Charlotte's Urban Street Design Guidelines: A Context-Sensitive Decision-Making Method

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ABSTRACT

As part of the City of Charlotte's Smart Growth strategy, staff and consultants are developing comprehensive new urban street design guidelines to be applied to all new and modified streets. The design guidelines provide for all travel modes, while explicitly considering land use context, street function, and allocation among competing uses for often-limited right-of-way.

The design guidelines offer direction on planning and designing for five street types and their intersections. As important as the "ideal" cross-sections developed, however, is the information provided to guide the tradeoff decisions inherent in street design, particularly in retrofit or modification situations. To that end, the guidelines include a step-by-step approach to their application. The approach is to be used by land planners, traffic engineers, urban designers and any other stakeholders when faced with accomplishing a variety of objectives within constrained conditions. A test application to a street improvement project demonstrates how the new method has resulted in an alternative street design that would not have been as likely under the traditional approach to street design in Charlotte.

INTRODUCTION

The City of Charlotte, North Carolina is developing comprehensive street design guidelines to be applied to all new and modified streets. Staff and consultants have been working to define recommended design elements, their ideal dimensions, and resulting cross-sections. In addition to providing cross-sections, the guidelines are intended to link and support other policy and planning initiatives related to integrating land use and transportation planning, improving connectivity, and promoting modal choice. As such, the street design guidelines provide a framework for realizing the intent of these other policy initiatives.

Perhaps most importantly, the guidelines include a step-by-step approach to their application. The suggested approach is intended to guide planners, engineers, and all stakeholders as they address the tradeoff decisions inherent in street design, particularly in retrofit or modification situations. For example, the 2002 City bond package included planning and design for a section of Rea Road, a suburban thoroughfare through a residential area. Reflecting the traditional approach to street design in Charlotte, this project was to consist of widening the current two-lane cross-section to four lanes. However, application of the new Street Design Guidelines resulted in consideration of an alternative, three-lane cross-section, which incorporates more stakeholders' perspectives and considers more issues related to the street's design. The alternative cross-section reflects a shifting policy emphasis (away from auto-oriented development) and results from a new process for evaluating and designing street projects. That process is described later in this report, following discussion of the initiatives that prompted the new approach.

BACKGROUND

Charlotte, like many U.S. cities that have grown rapidly since WWII, has an auto-oriented development pattern and street network. The oldest suburbs, which developed during the streetcar/transit era, have a dense network of streets that can support a variety of land use

changes through time. This area of the City extends roughly four miles from the central business district (CBD). Beyond this inner ring of suburbs, however, the street network reflects development patterns of the 1960s-1990s, a period of sustained rapid growth in Charlotte. In these areas, the thoroughfare network is sparse and residential neighborhoods are dominated by cul-de-sac design, few connections to the thoroughfares, and relatively low-density residential development. Natural constraints presented by Charlotte's rolling terrain and dense creek network have exacerbated historical trends that encouraged this type of development. These trends included the desire to improve quality of life by removing opportunities for through traffic in residential areas (*1*).

The predominant development pattern, along with the sparse thoroughfare network in the newer suburbs, has generally resulted in large intersections, sometimes wide cross-sections, and a difficult pedestrian environment along major streets. As existing thoroughfares carry increasing traffic volumes, the City has traditionally provided additional capacity by widening streets and intersections. This traditional approach of designing in response to vehicle capacity requirements sometimes works to the detriment of pedestrians, cyclists, and the surrounding neighborhoods.

In an effort to better provide for continued growth and future quality of life, the City of Charlotte adopted Smart Growth Principles in 2001 (*2*). Partly in recognition of the effects of Charlotte's auto-oriented development pattern, one of the eight adopted principles is to expand transportation choices, through integrated land use and transportation planning. The new street design guidelines help address the principles by providing a framework for integrated planning, through "context sensitive" street design, and a process for creating streets that increase transportation choices. Other, related initiatives include efforts to identify new street and bike/pedestrian connections in existing neighborhoods, policies to guide development into appropriate areas of the City, and the development of methods for assessing how and where the existing transportation network can best support continued growth.

The street design guidelines reflect a new philosophy for planning and designing Charlotte's streets. That philosophy assumes that the safety, convenience, and comfort of cyclists, pedestrians, transit users, motorists, and the surrounding community will all be considered equally when planning and designing streets. To accomplish this, street planning and design must be a group process to adequately reflect the varied perspectives of the street's users. Simply put, the traditional method of planning and designing streets only to increase vehicle capacity is increasingly at odds with other, emerging objectives to create more and better land use and transportation choices.

Resulting Guidelines Framework

The general framework of the street design guidelines builds upon the emerging philosophy defined above and links complementary initiatives by integrating land use and transportation planning, increasing connectivity, and encouraging additional travel options. The guidelines are based on defining and applying five major street types:

- Parkways,
- Boulevards,
- Avenues,
- Main Streets, and
- Local Streets.

Local streets are further classified according to whether they serve residential, commercial, or industrial land uses (see (*3*) for additional detail on the street types). Each of the street types carries with it assumptions about the existing and proposed land uses along the street, their design character, the manner in which the street functions (volumes, speeds, etc.), and, subsequently, the preferred design elements that should be included.

Integrated Planning

The five street types are to be applied as overlays to the existing street classification system. A given thoroughfare might be classified as a higher-volume, higher-speed Boulevard in one section and a lower-speed, commercial Avenue in another section. The overlay concept explicitly recognizes that the land uses and the street function are likely to vary over the length of any given street and that the resulting design should reflect those variations.

Once a street is classified, not only should the ultimate design of the street reflect its classification, but future land use decisions along the street are also expected to support that classification. The classification of streets to these five types will occur through a variety of processes, including the area planning process. In this sense, street design decisions and land use decisions are to be mutually reinforcing (hence, truly integrated).

Increased Connectivity

The guidelines are also intended to create a more connected street network. The current draft of Charlotte's updated General Development Policies (GDP) includes an element relating development intensity to network connectivity. By relating higher density development to the transportation network, it should be possible to provide more route choices. A denser street network is expected to better respond to changing land uses and intensities over the long run and to enhance pedestrian and bicycle safety and convenience. To that end, the street design guidelines include recommended block lengths for each street type. For example, Main Streets are expected to have a 400' maximum block length, while local residential streets should have 400-600' block lengths, considerably shorter than the current 1000' maximum for subdivisions (*4*).

Increased Modal Choices

In addition to improving network connectivity, the shorter block lengths described above are also expected to help increase modal options, in that they create more direct connections between land uses. More direct connections should shorten the necessary trip length, an important inducement for motorists, but even more so for pedestrians and cyclists.

While increased connectivity should encourage travel by non-auto modes, all five street types are also explicitly expected to provide, in some form, for all modes. There is a shift in modal emphasis among the street types, with the Parkway having the strongest automobile emphasis and the Main Street having the strongest pedestrian emphasis. Boulevards, Avenues, and Local Streets are expected to provide some balance among the modes. The guidelines include a requirement for assessing pedestrian and bicycle levels-of-service (LOS) for each street type (see (*5*) for a description of the method for determining LOS), which are to be applied in the design process to ensure that the recommended street design reflects the appropriate modal emphasis. The preferred design elements for the different street types (and their intersections) also support the desired modal emphasis. Finally, a separate section of the guidelines describes the sometimes conflicting requirements of the different users of streets and which design elements can be provided, separately or in combination, to best meet those requirements. These inter-related sections of the guidelines provide a comprehensive approach to help guide the tradeoff decisions that may arise among competing users of the street.

APPLICATION METHOD

The previous discussion highlights those aspects of the street design guidelines that most directly relate to other City efforts. Perhaps the most important aspect of Charlotte's street design guidelines, however, is the definition of the "thought process" to be followed in applying them. Although a prescriptive approach to street design may be preferable in some circumstances, a more flexible approach may be desirable in other circumstances. For example, a developer providing local subdivision streets can typically build a pre-defined cross-section. On the other hand, retrofitting an Avenue with limited right-of-way through an existing neighborhood may be more complicated and require more tradeoff analysis. In this case, strict application of a prescribed cross-section may result in an inappropriate street design.

The street design guidelines provide for both the prescriptive approach, through cross-sections and recommended dimensions, but also suggest a method for working through the more analytic approach. The method outlined in the guidelines (and described below) provides the opportunity to develop creative solutions by ensuring that land use planners, engineers, and others work together to think through the implications of alternative design solutions.

There are two basic assumptions built into the six-step method. The first is that it will include some sort of stakeholder involvement. The degree of stakeholder involvement will vary, depending on the magnitude of and impetus for the design or retrofit of the street. The second assumption is that the decision-making process will be well-documented. The documentation should clearly spell out any tradeoffs among competing design elements and how those were discussed and weighed against each other, as well as describing the outcome. This documentation should ensure that all users' requirements are considered and encourage consideration of the various tradeoffs that may be necessary in the final design. The following section describes the diagnostic steps to be included in applying the street design guidelines.

Step 1: Define the Land Use and Urban Design Context

The classification and ultimate design of any street is expected to reflect the existing and expected future land use context. That context should be considered from the broadest, area-wide perspective down to the details of the immediately adjacent land uses. In the larger context, for example, the street may be classified and/or designed differently depending on whether it is in an area targeted for higher density development, based on Charlotte's general growth strategy. The following questions regarding the existing and future land use environment around the project should be addressed:

- What does the area look like?
- What is the character of the area, the land use mix and density?
- What are the general "function" and circulation framework of the neighborhood and adjacent parcels?
- What are the building types, their scale, setbacks, any amenities, etc.?
- Is there a plan for the area?
- If so, what does the plan envision for the future of the area?
- Does the plan make specific recommendations regarding densities, setbacks, etc.?
- Are there any other existing development policies that cover the area?
- If so, what do those policies imply for the area?

Step 2: Define the Transportation Context

The transportation assessment should consider both the existing and expected future conditions of the overall transportation network relative to the potential street project. The ultimate design should reflect the entire context, rather than that related strictly to capacity on a given segment. The following issues should be considered:

- What is the existing street character? How does it currently relate to the adjacent land uses?
- How does the street currently function? What is the traffic volume? Speeds? What is the LOS for pedestrians? Cyclists? Motorists?
- What are the current design features, including number of lanes, sidewalk availability, bicycle amenities, traffic control features, street trees, etc.?
- What, if any, transit services are provided? Where are the stops?
- What is the relationship between this street segment and the surrounding network (streets, sidewalks, transit, and bicycle connections)?
- Are there any programmed or planned transportation projects in the area that would affect this street segment?
- Are there any other transportation plans or policies that would affect the classification of the street segment?

Step 3: Identify Deficiencies

Once the land use and transportation contexts are defined and understood from an area-wide perspective, the design team should be able to identify and describe any deficiencies that

could/should be addressed by the project. This step should address all of the modes and also the relationship between the transportation and the land use contexts. In this sense, "deficiencies" might include:

- Gaps in the bicycle or pedestrian network near or along the street segment;
- Gaps in the bicycle or pedestrian network in the area (which may increase the need for facilities on the segment, because of lack of alternative routes);
- Insufficient pedestrian or bicycle facilities (in poor repair, poorly lighted, or not well buffered from traffic, e.g.);
- Gaps in the overall street network (this includes the amount of connectivity in the area, as well as any obvious capacity issues on other segments in the area);
- Inconsistencies between the amount or type of transit service provided along the street and the types of facilities and/or land uses adjacent to the street;
- Inconsistencies between the existing land use and the existing or planned street network.

Step 4: Describe Future Objectives

This step synthesizes the information from the previous steps into defined objectives for the street project. The objectives could be derived from the plans and/or policies for the area around the street, as well as the previously identified list of deficiencies. The objectives for the street will form the basis for the classification and ultimate design. The following issues should be considered in defining the objectives:

- What conditions are expected to stay the same (or what conditions *should* stay the same)?
- Would the community and the users like the street and the neighborhood to stay the same or to change?
- Why and how would the community and the users like the street and the neighborhood to change?
- Given this, what conditions are likely to change as a result of this street classification (how will the street classification and design support the stakeholders' expectations)?

Step 5: Recommend Street Typology and Test Initial Cross-Section

The plan/design team should recommend the appropriate street typology, based on the previous steps. The rationale behind that classification should be documented. This step should also include a recommendation for any necessary adjustments to the land use plan/policy and/or transportation plan for that area. Since the street type and the ultimate design are defined, in part, according to the land use context, subsequent land use decisions are expected to recognize and support the agreed-upon street type and design.

The initial cross-section should be defined based on the recommended street typology, keeping in mind that some typologies allow more than one option. Once the preferred option is identified, the ideal cross-section will typically include the design features and ideal dimensions specified for that street type.

The initial cross-section is then tested against the land use and transportation contexts and the defined objectives for the street project. At this point, any constraints to provision of the initial, ideal cross-section should also be identified, including:

- Lack of right-of way,
- Existing structures,
- Existing trees or other environmental features,
- Topography, and
- Location and number of driveways.

Many of these constraints will have been considered in earlier steps, but this step should clearly identify which constraints may prohibit use of the cross-section defined initially.

Step 6: Describe Tradeoffs and Select Cross-Section

If the initial, "ideal" cross-section can be applied, then this step is easy: the initial cross-section is the recommended cross-section. In most cases, though, the initial cross-section will need to be refined to better address the land use and transportation objectives, given the constraints identified in Step 5. Sometimes, the technical team will develop more than one alternative design. Either way, these refinements should result from a thoughtful consideration of tradeoffs among competing uses of the right-of-way. The tradeoffs should be related to the requirements of each group of stakeholders and the variety of design elements that can best accommodate those requirements.

The method of evaluating the tradeoffs is left open to the design team, as long as the method/discussion/analysis is documented. This step serves as a reminder that all users should receive equal consideration in the design process. It also provides accountability and direction for future street design projects.

Once the tradeoffs are evaluated, the team should be able to develop a refined (or more than one alternative) cross-section and suggested design treatments. The culmination of all of the previous steps, including any additional stakeholder input, should provide enough rationale to select the alternative that best matches the context and future expectations relative to the street project.

The steps outlined above suggest a linear process leading to an ideal solution. In some instances, the process may not follow the exact sequence described above. Some information may not be available or even be applicable for some conditions. The intent, though, is to ensure that the context is given adequate consideration, all users of the street are given equal consideration, and that any related plans are modified to reflect the outcome.

EXAMPLE APPLICATION

The Street Design Guidelines are still under development, but staff have begun to test the guidelines, particularly the application approach. As mentioned earlier, this new approach was used to assess the design options for a 1.4 mile section of Rea Road, a street slated for widening

as part of a bond package. This project provided an interesting test for the evolving guidelines because it was already in the project design pipeline, with expectations that the project would entail widening from the current two-lane (with turn lanes) to a four-lane cross-section. The project design team worked through the six-step application approach with the Street Design Guidelines project team. A detailed description of the project and resulting discussions is beyond the scope of this paper, but the following paragraphs describe the main points addressed through the new approach, which has resulted in an alternative design that is receiving serious consideration.

Major Land Use Considerations:

- Rea Road is located in Charlotte's southern "outer wedge" (Figure 1). As a "wedge" location, the overall development pattern is (and should remain) relatively low density, compared with the transit corridor areas or other activity centers.
- As shown in Figure 2, the predominant land use adjacent to the segment is single family residential. The only sections of vacant land are a golf course and open space areas adjacent to the creek system.
- Given the "wedge" location, the existing development, and area plans, the development pattern is not expected to change dramatically from low-density residential uses.
- The northern end of the segment has some higher density residential development and a neighborhood retail center. Institutional uses, including a library, anchor the southern end of the segment.
- The recent construction of the neighborhood retail center at the northern terminus of the segment creates a complementary land use for this residential area, which may encourage walking, if the right pedestrian environment is provided.

Major Transportation Considerations:

- Volumes along this section of Rea Road (Figures 3-5) were approximately 17,000, when counted this year (2003).
- Traffic traveling north toward Charlotte either continues north onto Colony Road or turns east onto Rea Road (fairly balanced volumes) and eventually to Providence Road, a major parallel route into central Charlotte. For a variety of reasons, neither of these adjoining segments is likely to be widened in the foreseeable future.
- At the southern end of the project section, Pineville-Matthews Road is a high volume cross-town route that, because of its general orientation, is a natural, high-volume connection between outlying suburbs and Providence Road.
- The street network for the adjacent developments is disconnected and cul-de-sac heavy (Figure 2). Options for improving vehicle connections in the immediate area are limited.
- This section of Rea does not represent a future high capacity link when the broader network is considered. Widening will likely only allow traffic to move more quickly to an emerging bottleneck at the intersection of Colony and Rea.

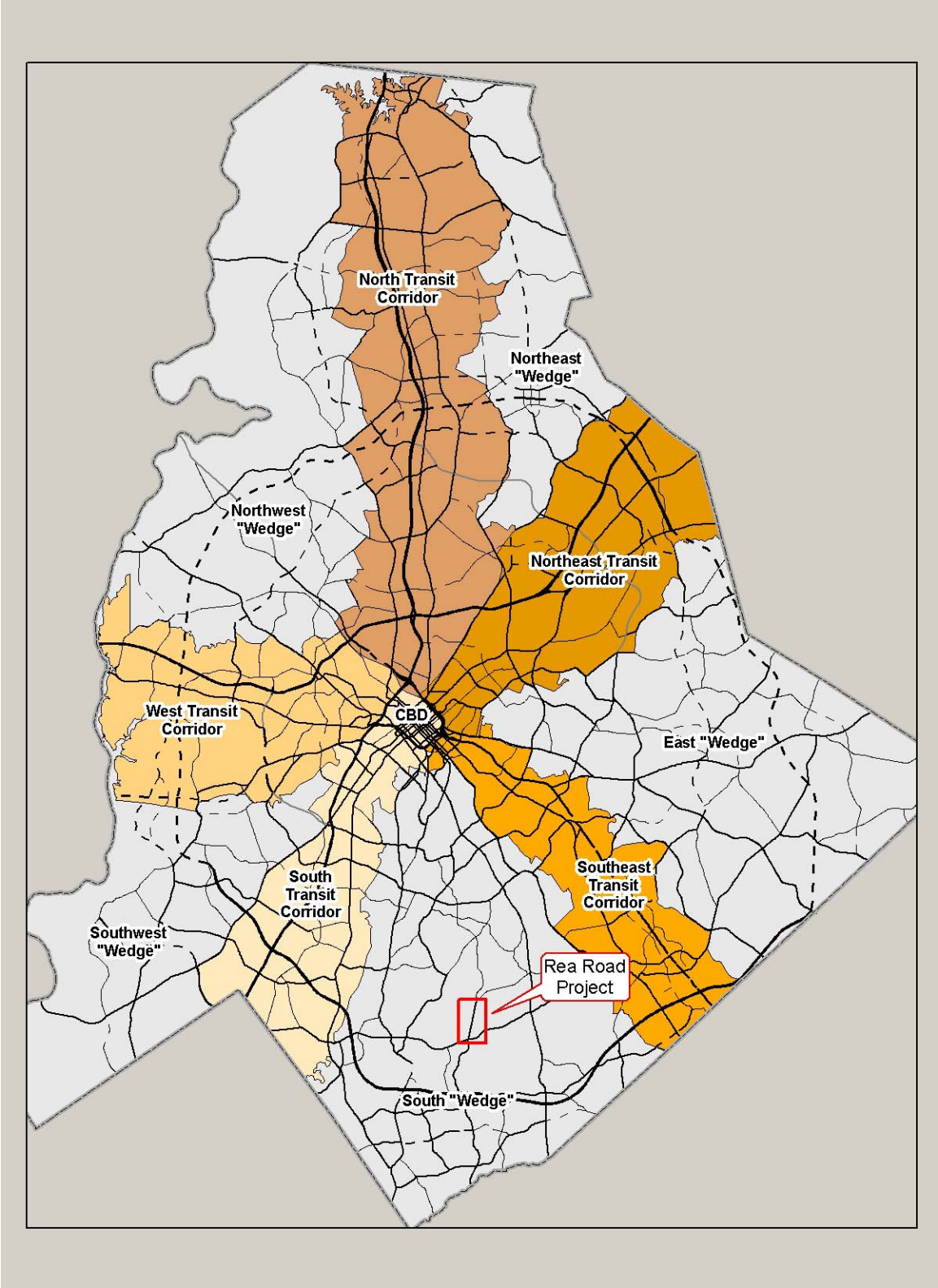

Figure 1. Rea Road – the Urban Context.

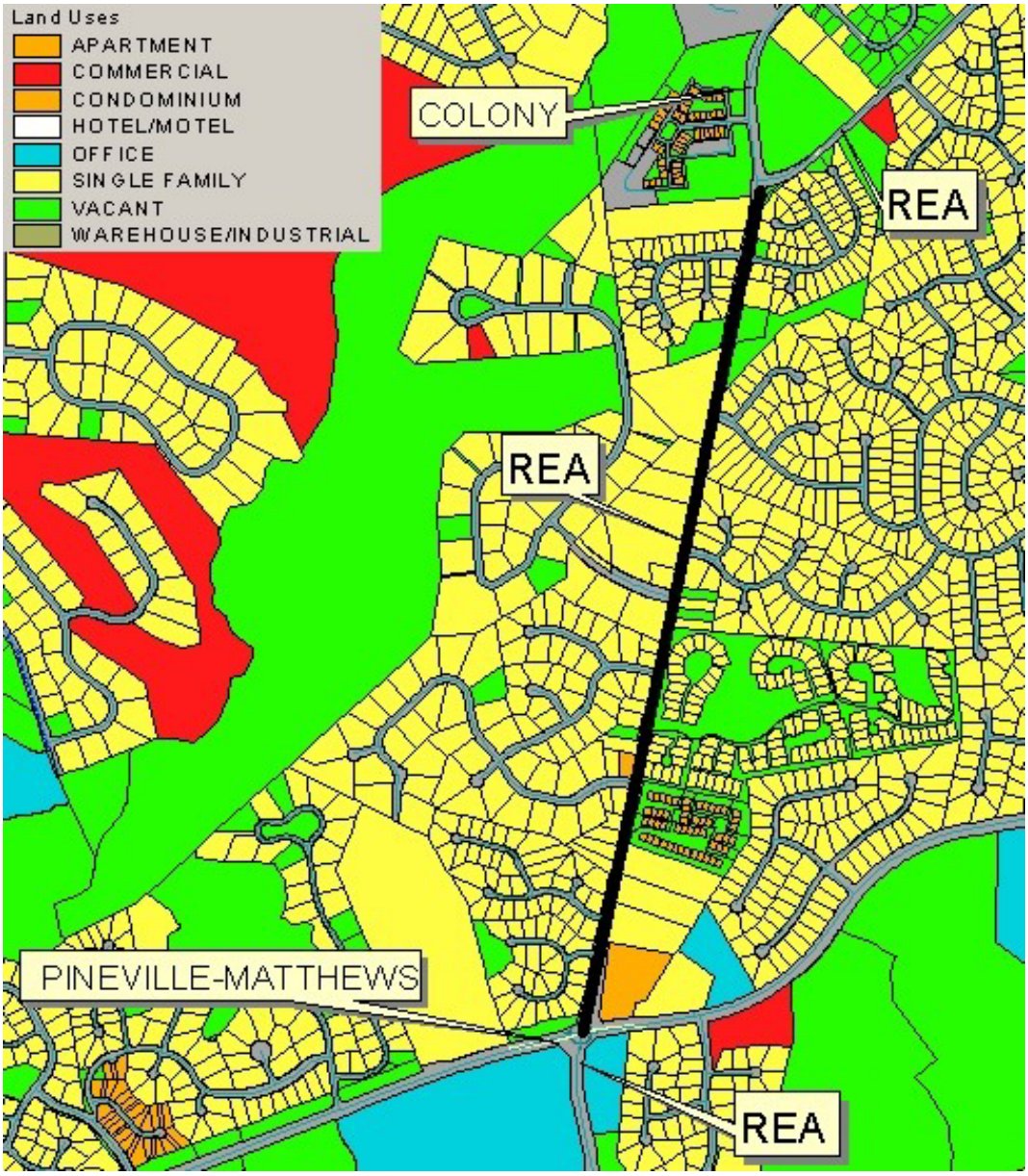

Figure 2. Rea Road Land Uses.

Figure 3. Rea Road, South to Pineville-Matthews Road.

- This segment represents a major gap in both the bicycle and pedestrian network. This section of Rea does not have continuous sidewalks or any bike facilities. The adjoining section of Colony Road consists of two lanes, with a median and continuous bike lane and sidewalk.
- The Charlotte Bicycle Plan shows no significant alternative routes for bikes, particularly given the lack of local street connectivity.
- Speed limits are frequently exceeded along this segment, which, combined with poor sight distances due to rolling terrain, makes provision of safe bicycle and pedestrian facilities even more important.
- The basic question relative to this project was whether this section of Rea Road should become an extension of the Colony Road cross-section to the north or of the Rea Road cross-section to the south.

Other Considerations:

- Environmental constraints, including an extensive creek system, along with the existing development pattern, make significant changes in land use along this segment unlikely.
- The rolling topography, creek crossings, and existing tree stands suggested to the team that there would be significant expense, difficulty, and potential environmental degradation associated with widening the section.

Figure 4. Rea Road, North to Colony Road.

Figure 5. Rea Road, at Pineville-Matthews Road.

Suggested Alternative Improvement

The combination of the above factors led the project team to classify the segment as an "Avenue" and to suggest a three-lane cross-section, even though the volumes are fairly high. The street design guidelines allow two, three, and four-lane cross-sections for Avenues. Avenues can serve a variety of land use contexts, but are generally expected to provide balance among the modes. The absolute lack of bicycle and pedestrian facilities along this Avenue, an anticipated increase in automobile capacity, and the other environmental and land use considerations suggest that the "improvements" to this street segment need to include better provision for cyclists and pedestrians.

To that end, the design team is further investigating the possibility of a three-lane cross-section (two lanes with an intermittently landscaped turn lane), with bicycle lanes and sidewalks. The team will not strictly observe the guideline-recommended 8' planting strip, 6' sidewalk configuration in this case, instead leaving latitude for a smaller planting strip or narrower sidewalk in some places. This recognizes that some existing stands of trees should be left intact (to maintain tree canopy), that the bike lane can serve as an additional buffer between vehicles and pedestrians (allowing a smaller planting strip, with existing trees remaining on the outside of the sidewalk), and that some areas along the segment will be very constrained (due, in part, to topography). In this test case, it was impossible to use the street design guidelines to increase overall network connectivity, but bike and pedestrian connections will increase, as the suggested design should fill significant gaps in those networks.

The final design of this project has not been decided. Further analysis of and discussions about the advisability of a three-lane versus a four-lane section will no doubt continue among staff. The public involvement portion of the process will need to include options for discussion, as well as to educate the public about the tradeoffs between one initial "solution" (widening) and the provision of better modal alternatives. What has occurred, though, is a much more inclusive discussion of the existing and likely future land use and multi-modal network conditions than has been typical of past projects. These types of issues have not necessarily been ignored on past projects, but, by following the steps outlined earlier, the design team more *explicitly* considered the impact of these contextual issues on the design options for this section of Rea Road. This has resulted in a design alternative that probably would not have been considered previously and the final design is likely to more clearly address these context issues.

CONCLUSION

The design engineers on the Rea Road project have stated that they found the new process useful in helping them understand how Charlotte's emerging street design guidelines should be applied, as well as in sorting through the myriad issues associated with modifying an existing street. Other City projects have also been discussed via the steps outlined in the street design guidelines and the general reaction to the process has been favorable. While all of these projects are still open for discussion, the emerging process has helped clarify the intent of the street design guidelines. Further, it has helped to organize the manner in which land use context and

alternative travel modes are addressed through the street design process to ensure that, at least at the staff level, varying perspectives are incorporated very early in the design process.

As the street design guidelines are refined and continue to be applied throughout the City, it is anticipated that the process described here will be applied in the earliest planning stages, where projects are initially defined and selected. Currently, the guidelines provide a framework for integrated design. With full implementation, they will also provide a framework for integrated land use and transportation planning. The example discussed here shows how a reasoned discussion of tradeoffs among competing uses of the right-of-way can improve multi-modal network connectivity in retrofit situations. In the long run, through application to other modification projects and to new street construction and, as land use plans begin to reflect the new street overlay classification system, Charlotte's street design guidelines should prove a useful tool for meeting the City's Smart Growth objectives.

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