain and identify the areas and type of infrastructure improvement (i.e., water, sewer)

Yes. If future development resulting from the Project demands infrastructure improvements, then it is anticipated that Johnston County will provide the appropriate infrastructure for this development. Further NCDOT may be requiring certain improvements, e.g. turn lanes, signalized intersections and road widening based on Traffic impact Analysis (TIA).

8. Would you anticipate that the Project will affect the demand for available development parcels or planned/proposed development projects?

No. Additionally Johnston County requires a TIA for mew commercial land uses generating 1000 or more daily trips and for new subdivisions with 50 or more lots.

9. If yes to Question 8, what is the likelihood of the Project influencing timing or status of planned development projects (high, low) ?

10. How do you see the Project influencing traffic and transportation patterns and what industries and/or populations will it most affect, and in what way?

Residents commuting to points west, that live in proximity to the Project will realize a shortening of commuting time; recognized as an important element in number 3 above. The project may prove attractive to future potential industrial and commercial development, depending on access status as mandated by NCDOT.

11. What types of industries and business will be most affected by construction of the Project?

No existing industries or businesses will be more than marginally affected. However if residential development occurs supporting businesses will ensue.

12. What are some of the competitive strengths that the study area has over other regions in North Carolina? What are some of the weaknesses? (i.e., in terms of technology, the labor pool, industrial base, etc.)

As mentioned earlier Johnston County has had significant residential development in recent years. A large portion of these residents commute out of the County to jobs in Wake County. Johnston County schools have been recognized as state leaders thus is attractive to families with school age children. This along with lower housing costs, attractive rural/suburban type development and relative proximity to thousands of higher paying jobs will ensure continuing residential development; market demands and relative economic factors being imperative determining factors.

13. How significant a role does transportation and accessibility play in residential, commercial and industrial development in the study area?

As with most areas, the three types of development mentioned in the question largely react to transportation improvements by locating on or near these improvements. As mentioned above the access status of the Project will directly affect the type and amount of development in the study area Critical mass may support and positively impact pursuit of rail, light rail or other mass transit system.

14. Do you think that the Project will improve travel time and reliability in the study area? If yes, what impacts would you anticipate this improvement would generate?

Without a doubt. Since Johnston County has thousands of residents that commute to points west, specifically Wake County, the Project will definitely improve travel time. In addition traffic currently using "local" roads would divert commuting traffic to the Project which will decrease the traffic on the "local" roads.

15. How do you think the study area will respond to current and predicted national and regional changes in industrial and commercial trends? What additional support, suppliers, etc. will these industries need?

16. How does access to the study area affect its competitive advantages in relation to other North Carolina cities/regions?

With two interstates (I-40 and I-95) crossing Johnston County the Project will provide an element attractive to most industries; easy access to The Interstate Highway System. This will prove a positive aspect when recruiting potential new industries and businesses.

17. In your opinion, how will industry and business trends in the study area change by 2018 if a) the Project is not built? B) no significant improvements are made to the roadway network?

THANK YOU

To conclude, continued congestion, increased commuting times and safety factors, particularly with new drivers on unfamiliar and compacted roads will be issues at the forefront of concern.

APPENDIX D

Method for Determining Land Use for the Clayton Bypass Study Area (TIP R-2552)

Method for determining Land Use for the Clayton Bypass Study Area (TIP R-2552)

The input data layers for this project were:

- Wake County and Johnston County Tax Parcels
- Wake County and Johnston County Zoning
- Town of Clayton Zoning
- Town of Garner Zoning
- Johnston County 2001 Aerial Photography
- FEMA Floodplain Data
- National Wetlands Inventory Data
- CAMPO TAZ data with 2025 Dwelling Unit and Employee Projections

Step 1 – Determine the current land use

Tax parcel, aerial photography (where available), site visits (drive through the study area) and current zoning were combined to create current land use on an individual tax parcel level. Areas designated as floodplains and wetlands were attributed accordingly in the current land use and determined as areas less suitable for development.

Step 2 – Determine future land use with bypass

CAMPO TAZ data with 2025 dwelling unit projections were overlaid on current land use. The CAMPO data takes into account all current and future NCDOT transportation projects, including TIP R-2552. The difference between 2000 dwelling unit counts (derived from 2000 block group data) and the 2025 projection gave a reasonably accurate count of how many new dwelling units would be built in the future. The zoning layer was useful in determining which areas were more likely to be built out: areas where zoning allowed for greater densities; or large tracts of undeveloped land in areas zoned as residential. The sum of the area of the residential parcels available for development was divided by the minimum lot requirement (taken from zoning codes). This gave a number of lots, or dwelling units, that could be built in this particular area. The process was repeated until the number of dwelling units that could be built in the available parcels matched the difference between the 2025 and 2000 dwelling unit counts. These parcels were denoted as General Residential.

A similar process was used to determine future commercial/industrial growth. CAMPO TAZ data also contains employee projections. These were overlaid on the current land use and used to build out the existing, yet undeveloped, commercial or industrial zoned parcels in the study area.

The southern portion of the study area fell outside CAMPO projections for dwelling units and employees. In this situation, the projection of the closest TAZ, or the average growth of surrounding TAZs was used to determine the future build out. This was reasonable since many of the outlying portions were similar in current land use and context to those of the surrounding TAZs.

Step 3 – Determine future land use without bypass

Certain portions of the study area were noted as having greater potential for growth. This mainly included areas around the interchanges for the bypass. These were areas that already contained intersections of major roads and would be most likely to grow even without the bypass, but at a lesser rate.

To determine the future land use without the bypass, particular attention was paid to those areas mentioned above: areas with potential growth with or without the interchange. To allow for the reduction in growth without the bypass, it was assumed that growth would be diminished by 15% from the growth associated with the bypass. The sum of dwelling units determined for each TAZ in Step 2 was reduced by 15% and those parcels no longer included in the future growth scenario reverted to their current land use, usually cultivated, low-density residential or forested/wetlands.

In a similar fashion, other areas of the study area were noted as having medium (10%) or low (5%) growth rates. The land uses in these areas were adjusted to reflect growth without the bypass.

The above-mentioned 15%, 10%, and 5% growth associated with the bypass was determined through a Delphi Process/Expert Panel Survey of NCDOT OHE staff and th URS consultant team. See Steps 6, 7, and 8 of the *Clayton Bypass Indirect and Cumulative Impact Analysis* for more information on this process.

Most of the commercial and industrial zoning in the study area centers on the US70 corridor in Johnston County. Since this provided ample area and suitability for growth, it was determined that commercial and industrial growth would be similar with or without the bypass. One exception to note is the area around the NC42 and I-40 interchange. This TAZ had such an extraordinarily high 2025 employee prediction that it could be assumed that the bypass would have a significant impact in this area. The sum of commercial and industrial area was reduced by 15% to achieve a future land use without the bypass.

Disclaimer

Future land use projections are estimated based on supporting information provided throughout this report. City or county planning agencies have not officially adopted these projections.