



Collector Street Element

Introduction

The primary purpose of the collector street system is to collect traffic from neighborhoods and distribute it to the system of major and minor thoroughfares throughout an area. In general, collector streets have two lanes and often have exclusive left-turn lanes at intersections with major and minor thoroughfares and less frequently at intersections with other collectors. Collector streets rarely are constructed and funded by the state. Responsibility for collector streets usually falls to the local government and developers for funding, design, and construction.

Within Fuquay-Varina, collector streets have a wide range of physical characteristics, some of which are attributable to the neighborhoods in which they exist. Though different, the one commonality is that of providing good connectivity. Examples of collector streets in Fuquay-Varina include:

- § Fuquay Avenue
- § Spring Street
- § Buck Rowland
- § Coley Farm Road
- § Whitted Road

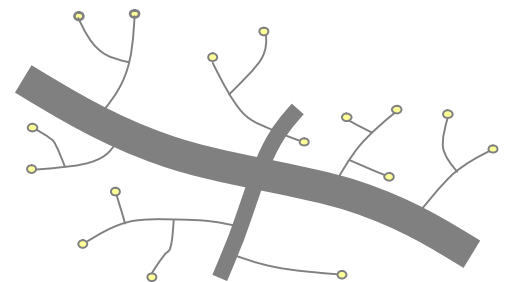
The existing collector street network in Fuquay-Varina is shown in Figure 4.1.

Natural Environment

Located in two watersheds, Fuquay-Varina occasionally faces challenges related to the natural environment that accompanies the Neuse and Cape Fear River basins. Floodplains and wetlands all impact Fuquay-Varina. These features affect how the community develops, where streets can be constructed and maintained, and where connections between streets can be made. Other features of the natural environment that can be found around Fuquay-Varina include historic properties, endangered and threatened species, and superfund sites.



Connected Street Network



Fragmented Street Network



Policy and Guidelines

While this study is focused on transportation, a number of urban design and land use issues must be considered as they impact the character and function of streets.

To reinforce the Town's desire to create an interconnected network of streets that is pedestrian, bicycle, and automobile-friendly, a number of general guidelines are described, including:

- § General connectivity
- § Street spacing and access
- § General street design requirements
- § On-street parking
- § Streetscape enhancements
- § Medians
- § Lighting
- § Street trees
- § Pedestrian crossings
- § Stream crossings
- § Sidewalks and bikeways
- § Transit accommodations (for future local bus service)

Assessment of Collector Street Spacing Needs

It is important to determine an appropriate set of collector street spacing guidelines for this plan. It has been theorized that 1,500 to 3,000 feet is an appropriate spacing for collector streets in a suburban setting; unincorporated and incorporated areas tend to have different development potential. This is mostly due to environmental constraints and the availability of municipal water and sewer service.

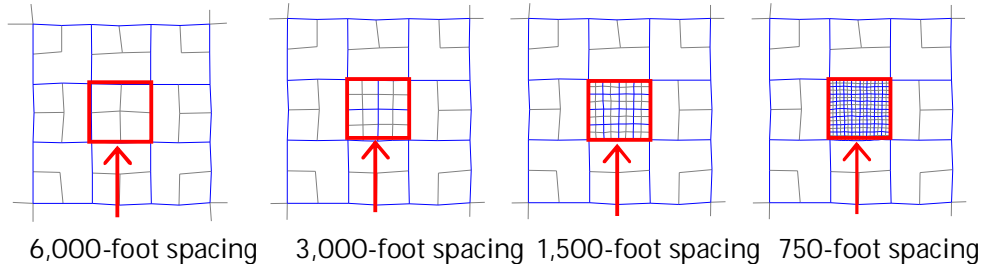
Different spacing standards are necessary for different development types and intensities. Understanding this reality, a theoretical model largely influenced by land use intensity ranges developed by Kimley-Horn shows the desired collector street spacing for different land use intensities.

Process — To test the effects of land use intensity and transportation system density, a TRANPLAN computer model was used for an area in rural Wake County east of the Fuquay-Varina planning area. This model addresses an area approximately 18,000 feet by 18,000 feet — roughly 3 ½ miles by 3 ½ miles in nine super blocks. In the context of this modeling exercise, a super block is defined as an area of land bordered on four sides by a major roadway — a freeway or thoroughfare. Each super block is 6,000 feet by 6,000 feet. To test the impacts of varying land use mixtures and intensity with differing levels of street connectivity, eight land use scenarios were tested under four street spacing



alternatives. The center super block is used to test the effect of varying land use intensities and transportation network density.

Street spacing alternatives include:



The eight land use scenarios include:

- § Low intensity residential, low intensity employment
- § Low intensity residential, high intensity employment
- § Medium intensity residential, low intensity employment
- § Medium intensity residential, medium intensity employment
- § Medium intensity residential, high intensity employment
- § High intensity residential, low intensity employment
- § High intensity residential, medium intensity employment
- § High intensity residential, high intensity employment

To understand the effect of land use intensity and transportation system density, the model can be run for each potential scenario—a total of 32 model runs. For each model run, trips are assigned to the network using equilibrium techniques, which allows for traffic to divert to the most desirable path based on the level of congestion (length of travel time) experienced.

Study and Results — The results show that a 3,000’ grid is typically the most appropriate for the mixed suburban and rural development pattern that prevails in rural Wake County. For more intense development, a 750’ grid proves optimal, but this is independent of the costs that would be incurred to build a network of such intensity. Summary results are indicated in Table 4.1. It should be noted that Fuquay-Varina classifies residential densities differently than Wake County. For example, medium density in Fuquay-Varina is four to seven dwelling units per acre, which is considered high density in Wake County.

Table 4.1 — Street Spacing Results

		Street Spacing		
Employment	High	3,000 ft	3,000 ft	750 ft
	Medium	6,000 ft	3,000 ft	750 ft
	Low	6,000 ft	3,000 ft	1,500 ft
		Low	Medium	High
Land Use Type and Intensity		Residential		

Recommendations — For local and collector streets, recommendations include:

- § Local Streets — One connection along a collector should be in place every 750-1,500 feet. There are cases that will necessitate a variation in this guideline. Approval for these cases will be the responsibility of the Town Engineer and State Division Engineer who will consider traffic impacts, land access, property rights, and environmental conditions.
- § Collector Streets — One public street intersection along a collector or an arterial should be in place every 1,200 to 2,000 feet in a suburban context and every 500 feet to 1,000 feet in the context of heavily developed areas or the central business district. As determined by the Town Engineer, variations in spacing requirements will depend on traffic impacts, land access, property rights, and environmental conditions.

Identifying Future Collector Street Connectors

The following guidelines are used to developing the draft collector street network:

- § Avoid steep slopes and otherwise unsuitable topography
- § Minimize impact to the built environment
- § Avoid FEMA designated floodplains
- § Minimize the number of wetland (National Wetland Inventory) impacts
- § Minimize the amount of each wetland impact (i.e., don't cross a wide wetland when a narrower one can be crossed)
- § Minimize the frequency of stream crossings
- § Minimize the number of high-quality (larger) stream crossings
- § Minimize the length of stream crossings
- § Minimize school impacts
- § Minimize the number and size of each impact to other environmental features such as historic features and districts, threatened and endangered species, hazardous waste sites, and superfund sites
- § Avoid impacts to parks and designated open spaces
- § Minimize the number of new facilities in critical watershed areas
- § Be responsive to existing and planned development patterns
- § Look for existing stub streets
- § Develop feasible connections (A to B)
- § Consider Land Use Plan goals for area development
- § Consider land use potential and plan collectors according to established spacing guidelines.



*Low Intensity L/U
Less than 4 dwelling units
per acre
Street Spacing
3,000' to 6,000'*



*Medium Intensity L/U
4 to 6.9 dwelling units per
acre
Street Spacing
1,000' to 1,500'*



*High Intensity L/U
7 or more dwelling units
per acre
Street Spacing
500' to 1,000'*

Design Guidelines

Designing a street with appropriate horizontal and vertical alignment is important. The following horizontal and vertical design features – based on standards published by *A Policy on Geometric Design of Highways and Streets, 2001*, American Association of State Highway and Transportation Officials (AASHTO) – are recommended for the design of future collector streets. Design speed should be 35 miles per hour, and the maximum recommended grade is 8%. The maximum degree of horizontal curvature is 10 degrees ($R_{\min} = 573$ feet).

General Connectivity

Because the Town has expressed a desire to limit the number of dead-end streets so that traffic is not funneled to a few streets, the following are recommended:

- § Require all subdivisions smaller than 100 dwelling units to include at least one stub-out street to extend and connect with future streets
- § Require subdivisions larger than 100 dwelling units to include at least 2 points of access from a publicly maintained street as part of the development review process and at least one stub-out street to extend and connect with future streets (where applicable)
- § Require that a traffic impact study—prepared by a professional engineer—accompany all development applications that may generate 100 or more peak-hour trips, more than 1,000 daily trips, and any other development at the discretion of the Town Engineer



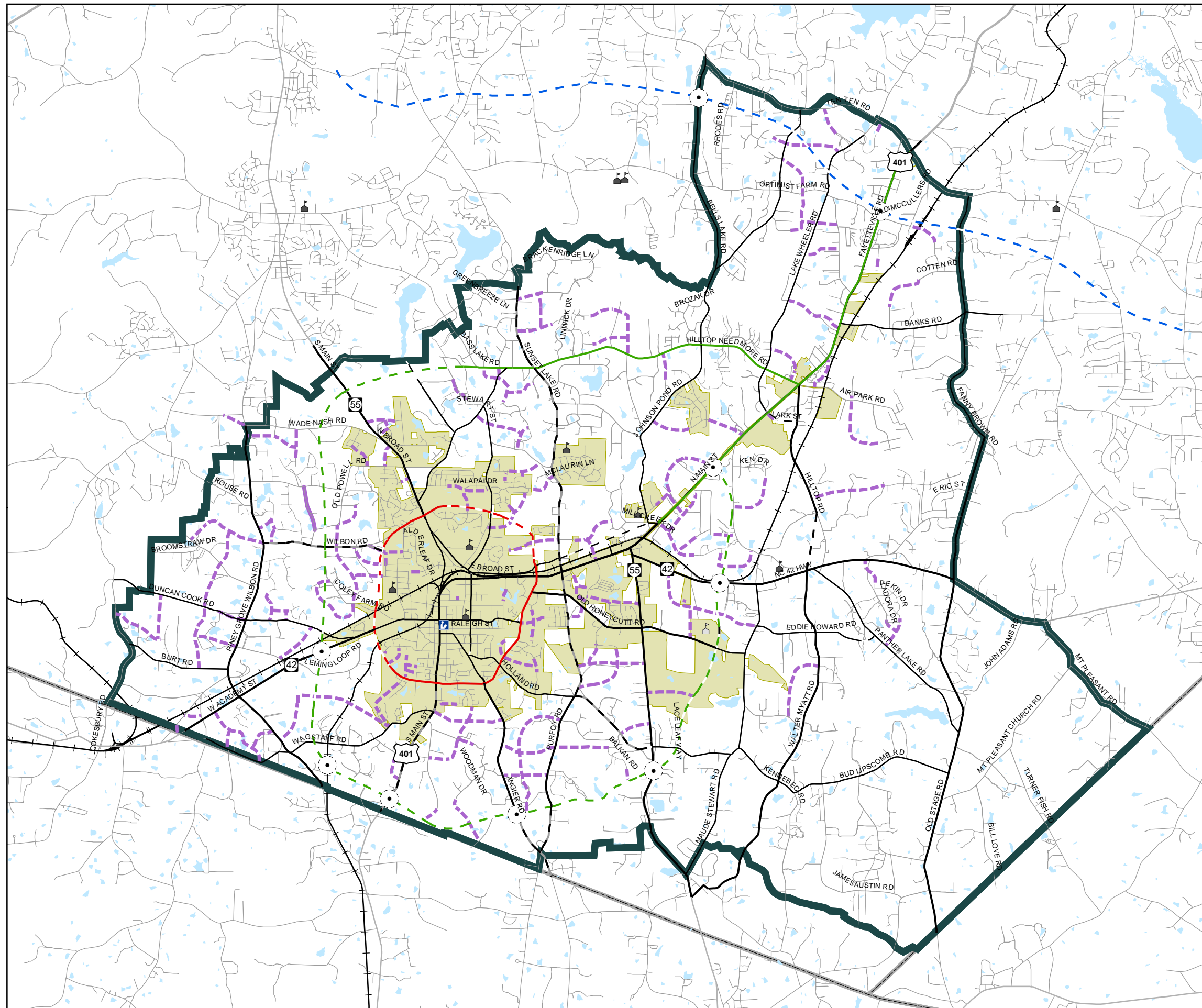
Neighborhood with stub-out streets

Future Collector Street Network

Utilizing the tools discussed above, a future collector street network was developed. This network is shown in Figure 4.2. As can be seen when comparing this figure to Figure 4.1, the future collector street network is much more extensive than the existing network. Key outcome goals of this plan include improving accessibility to higher intensity residential areas and activity centers and avoiding or minimizing impacts to sensitive areas for the preservation of the natural environment. Ultimately, the future collector street network will provide a greater level of connectivity and mobility to the residents of Fuquay-Varina by reducing the travel time between local streets and arterial streets.

FIGURE 4.2

Future Collector Streets



Proposed Collector Street Plan		Expressways	
	New Location		Existing
	Existing		Needs Improvement
	Study Area		Recommended
	Town of Fuquay-Varina	Boulevards	
	County Boundary		Existing
	Bodies of Water		Needs Improvement
	Existing School		Recommended
	Future School	Other Major Thoroughfares	
	Library		Existing
	Proposed Interchange		Needs Improvement
Freeways			Recommended
	Existing	Minor Thoroughfares	
	Needs Improvement		Existing
	Recommended		Needs Improvement
			Recommended



Fuquay-Varina Community Transportation Plan

