



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT L. MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

April 10, 2013

N.C. Division of Water Quality
Transportation and Permitting Unit
1650 Mail Service Center
Raleigh, NC 27699-1617

ATTN: Mr. Charles Wakild
Director

SUBJECT: **Response to On-hold Letter for Section 401 Water Quality Certification Application** for the proposed Greensboro Western Loop from north of SR 2176 (Bryan Boulevard) to SR 2303 (Lawndale Drive), Guilford County, North Carolina. Federal Aid Project No. STP-NHF-124(1), TIP Nos. U-2524C and D.

REFERENCE: Application for Section 401 Water Quality Certification dated February 26, 2013.
Permit-On Hold letter dated March 12, 2013
NCDOT Response, dated March 28, 2013

Per the above-referenced DWQ on-hold letter and our response letter, the N.C. Department of Transportation (NCDOT) has completed an Indirect and Cumulative Effects (ICE) Screening Update that covers the gap in information not covered by previous ICE studies. We believe that this new information addresses all of your concerns regarding this project and respectfully request that you to proceed with processing the permit application.

A copy of this on-hold response packet will be posted on the NCDOT Website at: <https://connect.ncdot.gov/resources/Environmental/Pages/default.aspx>. Thank you for your assistance with this project. If you have any questions or need additional information, please contact Greg Price at either gwprice@ncdot.gov or (919) 707-6148.

Sincerely,

E. L. Lusk
for

Gregory J. Thorpe, Ph.D., Manager
Project Development and Environmental Analysis Unit

cc: Andy Williams, USACE
Chris Militscher, USEPA
Amy Euliss, NCDWQ

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS
NATURAL ENVIRONMENT SECTION
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

TELEPHONE: 919-707-6100
FAX: 919-212-5785
WEBSITE: WWW.NCDOT.ORG

PHYSICAL ADDRESS:
Century Center - Building B
1020 Birch Ridge Dr
Raleigh, NC 27610-4328



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MEMORANDUM

To: Colin Mellor, NCODT-PDEA-NES

From: Tristram Ford and Herman Huang, Ph.D., NCDOT-PDEA-HES-Community Studies

Date: April 10th, 2013

Re: U-2524C – DRAFT Indirect and Cumulative Effects Screening Update

CC: Amy Chapman, NC-DWQ; Amy Euliss, NC-DWQ; Lisa Feller, NCDOT-PDEA

Indirect and Cumulative Effects Screening Update

This memorandum analyzes the potential for indirect and cumulative effects, in the form of change in land use, in an area of northwest Greensboro/southeast Summerfield/small portions of unincorporated Guilford County, that surround State Transportation Improvement Plan (STIP) Project U-2524C. This area is between adjacent projects covered in previous ICE/ICI reports.

Current ICE report methodology was employed in this analysis including the ICE screening matrix, which uses data inputs to provide a numerical and therefore quantifiable output. In addition, this memorandum provides current study area population and employment trends, inventories notable natural features, outlines existing development regulations and other public policy, discusses current land use and future land use vision and outlines existing and planned infrastructure. This memorandum also includes a cumulative effects discussion to aid in project permitting.

The time horizon used for this update memorandum is 2035, which is the design year of this project. This date is generally in line with previously completed ICE studies for adjacent projects and population projections from the North Carolina Office of State Budget and Management. The time horizon for the City of Greensboro's *Connections 2025 Comprehensive Plan* is as stated.

Based upon the output of the U-2524C ICE Screening Matrix, this full control of access project has moderate likelihood to increase the development potential of and intensity in the areas adjacent to the STIP U-2524C corridor, although development is expected to continue to occur in the FLUSA in the No-Build scenario.

STIP U-2524C Project Overview

STIP Project U-2524C proposes to construct an approximately 4.8 mile long six-lane freeway from north of Bryan Boulevard to US 220/Battleground Avenue, which will serve as a segment of the northwestern portion of the Greensboro Urban Loop (I-840). The project will also include the construction of a system-to-system interchange at US 220/Battleground Ave and the completion of the existing system-to-system interchange at Bryan Boulevard to accommodate all traffic movements.

The project is currently in the right-of-way acquisition phase, with the construction phase scheduled to begin in September 2013. STIP Project U-2524C, with an estimated cost of \$101M, is one of four projects in various stages of project development and/or construction which will complete the remaining 15 miles of the Greensboro Urban Loop.¹

A Draft Environmental Impact Statement (EIS) was signed in 1991, with the Final EIS and the Record of Decision (ROD) published in 1995. A Design Public Hearing was subsequently held in 1996 to present designs and the protected corridor to the public. In October of 2010, a Corridor Official Map Act Public Hearing was held to show updated designs and the revised protected corridor.

Adjacent Projects –ICE Document Conclusions Overview

Indirect and Cumulative Effects (ICE) reports have been completed for other portions of the Greensboro Urban Loop, specifically for STIP U-2525B/C in 2009 and STIP U-2524AB/AC in 2003. ICE reports have also been completed for other projects in the vicinity namely: STIP I-5110, the extension of Bryan Boulevard/I-73 Connector, in 2011; STIP R-2413, the multi-lane improvement as part of the NC 68/US 220 Intrastate corridor, in 2005 and updated in 2010; for STIP R-2309, the widening of US 220 to multi-lanes from SR 2182 (Horsepen Creek Road) in Greensboro to the proposed US 220/NC 68 Connector (TIP Project R-2413) just north of the Haw River in 2005 and; for the Piedmont Triad Airport Expansion project in 2003.

STIP U-2525B/C

STIP Projects U-2525B/C are segments of the new location, fully controlled-access Greensboro Urban Loop. The projects begins east of Greensboro at US 70 (Burlington Road) and ends northwest of Greensboro near Lawndale Drive.

In terms of the potential indirect and cumulative effects of the U-2525 project and the actions of others, it was concluded that:

“Based on the information analyzed, the screening matrix reflects a moderate to high concern for indirect and cumulative effects potential. The overall matrix result suggests that further examination is warranted as the project may have impacts on development activity.

¹ NCDOT webpage, High Profile Projects and Studies, Greensboro Urban Loop, <http://www.ncdot.gov/projects/greensborourbanloop/>

The projected development under the Build Scenario is expected to consist of larger, planned mixed-use development around the proposed interchanges, as indicated on future land use maps. Under the No-Build Scenario, strip or sprawling development may be more likely as piecemeal development spreads along existing roadways. The project is not expected to change the ability of the local jurisdictions to implement and meet land development and stormwater management goals. In fact, the project would enhance the abilities of the City of Greensboro and Guilford County to meet their future land use goals, as designated on future land use maps, by providing transportation infrastructure necessary for proposed activity centers and mixed-use nodes.

Based on the indirect land use screening and land use scenario assessments, detailed in the following sections of this study, the project is not expected result in substantial changes in land use that result in significant indirect effects.”²

STIP U-2524AB/AC

STIP Projects U-2524AB/AC, are new location, multi-lane freeway segments of the Greensboro Urban Loop. The project extends from just north of Interstate 85 (I-85) near Groometown to just south of the Interstate 40 (I-40) interchange with Chimney Rock Road, a distance of approximately 5.2 miles.

In terms of the potential indirect and cumulative effects of STIP U-2524AB/AC and the actions of others, it was concluded within the ICI document that:

“Future development in the study area will be primarily influenced by the growing need for residential development to serve the Piedmont Triad area and will be largely dependent on transportation infrastructure and the availability of water and sewer services. New commercial development, constructed in response to the additional residential development, can be expected. However, much of the study area is already developed, which limits the area’s future growth potential. Growth is more likely to occur in the southern and northwestern portions of the study area. More intense land uses will likely occur in the vicinity of the proposed interchanges along the Urban Loop.

Although the Urban Loop will likely accelerate residential development along the corridor and non-residential development in proximity to interchanges as permitted by local regulations, notable changes in general land use patterns are not expected. The land already developed in Greensboro and High Point limits the future growth potential of the study area. Furthermore, because the corridor is fairly close to these developed areas, it is not expected to open large areas of land for development.

The City of Greensboro implements plans, programs, and regulations to protect and improve the city’s lakes and streams. The City of High Point has also adopted regulations to protect water quality. In addition to the municipal regulations, the entire study area is subject to the Randleman Rules, which further protect water quality.

² U-2525 Indirect Land Use Effects Report, PBS&J, October 30, 2009

Due to these existing ordinances and regulations, the construction of STIP Project No. U-2524AB/AC will not result in indirect or cumulative impacts that will adversely affect water quality.”³

STIP R-2413

An ICE report was completed for STIP Project R-2413, the multi-lane improvement as part of the NC 68/US 220 Intrastate corridor to serve as the future I-73 corridor, in 2005. Based upon the analysis of the potential indirect and cumulative effects as a result of the project, the report concluded that:

“Heavy commercial and industrial growth is expected to occur in the western portion of Guilford County, due to the availability of infrastructure and the close proximity to the PTIA. Local officials indicated that growth taking place within this area is primarily due to the airport and not from various transportation projects.”

In addition, “potential impacts to water quality throughout the project area should be minimized due to the presence of state and local water supply watershed protection regulations, the creation and implementation of Guilford County’s Phase II stormwater plan, and land use plans/zoning regulations enforced by the various municipalities throughout the [FLUSA] (including riparian buffers and the preservation of open space/natural land).”⁴

The final 2005 ICE report was updated in a memorandum prepared by NCDOT Community Studies in 2010. This memorandum confirmed the findings that potential impacts to water quality will be minimized by the presence of local and state regulations. The memo states:

“In conclusion, this project has the potential to minimally increase the development potential of and intensity in the areas adjacent to the US 220 corridor that would not otherwise occur. However, development in this area is more dependent on the recently completed extension of water and sewer infrastructure, the planned extension of water and sewer service and the designation of the US 220 corridor by Rockingham County as an economic development zone. Development pressure is likely at the NC 68/US 220 intersection, the northern terminus, due to the presence of water and sewer service. The northern portion of this area is not subject to any water supply watershed requirements, Phase II, or the Jordan Rules. Any new development along the Guilford County portion of Section C, which is partially within a WS-V Water Supply Watershed, will be required to comply with Guilford County’s Phase II Stormwater Management Program.

New development, some of which has the potential to be located in the WS-III protected watershed, will follow established zoning and would be required to conform to existing development and water supply watershed land use regulations, which include density restrictions and riparian buffers, which are also required as part of the Jordan Rules.”

³ U-2524AB/AC Indirect and Cumulative Impact Study, Arcadis G&M of North Carolina, Inc., June 2003

⁴ R-2413Final Qualitative Indirect and Cumulative Effects Report, HNTB, September 2005

STIP R-2309

An ICE report was also completed for STIP Project R-2309, the multi-lane widening of US 220, in 2005. Based upon the analysis of the potential indirect and cumulative effects as a result of the project, the report concluded that:

“While TIP Project R-2309 is located in a rapidly developing area with a substantial amount of available land in close proximity to a major urban area, public utility limitations, the presence of water supply watershed regulations, noise contours for PTIA, and existing development should serve to limit the intensity of development within the [FLUSA].

Development resulting from the project will likely include a mix of low and medium density single-family residences along arterials feeding into US 220. Commercial development (retail/office) should occur along US 220 near major intersections or at proposed interchanges of the NC68/US 220 Connector (at Brookbank Road and NC 150). Limited industrial development could occur along US 158 west of the project corridor, or in the vicinity of the two proposed interchanges along the NC 68/US 220 Connector.

When combined with TIP Project R-2413 (the NC 68/US 220 Connector), PTIA expansion, and TIP Projects U-2524/U-2525 (the Greensboro Urban Loop), TIP Project R-2309 should make northwestern Guilford County more attractive for residential, commercial, and industrial development due to improved access and regional mobility.

Despite potential direct impacts relating to water quality, no indirect impacts to water quality were identified in the 2004 Environmental Assessment or the 2001 Natural Resources Technical Report.”⁵

STIP I-5110

An ICE report was also completed for STIP Project I-5110, the extension of Bryan Boulevard/I-73 Connector, in 2011. Based upon the analysis of the potential indirect and cumulative effects as a result of the project, the report concluded that:

“No indirect effects are expected from the proposed I-73 Connector alone. The I-73 Connector will be designed as a short (1.5 mile), freeway to freeway connection with fully controlled access. It also will not give new exposure to properties along its alignment. Local officials expect this area to develop according to their future land use plans if the I-73 corridor is completed and PTI expands as expected. The need for this project is to provide a connection between an existing freeway (Bryan Boulevard has been constructed to interstate standards) and the proposed US 220/NC 68 Connector. Once completed, I-73 will extend to northern Guilford County. The *combination* of these transportation projects may have some effect on the rate and type of development, but this project *alone* should not result in considerable indirect effects.”⁶

⁵ R-2309 Qualitative Indirect and Cumulative Effects Report, HNTB, October 2005

⁶ I-5110 Indirect and Cumulative Effects Screening Report, Florence and Hutcheson, Inc., April 2011

Piedmont Triad International Airport Cumulative Impact Study

As part of the Piedmont Triad International Airport expansion project, ICI water quality modeling was completed in order to address potential direct, indirect and cumulative impacts. The *Piedmont Triad International Airport Cumulative Impact Study*⁷ was completed as a requirement of the North Carolina Division of Water Quality's Section 401 Water Quality Certification.

The larger indirect study area defined for this ICI water quality modeling study overlaps the Future Land Use Study Area (FLUSA) defined for this U-2524C update memo, as approximately the western two-thirds of the U-2524C FLUSA is within the overall indirect study area. In addition, the BMP Evaluation Study Area boundary, which corresponds to the Brush Creek sub-basin, also overlaps approximately one-quarter of the newly defined U-2524C FLUSA. This overlap area includes the land located generally southwest of Lake Higgins and Fleming Road, which is primarily developed with residential uses.

According to the executive summary within this document, "Watershed analyses were performed for an area surrounding the Piedmont Triad International Airport for each of four scenarios, two of which included the proposed expansion of the airport and two of which did not. The purpose of the study was to estimate the percentage difference in nutrient and sediment loads between the 'with project' and 'without project' scenarios." More specifically, the four scenarios included: 1. Projected growth, without the airport project; 2. Projected growth, with the airport project; 3. Year 2019 projected growth and; 4. Year 2019 projected growth, with the airport project. The executive summary goes on to state that "existing conditions were evaluated" and that "all scenarios include constraints resulting from current and possible land use ordinances and controls, including water supply watershed protection regulations, Randleman Riparian Buffer Rules, and Phase I and Phase II storm water controls expressed as changes in land use."

The study concluded that, "actual pollutant loads are expected to be less than reported in this study with current measures in place. It is believed that full inclusion of BMP efficiencies may result in a reduction of pollutant yields beyond what has been demonstrated through use of land use density restrictions and overland BMP's."

Future Land Use Study Area

The Future Land Use Study Area (FLUSA) (see Figure 1) is the area surrounding a construction project that could possibly be indirectly affected by the actions of others as a result of the completion of the project and combined projects. This study area encompasses all of the areas examined for potential increases in development pressure as a result of project construction. For the purposes of this analysis, the FLUSA is generally defined as the area to the south/southeast of Lake Brandt and Lake Higgins and is mainly within the municipal limits of the City of Greensboro, but also includes small portions of the Town of Summerfield and unincorporated Guilford County. More specifically, the FLUSA is bounded on the west by Oak Ridge Road and

⁷ Piedmont Triad International Airport, Cumulative Impact Study Calculation of Comparative Sediment and Nutrient Loads Under Alternative Growth Scenarios Without Full Consideration of Best Management Practice Efficiencies, Eco-Science Corporation, June 2003

Pleasant Ridge Road; to the north by City of Greensboro municipal boundary; to the east by Lake Brandt Road; and to the south by Bryan Boulevard.

Current Land Use

In a general sense, existing land use varies within the FLUSA, as development has become more prevalent. Existing land uses within the FLUSA include: agricultural land, forested land, park land, land owned by the City of Greensboro for water impoundment and the associated buffer (Lake Brandt and Lake Higgins reservoirs), single family residential (both in recently developed and established high and low density subdivisions as well as individual rural homesteads and clusters), multi-family residential, commercial/retail, industrial and institutional.

Water and Sewer Infrastructure

According to Generalized Future Land Use Map contained with the *Greensboro Connections 2025 Comprehensive Plan*⁸ which graphically depicts the City of Greensboro's water and sewer service boundary, water and sewer service is available for the entire FLUSA except for two areas to the east of Pleasant Ridge Road and west of Lake Higgins. The first area is bordered by Pleasant Ridge Road, Fleming Road and Long Valley Road and is within the Town of Summerfield's municipal limits. The second and larger area is located to the northeast, in the vicinity of Carlson Dairy Road, Lewiston Road and Hamburg Mill Road. Each area is characterized by low density single family residential, and forested and agricultural land. Greensboro's urban service area boundary includes areas within the municipal limits and portions of un-incorporated Guilford County, but does not extend into the Town of Summerfield.

The April 2007 *Revised City and County Water and Sewer Line Agreement* established this water and sewer service area, divided into three service availability areas, to guide the provision of water and sewer infrastructure. This is based upon the cost to install infrastructure, the proximity to existing service and the ability of that service to protect the Watershed Critical area, which applies to the FLUSA for this project.

Water Service

The City of Greensboro's webpage states that "Greensboro depends upon three surface water sources to supply our water: Lake Townsend, Lake Brandt, and Lake Higgins. These lakes are located in northern Guilford County in the upper Cape Fear River Basin within a protected watershed. When full, Greensboro's three water reservoirs hold about eight billion gallons of water."

Water from Lake Brandt is treated at the Mitchell Water Treatment Plant and water from Lake Townsend is treated at the Townsend Water Treatment Plant. Lake Higgins is used to refill Lake

⁸ Generalized Future Land Use Map, Greensboro Connections 2025 Comprehensive Plan webpage, <http://www.greensboro-nc.gov/modules/showdocument.aspx?documentid=8121>

Brandt as needed. On average, both plants treat and deliver about 32 million gallons per day (mgd) to nearly 250,000 customers.”⁹

In addition, the Randleman Lake Project has been recently completed and provides another source of water for the Triad region under the control of the Piedmont Triad Regional Water Authority. According to the *Piedmont Triad Regional Water Authority 2012 Annual Drinking Water Quality Report*¹⁰ the Randleman Reservoir holds approximately 18.3 billion gallons of water is capable of providing up to 48 million gallons per day which will fulfill projected water demand for 30 to 50 years. More specifically, the City of Greensboro’s total share of 25.5 mgd will increase the City’s water supply by 75 percent.

At this time, residents of un-incorporated Guilford County and the Town of Summerfield within the FLUSA rely on private wells. According to the *Summerfield Comprehensive Plan*, “currently, all residential and commercial water users in Summerfield rely on groundwater resources, whether from individual or community wells. The Town does not have a convenient surface water source of the magnitude necessary to establish its own water plant, nor does the community’s ‘charter’ as a limited services local government advocate for such a facility. If a centralized water distribution system were to be pursued, the most likely option would be to purchase water wholesale from a nearby supplier and resell it to customers in Summerfield. It remains to be seen whether such action will be necessary, or whether the community can continue to rely upon groundwater resources for the foreseeable future.”¹¹

Sewer Service

The City of Greensboro’s *Sewage Collection and Water Reclamation Plant Report for 2011*¹² states that the sewage collection system has approximately 101,946 connections that serve residential, commercial, and industrial customers. In 2011, the City’s Water Resources Department treated an average of 27 MGD of wastewater.

The sewer collection system transports wastewater to two large wastewater treatment facilities. The North Buffalo Facility located off White Street and the T.Z. Osborne Facility located off Huffine Mill Road are permitted to process up to 16 MGD and 40 MGD of wastewater, respectively.

Residents of un-incorporated Guilford County and the Town of Summerfield within the FLUSA rely on septic tanks for wastewater disposal. The *Summerfield Comprehensive Plan* goes on to state that the overall density within the town is too low to support the development of a

⁹ City of Greensboro, Water Status Update webpage, <http://www.greensboro-nc.gov/index.aspx?page=2327>

¹⁰ Piedmont Triad Regional Water Authority 2012 Annual Drinking Water Quality Report webpage, <http://ptrwa.org/images/2012%20PTRWA%20CCR.pdf>

¹¹ Town of Summerfield Comprehensive Plan, webpage, <http://www.summerfieldgov.com/vertical/sites/%7BC25D1811-CF89-415D-A5B8-0412F39A34CB%7D/uploads/%7B22FCF646-697B-482F-9C4B-E68514F08DBF%7D.PDF>

¹² City of Greensboro Water Resources Department webpage, <http://www.greensboro-nc.gov/Modules/ShowDocument.aspx?documentID=13788>

centralized sewer system and that the community desires that future growth continue to be low-density in nature.

Forecasted Population Growth

In order to analyze population characteristics within the FLUSA, data from the US Census Bureau and the North Carolina Office of State Budget and Management (NCOSBM) were used.

According to data from the 2000-2010 Decennial US Census, the Demographic Study Area grew by a 2.8% annualized rate during that decade time period. In comparison, Guilford County as a whole grew by a 1.5% annualized rate.

According to population estimates and projections from the State Demographer provided by the North Carolina Office of State Budget and Management, Guilford County's total population was estimated to be 489,671 in July 2010 and was expected to be 613,198 in July of 2032. This represents a projected 1.03% annualized growth rate during that time period.

Forecasted Employment Growth

According to employment projections provided by the North Carolina Department of Commerce-Division of Employment Security, the Greensboro/High Point/Guilford County Workforce Development Board (WDB) will experience a 0.65% annualized employment growth rate between 2008-2018.¹³

Available Land

The FLUSA as a whole contains approximately 12,337 acres. The total area of the parcels within the FLUSA is 11,388 acres; the remaining acreage of the FLUSA is in roadway rights-of-way. The City of Greensboro owns parcels around the lakes and in parks. These were assumed to be protected from development and were subtracted out, leaving 8,681 acres of non-city-owned parcels. Among the non-city-owned parcels, there are 2,886 acres of undeveloped parcels, where a parcel is defined as being undeveloped if the value of any buildings on it is less than \$20,000. The Clip tool was used in ArcGIS to calculate the acreage within each of the following:

- 50-foot stream and lake buffers (250 acres)
- 300-foot project right-of-way (*i.e.*, 150-foot buffer to either side of the project centerline) (48 acres)

To avoid double-counting the acreage that is in both the stream/lake buffer and the right-of-way, the Union tool was used in ArcGIS to calculate the "unique" acreage, resulting in 291 acres. This acreage was subtracted out, leaving 2,595 acres of undeveloped parcels in the FLUSA which are considered to be available for development.

¹³ North Carolina Department of Commerce-Division of Employment Security WDB webpage, <http://eslmi23.esc.state.nc.us/projections/EmpByMajIndGrp>

Market for Development

Annualized population growth of the Demographic Study Area was almost double that of Guilford County between 2000 and 2010, 2.8% and 1.5%, respectively. Population projections predict that Guilford County will experience a 1.03% annualized growth rate until 2032. Based upon the historical data and projections, future land use plans, available land and available water and sewer service, it can be assumed that the market for development within the FLUSA will remain strong.

Public Policy

Future Land Use

The first City of Greensboro *Comprehensive Plan – Connections 2025* (referred to as Comprehensive Plan) was adopted in May 2005 and last updated in June 2007. The Comprehensive Plan provides “a guide for the citizens of Greensboro to retain the community’s character, define its identity, improve its quality of life, and strengthen its economy.” The study area for the Comprehensive Plan includes land within the Greensboro city limits and the area in un-incorporated Guilford County that falls inside of the Water and Sewer Service Area boundary. Plans for future development are done in concert with the provision or extension of water and sewer.

The Urban Loop is listed as a “Factor for Change” in the Plan, or a condition that can be expected to influence where and when development pressures will occur. These Factors for Change indicate where attention should be focused to manage future growth and change. The Plan anticipates development pressures at many of the interchanges along the Urban Loop.

In analyzing growth trends, the City’s overall development pattern was divided into three components: Urban Greensboro, Suburban Greensboro, and Fringe Growth Areas (Comprehensive Plan, pages 3-6 and 3-7 and Figure 3-3).

- Urban Greensboro consists of the urbanized center of the City, including the Downtown and the surrounding older highway corridors and neighborhoods, including much of East Greensboro. This area encompasses much of the City's history and its urban grid pattern that predate the period of post-war growth of the 1950s and after. No part of the FLUSA is characterized as Urban Greensboro.
- Suburban Greensboro covers the large swath of the City, comprised primarily of "built-out" lower density residential neighborhoods and newer commercial developments, which almost entirely surrounds Urban Greensboro. Most of the FLUSA is characterized as Suburban Greensboro.
- Fringe Growth Areas are areas beyond the City's presently developed edges where new development is already occurring, or where growth pressures may be expected to occur in the future. The portion of the FLUSA north of the lakes is characterized as a Fringe Growth Area; more precisely, it is an Anticipated Growth Area, where development pressures may be expected but where it may not be feasible for the City to provide services.

The City developed a Generalized Future Land Use Map (FLUM) to depict the desired future pattern of land use over the next ten to twenty years as described in the Comprehensive Plan. The Generalized FLUM serves as a broad land use guide to be implemented by zoning regulations.

The Generalized FLUM (Comprehensive Plan, Figure 4.2) shows low (3 to 5 dwelling units per acre) residential land use for most of the Greensboro portion of the FLUSA. The land surrounding the lakes is Major Parks/Open Space. An area of Mixed Use Residential is centered on Battleground Avenue north of the proposed project. An area of Mixed Use Commercial is centered on Battleground Avenue south of the proposed project. To the west and east of the Activity Center are areas of medium (5 to 12 dwelling units per acre) residential land use. Mixed Use Commercial is also shown in the southern part of the FLUSA, around Bryan Boulevard, Horse Pen Creek Road, and New Garden Road. The project corridor also passes through areas that are shown as airport property, industrial/corporate park, and institutional uses.

The Mixed Use Commercial area centered on Battleground Avenue south of the project is designated as an Activity Center. According to page 4-15 of the Comprehensive Plan:

Activity Centers are existing or anticipated future concentrations of uses that function as destinations or hubs of activity for the surrounding area. Typically located in areas of mixed use shown on the Generalized Future Land Use Map, such centers are intended to include features such as a mix of higher intensity uses (housing, retail, office, etc.), compact development patterns, and pedestrian and transit linkages.

The Comprehensive Plan (pages 3-10 and 3-11 and Figure 4.3) delineates three growth tiers between the present City limits and the water/sewer boundary to properly stage annexation, development, and the extension of City infrastructure and public services.

- Tier One (Current Targeted Growth) is where growth can best be accommodated over the next ten years. Within these areas growth pressures are already emerging, infrastructure extensions are already being made or planned, and City costs to make such extension are lowest. To the northwest of the proposed project, much of the land in the Greensboro portion of the FLUSA is in Tier One.
- Tier Two (Intermediate Growth) includes areas where substantial growth pressures are not yet in evidence, and where infrastructure costs are greater than in Tier One. It is expected that such areas will be needed to meet the City's growth needs beyond the next ten years. Until such time that Tier One approaches build-out, water and sewer extensions and annexations in Tier Two shall generally be discouraged. There are no Tier Two areas within the FLUSA.
- Tier Three (Long Term Growth) includes areas within the water/sewer boundary where costs to extend infrastructure and city services are highest and where development is less desirable or advantageous until development has consolidated within Tiers One and Two. It is expected that such areas will be needed to meet the City's growth needs beyond the next 20 years. Until such time that Tier Two approaches build-out, water and sewer extensions and

annexations in Tier Three shall be discouraged. Within the FLUSA, some land in the vicinity of the lakes is in Tier Three.

Zoning

Greensboro

The City of Greensboro adopted a *Land Development Ordinance*¹⁴, effective July 1, 2010, which outlines and defines zoning districts. The City's interactive GIS viewer¹⁵ was used to identify the zoning categories present within the FLUSA.

The predominant zoning within the Greensboro portion of the FLUSA is Single-Family Residential (R-3). Zoning in the vicinity of the project corridor includes Office (O), Public and Institutional (PI), Business Park (CD-BP), Multi-Family Residential (RM-8 and CD-RM-12), and Commercial (CD-C-H). In the vicinity of the lakes, the zoning categories include Parkland and Natural Resource Area (PNR), Public and Institutional (PI), and Planned Unit Development (PUD).

The proposed interchange at Battleground Avenue includes Multi-Family Residential (CD-RM-18), Commercial (CD-C-M), Light Industrial (CD-LI), and Office (O).

Within the FLUSA, most of the project corridor lies within the Scenic Corridor Overlay District 1. From a point about one-fourth mile west of Battleground Avenue to the eastern boundary of the FLUSA, the project corridor lies within the Scenic Corridor Overlay District 2.

Other zoning in the FLUSA includes Multi-Family Residential (CD-RM-5) and Single-Family Residential (R-5).

The zoning classifications are defined on pages 6-1 through 6-9 of the Land Development Ordinance. The definitions are reproduced below.

Business Park (CD-BP) - The BP, Business Park district is primarily intended to accommodate office, warehouse, research and development, assembly and other uses on larger sites in a planned, setting that emphasizes natural characteristics and landscaping. The district may also contain retail, service and higher density residential uses which customarily locate within or adjacent to planned employment centers. Design and the orientation and operation of uses should ensure compatibility with adjacent residential uses. Standards are intended to foster originality and flexibility.

Commercial (CD-C-H) - The C-H, Commercial-High district is primarily intended to accommodate a wide range of high-intensity retail and service developments meeting the shopping and distributive needs of the community and the region, and other uses. The district is established on large sites which are typically located along thoroughfares to provide locations for major developments which contain multiple uses, shared parking and drives, and coordinated signs and landscaping.

¹⁴ City of Greensboro Land Development Ordinance webpage, <http://www.greensboro-nc.gov/index.aspx?page=3063>

¹⁵ City of Greensboro interactive GIS viewer, (<http://www.greensboro-nc.gov/index.aspx?page=1715>)

Commercial (CD-C-M) - The C-M, Commercial-Medium district is primarily intended to accommodate a wide range of retail, service, office and multi-family residential uses in a mixed-use environment. The district is typically located along thoroughfares in areas which have developed with minimal front setbacks.

Light Industrial (CD-LI) - The LI, Light Industrial district is primarily intended to accommodate limited manufacturing, wholesaling, warehousing, research and development, and related commercial/service activities which in their normal operations, have little or no adverse effect upon adjoining properties.

Multi-Family Residential (CD-RM-5) - The RM-5, Residential Multi-family district is primarily intended to accommodate duplexes, twin homes, townhouses, cluster housing, and other residential uses at a density of 5.0 units per acre or less.

Multi-Family Residential (CD-RM-12) - The RM-12, Residential Multi-family district is primarily intended to accommodate multi-family and other residential uses at a density of 12.0 units per acre or less.

Multi-Family Residential (CD-RM-18) - The RM-18, Residential Multi-family district is primarily intended to accommodate multi-family and other residential uses at a density of 18.0 units per acre or less.

Multi-Family Residential (RM-8) - The RM-8, Residential Multi-family district is primarily intended to accommodate duplexes, twin homes, townhouses, cluster housing, and other residential uses at a density of 8.0 units per acre or less.

Office (O) - The O, Office district is primarily intended to accommodate office, institutional, supporting service and other uses.

Parkland and Natural Resource Area (PNR) - The PNR, Parkland and Natural Resource Areas district is intended to accommodate large size (over 10 acres) public and quasi-public lands such as major regional parks and recreation areas, conservation or natural areas, shore land, urban wilderness areas, and waterfront access areas, open space owned by a governmental or nonprofit (or similar) entity for land conservation, and associated ancillary uses such as operational facilities, recreational facilities designed to accommodate intermittent activities (such as ball fields or amphitheaters), and concessions operating under the purview of the Parks and Recreation Department. It is not intended to accommodate outdoor recreation areas that are more commercial and permanent in nature, such as amusement parks or go-kart tracks. Nor is it intended to accommodate smaller neighborhood parks or recreation areas.

Planned Unit Development (PUD)

(A) PUD, Planned Unit Development districts are intended to allow a diverse mixture of residential and/or nonresidential uses and structures that function as cohesive and unified projects. The districts encourage innovation by allowing flexibility in permitted use, design, and layout requirements in accordance with a

Unified Development Plan. This should provide benefits by providing opportunities for employment and services closer to residences.

(B) Planned Unit Development districts are intended to reduce housing and infrastructure costs by promoting smaller lot sizes and the corresponding linear footage of streets, water lines, and sanitary and storm sewers. This should reduce the amount of site grading.

(C) Planned Unit Development districts are primarily intended in areas which have underutilized or vacant land near major streets and utility lines, or where the applicant proposes a development that is compatible with the surrounding area (natural and built) but may require modifications to the basic standards of the underlying zoning district. This should protect water quality and preserve wildlife habitats and other natural features such as streams, lakes, wetlands, and trees.

Public and Institutional (PI) - The PI, Public and Institutional district is intended to accommodate mid- and large-sized (over 5 acres) public, quasi-public, and institutional uses which have a substantial land use impact or traffic generation potential. It is not intended for smaller public and institutional uses customarily found within residential areas.

Single-Family Residential (R-3) - The R-3, Residential Single-family district is primarily intended to accommodate low density single-family detached residential development. The overall gross density in R-3 will typically be 3 units per acre or less.

Single-Family Residential (R-5) - The R-5, Residential Single-family district is primarily intended to accommodate low-density single-family detached residential development. The overall gross density in R-5 will typically be 5.0 units per acre or less.

Overlay district regulations contain standards applicable to certain areas in addition to base district zoning standards in order to help development fit better with the site and surrounding properties. Where specified, overlay district standards modify base district standards.

Scenic Corridor Overlay District - The -SCO, Scenic Corridor overlay district is intended to preserve and enhance the appearance and operational characteristics of certain designated roadways; and address development issues of special concern with specific requirements which relate to land use, traffic movement, access, environment, signs, preservation of vegetation, landscaping, visual quality, and aesthetics.

Summerfield

The Town of Summerfield adopted its *Development Ordinance*¹⁶ in 1997 and last amended it in 2010. To identify the zoning categories present within the FLUSA, the Town's Zoning Reference

¹⁶ Town of Summerfield Development Ordinance
http://www.summerfieldgov.com/vertical/sites/%7BC25D1811-CF89-415D-A5B8-0412F39A34CB%7D/uploads/Summerfield_Development_Ordinance_2012.pdf

Maps¹⁷ were accessed. Much of the Summerfield portion of the FLUSA is zoned Residential Single-Family (RS-40). There is a Manufactured Housing (MH) overlay district on Carlson Dairy Road.

Some areas bordering the lake are zoned either Agricultural (AG) or Public and Institutional (PI). The PI-zoned areas are part of the Watershed Critical Area (WCA) overlay district. A parcel at the northeast corner of Pleasant Ridge Road and Carlson Dairy Road is zoned Limited Business (LB), as is another parcel at the southwest corner of Pleasant Ridge Road and Lewiston Road.

The zoning categories are defined on pages 4-1 through 4-3 of the Development Ordinance. The definitions are reproduced below.

Agricultural (AG) - The AG, Agricultural District, is primarily intended to accommodate uses of an agricultural nature, including farm residences and farm tenant housing. It also accommodates scattered non-farm residences on large tracts of land. It is not intended for major residential subdivisions.

Limited Business (LB) - The LB, Limited Business District is primarily intended to accommodate moderate intensity shopping and services close to residential areas. The district is established to provide locations for businesses which serve nearby neighborhoods. The district is typically located near the intersection of collectors or thoroughfares in areas which are otherwise developed with residences.

Public and Institutional (PI-WCA) - The PI, Public and Institutional District is intended to accommodate mid-and large-sized public, semi-public and institutional uses which have a substantial land use impact or traffic generation potential. It is not intended for smaller public and institutional uses customarily found within residential areas.

Residential Single-Family (RS-40) - The RS-40, Residential Single-Family District is primarily intended to accommodate single-family detached dwellings on large lots in areas without access to public water and wastewater services. The district is established to promote single-family detached residences where environmental features, public service capacities, or soil characteristics necessitate very low-density single-family development. Development within this district requires Open Space dedication. The overall gross density in RS-40 areas will typically be 0.73 units per acre or less, with a minimum lot size of 40,000 square feet.

Overlay Districts establish certain area regulations which are in addition to the underlying general use, planned unit development or conditional use district(s).

Manufactured Housing (MH) - The MH Overlay District is intended to set forth regulations governing the development of subdivisions for manufactured housing in certain areas of the Town of Summerfield.

¹⁷ Town of Summerfield Zoning Reference Maps,
http://www.summerfieldgov.com/index.asp?Type=B_BASIC&SEC={B5146128-C9BE-4D5C-9A70-E551B5B268CB}

Watershed Critical Area (WCA) - The WCA Overlay District is intended to set forth regulations for the protection of public drinking water supplies and is applicable to all lands adjacent to and which drain toward existing or proposed water supply intakes or reservoirs.

Guilford County

Guilford County's current *Development Ordinance* was enacted in 2012. The County's interactive GIS viewer¹⁸ was used to identify the zoning categories present within the FLUSA.

Within the Guilford County portion of the FLUSA, the predominant zoning is Residential Single-Family (RS-40). Other zoning includes Agricultural (AG, along Pleasant Ridge Road, east of Highland Grove Drive), Planned Unit Development - Residential (PD-R, one parcel along Lewiston Road and one parcel south of Hackamore Road), and Public and Institutional – Watershed Critical Area Overlay District (PI-WCA, one parcel along Lewiston Road).

The zoning categories are defined on the Guilford County Planning and Development Department website¹⁹. The definitions are reproduced below:

Agricultural (AG) - The AG, Agricultural District, is primarily intended to accommodate uses of an agricultural nature, including farm residences and farm tenant housing. It also accommodates scattered non-farm residences on large tracts of land. It is not intended for major residential subdivisions.

Planned Unit Development – Residential (PD-R) - The PD-R District is intended to accommodate a variety of housing types developed on large tracts in accordance with a Unified Development Plan. The PD-R District also accommodates neighborhood business and office uses which primarily serve nearby residents.

Public and Institutional (PI) - The PI, Public and Institutional District is intended to accommodate mid-and large-sized public, semi-public and institutional uses which have a substantial land use impact or traffic generation potential. It is not intended for smaller public and institutional uses customarily found within residential areas.

Residential Single-Family (RS-40) - The RS-40, Residential Single-Family District is primarily intended to accommodate single-family detached dwellings on large lots in areas without access to public water and wastewater services. The district is established to promote single-family detached residences where environmental features, public service capacities or soil characteristics necessitate very low density single-family development. The overall gross density in RS-40 area will typically be 1.0 unit per acre or less.

Overlay Districts establish certain area regulations which are in addition to the underlying general use, planned unit development or conditional use district(s).

¹⁸ Guilford County interactive GIS viewer webpage, http://gcgis.co.guilford.nc.us/guilford_new/

¹⁹ Guilford County Planning and Development Department webpage, http://www.co.guilford.nc.us/planning_cms/zoning_gc.html

Watershed Critical Area (WCA) - The WCA Overlay District is intended to set forth regulations for the protection of public drinking water supplies and is applicable to all lands adjacent to and which drain toward existing or proposed water supply intakes or reservoirs.

NPDES Phase I and II Regulations

In 1972, the National Pollutant Discharge Elimination System (NPDES) was established under the authority of the Clean Water Act. Phase I of the NPDES stormwater program was established in 1990. It focused on site and operations planning to reduce pollutant sources. Phase I covered industrial activities in 10 categories, construction activities that disturbed five or more acres, and municipalities with populations of 100,000 or more that owned or operated a municipal separate storm sewer system (MS4). The Phase II program extends permit coverage to smaller (< 100,000 population) communities and public entities that own or operate a municipal separate storm sewer system (MS4) by requiring them to apply for and obtain a NPDES permit for stormwater discharge. Federal law requires communities and public entities that own or operate a MS4, and that meet either of the following two conditions, to obtain a NPDES Phase II stormwater permit:

- 1) The MS4 is located in an urbanized area as determined by the latest Decennial Census of the Bureau of the Census. If the MS4 is not located entirely within an urbanized area, only the portion that is within the urbanized area is regulated.
- 2) The community or public entity is designated by the NPDES permitting authority. In the state of North Carolina, the NPDES permitting authority is the Environmental Management Commission (EMC).²⁰

The entirety of the FLUSA is subject to Phase I and II regulations. The City of Greensboro is a designated NPDES Phase I entity and therefore also Phase II. In addition, the small portions of the FLUSA that are not within the City of Greensboro are within the designated Phase II MSI area. Furthermore, as they are within this Phase II MSI area, The Town of Summerfield and the Town of Oak Ridge and their Extra Territorial Jurisdictions (ETJ's) are designated as exempted Phase II municipalities.

Jordan Rules – Jordan Lake Nutrient Strategy

The land encompassed by the FLUSA defined for STIP U-2524C is subject to the Jordan Rules (15A NCAC 02B.0262-0311), which became effective August 11, 2009. According to a memorandum prepared by PBS&J for STIP U-2525, an adjacent portion of the Greensboro Urban Loop, these comprehensive set of rules were developed by the North Carolina Division of Water Quality (NCDWQ) to address excess nutrients in Jordan Lake, which serves as a source of water for some of the jurisdictions in the Triangle region. The Rules apply to portions of eight counties, generally located to the northwest of and which drain into, Jordan Lake.

The memo further states that, “the Rules constitute the Jordan Lake Nutrient Management Strategy with the goal of reducing the average annual loads of nitrogen and phosphorus

²⁰ NCDENR NPDES Stormwater Program webpage, <http://portal.ncdenr.org/web/wq/ws/su/npdessw>

delivered to the Jordan Reservoir. Specifically, the strategy establishes nutrient reduction goals for each of the three arms of the Jordan Reservoir and specifies stormwater management requirements for new and existing development to achieve these goals. The stormwater management requirements for new development include an approved stormwater management plan, a plan to ensure maintenance of Best Management Practices (BMP's) and a plan to ensure enforcement and compliance with all requirements. The strategy also specifies riparian buffer requirements within 50 feet of all sides of surface waters."²¹

In terms of potential new development within the FLUSA established for STIP U-2524C, the City of Greensboro's currently adopted stormwater program, a requirement as a designated National Pollutant Discharge Elimination System (NPDES) Phase I community and detailed in the City's *Post-Construction Stormwater Ordinance* (June 2009) will satisfy the stormwater management requirement set forth in the Jordan Rules.

For portions of the FLUSA within unincorporated Guilford County or the Town of Summerfield (a Phase II exempt community), the 'Phase II tipped county' status of Guilford County will also satisfy the stormwater management requirement set forth in the Jordan Rules.

In addition, The Town of Summerfield's *Riparian Buffer Protection Ordinance for Lands within the Jordan Watershed*²² applies to all land in the planning jurisdiction of the Town that is located in the Jordan Reservoir Watershed and establishes riparian buffers spelled out in the Jordan Lake Nutrient Management Strategy in order to maintain their nutrient removal and stream protection functions.

Notable Natural Features

Reedy Fork Water Supply Watershed

The entire FLUSA is within either the Protected or Critical Area of the Reedy Fork Water Supply Watershed (WSWS), which is classified as a WS-III-NSW within the Cape Fear River basin. The Critical Area is located in and extends outside of the northeast portion of the FLUSA, generally east of US 220/Battleground Ave and surrounding Lake Brandt, but also encompassing the northernmost portion of Lake Higgins. The remainder of the FLUSA is within the Protected Area, which also extends outside of the FLUSA in every direction except for the southeast, where the FLUSA follows the WSWS boundary.

According to the North Carolina Division of Water Quality, WS-III waters are generally located in low to moderately developed watersheds and are sources of water supply for drinking, culinary, or food processing where a more protective WS-I or WS-II classification is not feasible.²³

²¹ U-2525 Jordan Rules Memorandum, PBS&J, April 2010

²² Town of Summerfield Riparian Buffer Protection Ordinance for Lands within the Jordan Watershed, webpage, http://www.summerfieldgov.com/vertical/sites/%7BC25D1811-CF89-415D-A5B8-0412F39A34CB%7D/uploads/Jordan_Watershed_Buffer_Ordinance_final_for_second_submission_june_2_010.pdf

²³ NCDENR NC Water Quality Classifications webpage, <http://portal.ncdenr.org/web/wq/ps/csu/classifications#classes>

Significant Natural Heritage Areas

There are three Significant Natural Heritage Areas (SNHA) located within the FLUSA: the 120-acre Reedy Fork Bottomlands SNHA is located in the northwestern part of the FLUSA, to the west of US 220 and upstream of Lake Brandt; the 35-acre Lake Higgins Forest SNHA is located to the east of and adjacent to Lake Higgins and; the 8-acre Lake Brandt Slopes SNHA is located on the eastern shore of Lake Brandt.

In addition, there are two SNHA's located immediately outside and to the northwest of the FLUSA, the 150-acre Moores Creek Slopes and Floodplain and the 66-acre Cedar Ridge Farm SNHA. One SNHA, the 5-acre Laurel Bluff Ravine, is located immediately outside and to the northeast of the FLUSA.

303(d) Listed Impaired Waters

303(d) listed impaired waters within the FLUSA include: Brush Creek, Horsepen Creek and Un-named Tributary at Guilford College, which are all listed as category five and impaired for ecological/biological integrity Benthos.

There are no High Quality Waters or Outstanding Resource Waters within one mile of the project area. There are no streams within the project area that are designated as, trout streams, North Carolina Natural or Scenic Rivers or as National Wild and Scenic Rivers.

Lands Managed for Conservation, Open Space, Clean Water Management Trust Properties

According to GIS data, there is a parcel within the FLUSA that is listed as a Clean Water Management Trust Property. This parcel was donated individually and is located on eastern shore of Lake Brandt, aiding in watershed protection.

There is one parcel located partially within the FLUSA, which according to GIS data, which is listed as Lands Managed for Conservation and Open Space. This is the 213-acre Guilford Courthouse National Military Park, which is owned by the federal government and managed by the National Park Service.

Finally, the 41-acre parcel that contains the Lake Brandt Open Space and Hiking Trail facility is a Land and Water Conservation Trust Property located on the eastern side of Lake Brandt.

Indirect Screening Matrix Methodology

An Indirect and Cumulative Land Use Effects Screening Matrix was developed for STIP U-2524C. This matrix assesses factors that influence land development decisions and presents an assessment in a quantitative matrix based upon existing conditions and trends. It rates the impact of each category from higher potential for indirect effects to lower potential for indirect effects. The measures used are supported by documentation. Each category is assessed individually and the results of the table are looked at comprehensively to determine the indirect and cumulative effects potential of the proposed project. The Scope of Project, Change in Accessibility, Public Policy, and Notable Environmental Features categories are given extra weight to determine if future growth in the area is related to project modifications.

ICE Screening Matrix

Indirect Land Use Effects Screening Tool - STIP Project U-2524C - Greensboro Urban Loop										
Rating	Scope of Project	Change in Travel Time	Forecasted Population Growth	Forecasted Employment Growth	Available Land	Water/ Sewer Availability	Market for Development	Public Policy	Notable Environmental Features	Result
More Concern	Major New Location	> 10 minute travel time savings	> 3% annual population growth	Substantial # of New Jobs Expected	5000+ Acres of Land	All services existing / available	Development activity abundant	Less stringent; no growth management	Targeted or Threatened Resource	
↑										
↔	X					X	X			
↔		X	X		X					Possible Indirect Scenario Assessment
↓				X				X	X	
Less Concern	Very Limited Scope	No travel time savings	No population growth or decline	No new Jobs or Job Losses	Limited Land Available	No service available now or in future	Development activity lacking	More stringent; growth management	Features incorporated in local protection	

ICE Screening Matrix Summary

Based upon the information analyzed and the corresponding values assigned for each category within the ICE screening matrix, the output recommendation is 'Possible Indirect Scenario Assessment'.

Scope of Project

The proposed project is an approximately 4.8 mile long, six-lane freeway segment of the Greensboro Urban Loop. This new location project stretches from north of Bryan Boulevard to US 220/Battleground Avenue. The project will also include the construction of a system-to-system interchange at US 220/Battleground Ave and the completion of the existing Bryan Boulevard interchange to accommodate all traffic movements. Although this project is a freeway on new location, this category was rated as 'moderately- high' due to the project's relatively short length as compared to the value assigned to the scope of project category within the ICE matrix for STIP Project U-2525B/C, which is approximately 10.3 miles long.

Change in Travel Time

Potential travel time savings as a result of the project was estimated by utilizing the Google Maps trip estimating application. As this is a new location project, the project's termini were inputted and the trip was estimated by Google Maps using the shortest available route on existing roadways. It was estimated that the trip currently takes 9-10 minutes, whereas traveling the approximately 4.8 mile long new location facility at the posted speed limit of 65 mph would take approximately 4.5 minutes. Therefore, this category was rated as 'moderate' or between 3-6 minutes.

Forecasted Population Growth

According to population estimates and projections from the State Demographer provided by the North Carolina Office of State Budget and Management, Guilford County's total population was estimated to be 489,671 in July 2010 and is expected to be 613,198 in July of 2032. This represents a projected 1.03% annualized growth rate during that time period. As a result, this category was rated a 'moderate' or between 2-3%.

Forecasted Employment Growth

According to employment projections provided by the North Carolina Department of Commerce-Division of Employment Security, the Greensboro/High Point/Guilford County Workforce Development Board (WDB) will experience a 0.65% annualized employment growth rate between 2008-2018. Consequently, this category was rated as 'moderately-low' or between 0-1%.

Available Land

The FLUSA as a whole contains 2,595 acres of undeveloped parcels which are considered to be available for development. As a result, this category was rated as 'moderate' or between 2,500-3,750 acres.

Water and Sewer Availability

The majority of the FLUSA is within the City of Greensboro's urban services boundary. As a result, water and sewer service is available for the entire FLUSA except for two areas to the east of Pleasant Ridge Road and west of Lake Higgins within the Town of Summerfield. Residents of both Summerfield and un-incorporated Guilford County rely upon septic systems and private groundwater wells. This category was rated 'moderately-high'.

Market for Development

Development has been prevalent in and will continue to occur within the FLUSA. Based upon the historical data and projections, future land use plans, available land and available water and sewer service, it can be assumed that the market for development within the FLUSA will remain strong. This category was rated 'moderately-high'.

Public Policy

There are stringent public policies in place including Phase II regulations, Jordan Lake Nutrient Management Strategy Rules, an adopted Water Supply Watershed ordinance and planning documents (Comprehensive Plan and the Long Range Transportation Plan) that include planned provisions for this project. As a result, this category was rated as 'moderately-low', signifying the above average presence growth management policies.

Notable Environmental Features

Because of the above average presence of growth management policies, the notable natural features that are present within and in close proximity to the FLUSA (Lake Brandt, Lake Higgins,

303(d) listed streams, Significant Natural Heritage Areas, and lands managed for conservation and open space) will be incorporated into local protection. Therefore, this category was rated as 'moderately-low'.

Indirect Effects Summary

Based upon the output of the ICE Screening Matrix, this full control of access project has a moderate likelihood to increase the development potential of and intensity in the areas adjacent to the STIP U-2524C corridor, although development is expected to continue to occur in the FLUSA in the No-Build scenario.

Transportation impact causing activities include: an increase in exposure, minimal travel time savings and a change of travel patterns. However, the proposed full control of access freeway and system to system interchanges at the project termini will not increase access to parcels along the project corridor currently without access or create land use nodes not already planned.

It is likely that any development will be clustered in planned mixed-use developments as shown on the Generalized Future Land Use Map (FLUM) primarily north (mixed-use residential) and south (mixed-use commercial, designated activity center) of the planned I-840/US 220 interchange. Other planned high intensity growth shown on the FLUM along the project corridor includes: commercial (near PTI airport), industrial/corporate park and mixed-use commercial (centered on the planned I-840/Fleming Road interchange) and institutional land use (north and south of Drawbridge Parkway). This is important to note, because planned compact mixed-use development helps to steer development away from environmentally sensitive areas and serves to reduce impervious surface. The remainder of the FLUSA is designated as low density residential (3.5 dwelling units/acre) and Major Park/Open Space. The FLUM also shows a Watershed Critical Area for approximately the northern portion of the FLUSA surrounding Lake Brandt and Lake Higgins, where planned low density development will occur.

Any development, with or without the project that potentially impacts jurisdictional resources will be subject to regulatory permitting requirements. Furthermore, any development within the Reedy Fork WS-III Protected or Critical Water Supply Watershed will be subject to the requirements of the adopted ordinance such as specific density requirements and riparian buffers. Lastly, Phase II stormwater regulations in place and the Jordan Lake Nutrient Management Strategy Rules, which stipulate post construction stormwater treatment, maintenance of Best Management Practices and 50-foot wide riparian buffers, will further mitigate potential water quality effects.

Therefore, analysis indicates indirect effects in the form of change in land use, as a result of the project, are likely to be minimal and this project will likely not result in a significant change in impervious surface and subsequently will not notably affect water quality within the FLUSA.

Cumulative Effects Summary

The construction of STIP Project U-2524C, in conjunction with other planned transportation projects in the general vicinity within the Triad region, will improve mobility and have the potential to change travel patterns. Any resultant induced development and complementary

land development, coupled with the completion of recent transportation and development projects along with the construction of planned transportation projects and private development projects, could constitute a cumulative effect on the study area.

Other planned and/or constructed transportation projects include:

- STIP Project R-2309, the widening of a section of US 220 from SR 2182 Horsepen Creek Road in Guilford County to the US 220/NC 68 Connector (R-2413) in Rockingham County
- STIP Project R-2577, the multi-lane widening of US 158 north of US 421/I-40 Business in Forsyth County to US 220 in Guilford County with a potential new location bypass of Stokesdale
- STIP Project W-5114, the widening of NC 68 to a three-lane section with a center turn lane from south of SR 2111 (East Harrell Road to SR 4831 (Bartonshire Drive); and
- STIP Project I-5110, the new location freeway to connect NC 68 (near the proposed US 220/NC 68 Connector- STIP 2413) to existing Bryan Boulevard at PTI Airport
- STIP Project R-2413, a multi-lane improvement as part of the NC 68/US 220 Intrastate corridor (future I-73), extends from the current intersection of NC 68 and US 220 in Rockingham County south to the existing four-lane section of NC 68 near PTI Airport; includes new location along Sections A and B from US 220 to the NC 68/SR 2133 intersection
- STIP Project R-2309, the widening of US 220 to multi-lanes from SR 2182 (Horsepen Creek Road) in Greensboro to the proposed US 220/NC 68 Connector (TIP Project R-2413) just north of the Haw River

With respect to past and present projects within the FLUSA, development has occurred in the form of various types of land use including the PTI airport expansion, and transportation projects such as the completion of existing segments of the Greensboro Urban Loop and the widening of I-40. Presently, some residential and commercial development is under construction and a few development applications are under consideration. The past, present and future projects within the FLUSA are consistent with local land use plans.

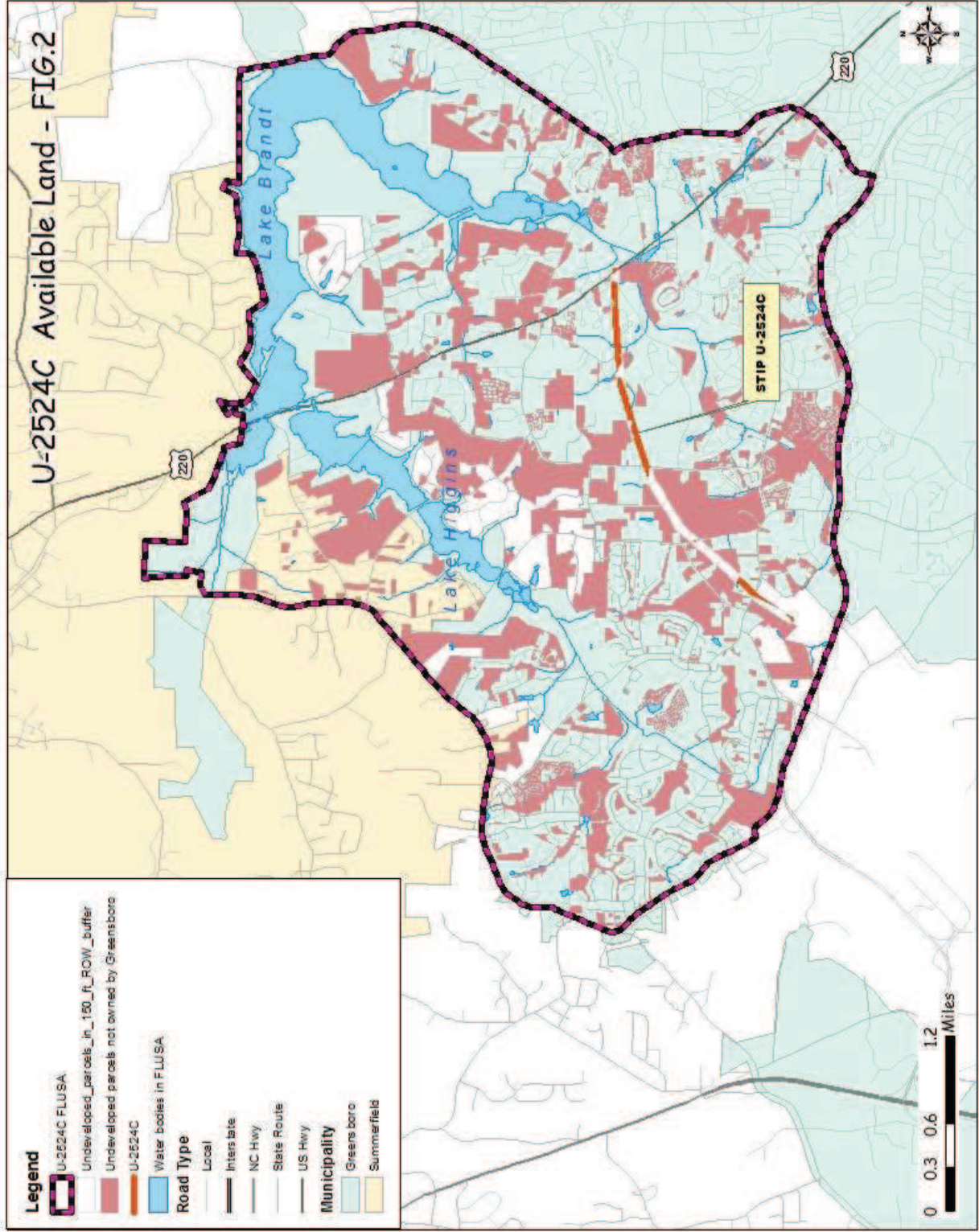
As discussed above in the Development Regulations section, several areas within the FLUSA are designated on the City's *Generalized FLUM* as Mixed-Use Residential, Mixed Use Commercial, Mixed Use Corporate Park, or Industrial/Corporate Park and. Specifically, the southern portion of the FLUSA around the proposed US 220/I-840 interchange is designated as an Activity Center and includes Mixed Use Commercial. Planned mixed-use development helps to steer development away from environmentally sensitive areas and serves to reduce impervious surface.

Conclusion

The potential does exist for water resources within the FLUSA to be impacted given the level of past, present, and planned projects. The FLUSA contains both 303(d) listed streams and Critical

Watershed Area. However, comprehensive planning, watershed protection zones and rules, stormwater ordinances, and local sediment and erosion control measures will minimize these effects

Direct natural environmental impacts by NCDOT projects will be addressed by programmatic agreements with resource agencies, and will be further evaluated by the NCDOT Natural Environment Unit during project permitting. Natural environmental impacts that may result from any induced development may be avoided or minimized through the implementation of local, state and federal regulations. Because few indirect impacts are anticipated, the cumulative effect of this project when considered in the context of other past present and future actions, and the resulting impact on the notable human and natural features, should be minimal. Therefore, potential indirect and cumulative effects to downstream water quality should be minimal.



APPENDIX

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Figure 3-3
Plan Section 3.1.3

Trend Growth Scenario

