

Streamlining, Consolidation, Expansion, Coordination, and Partnerships: A Guide for Improving Transit in the Research Triangle of North Carolina

by

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Abstract

In the Research Triangle region of North Carolina, five agencies operate public transit services: one regional provider, Triangle Transit Authority (TTA), which operates regional service in Wake, Durham, and Orange counties; and four local agencies, confined to providing services in the cities in which they operate: Capital Area Transit (CAT) in Raleigh; Cary Transit (C-Tran) in Cary; Durham Area Transit Authority (DATA) in Durham; and Chapel Hill Transit in Chapel Hill and Carrboro. A recent discussion about consolidation of services has prompted CAT, DATA, and TTA to pursue increased coordination of services before making the decision to consolidate. This paper will present a plan that could be implemented for expansion and realignment of existing services in order to achieve consolidation. It finds that removing barriers to providing services between cities can provide trunk lines, with feeder services provided on the neighborhood level.

I. Introduction and Literature Review

Public transit in the Research Triangle region of North Carolina consists of one regional transit agency, the Triangle Transit authority, four local agencies serving Raleigh, Cary, Durham, and Chapel Hill, two university providers (North Carolina State and Duke Universities), and three county providers mainly providing social service and medical transport to residents who live outside the main urban areas. This fragmented approach to transit has caused services to overlap, inconvenient and time-consuming transfers for fixed-route passengers, the need for paratransit users to transfer and coordinate services for providers serving different areas, and policies that restrict or make streamlining of services impossible or extremely difficult. Changes in policy, provision, structure, and management of various parties and agencies are necessary and required in order to provide more streamlined and time-efficient services to existing riders as well as attract new riders. These changes would require changes in provision of services, identifying potential residential, employment, and mixed-use centers for attraction of passengers, and involving transit on a regional level in order to create transit-friendly patterns of development to provide more transportation choices to people.

Many regions use different strategies to provide public transportation. Although smaller cities and towns usually have one agency that governs the operations and planning of transit, more highly-populated regions use different techniques to provide transit. Some large urban counties provide transit and serve as the only transit agency in the region (Allegheny County, PA; Miami-Dade County, FL; New York). Other areas have several agencies operating within a region, providing different types of services and serving different groups of people (Washington, D.C.; San Francisco Bay Area; Detroit; Atlanta; Seattle; Research Triangle). Another governing structure of transit involves multiple jurisdictions served by one transit agency (Denver; Norfolk; Philadelphia). Vuchic (2005) describes the advantages and disadvantages of a single private operator serving a region, as well as challenges to integration and consolidation of agencies. As an alternative to agency consolidation, integration practices such as interagency coordination of schedules, fare payment, information, and infrastructure integration can also be useful ways to improve dissemination of information and service quality (Miller et al., 2005). Because of the regional nature of commuting and traffic problems, efforts to reduce congestion must also be initiated at the regional level, of which the creation of the Bay Area Rapid Transit District is a prime example (Downs and Puentes 2005, Steiner 1978).

Many of the strategies range from simply responding to current conditions and forming a transport system that adequately responds to them to bringing about changes in policies that would direct some people to change and make traditional transit supply more effective. Bunting (2004) calls for revamping the entire transit planning and hierarchical structure through privatization, which he argues will better respond to customers' needs, use public resources more efficiently, and depoliticize transport. A redefinition and restructuring of services is also mentioned by Cervero (1997) who studied paratransit services in the United States and around the world, and advocates the removal of barriers to allow operators to operate service where the market will allow. Cervero and Beutler (1999) presented case studies of transit reforms aimed at auto-dependent suburban areas

struggling with increased vehicular traffic and declining transit patronage, providing reasons that the particular reform succeeded or failed. Black (1995) and Vuchic (2005) provide examples of how operators choose a particular mode or technology based on travel demand in particular corridors, cost, and other factors. In order to provide more regional transit systems to serve the needs of people more likely to use both long-distance commuter services and local services, policy changes must level the playing field between highway and transit funding (Beimborn and Puentes 2005; Katz, Puentes and Bernstein 2005).

Consolidation of services has helped transit agencies coordinate service better for people within their service areas. Two such agencies in North Carolina that have coordinated services are AppalCART, serving the town of Boone and Watauga County, and Wave Transit, serving Wilmington and New Hanover County. In both of these instances, one agency provides urban, rural, and social service transportation. Hampton Roads Transit in southeastern Virginia became the first agency in the country created from a voluntary merger of two transit agencies in 1999. In the Triangle area, providers have expressed an interest in coordination and consolidation of services and functions (TJCOG 2005).

The various strategies for coordination and possible consolidation will be compared with regions that have already undertaken these steps. The results from other cities would then be compared to how the strategies could be implemented in the Triangle region and what the possible new system would look like and how it would affect ridership. The strategies would measure system coverage, integration, projected travel time, and ease of implementation.

II. Current Conditions

There are currently five agencies operating fixed-route transit services in the Triangle: the Triangle Transit Authority (TTA), the regional agency, operating services in Wake, Durham, and Orange counties; and four local agencies: Capital Area Transit (CAT) in Raleigh, Durham Area Transit Authority (DATA) in Durham, Chapel Hill Transit in Chapel Hill, and Cary Transit (C-Tran) in Cary. Two additional providers, Duke University Transit and Wolfline, operate circulator services for Duke University and North Carolina State University, but because these services are different from the local and regional providers, those systems will not be studied in this paper.

The funding structures of the local agencies place the responsibility of local funding through the respective municipalities in which the service operates. CAT, DATA, and C-Tran operate fully within the city limits of Raleigh, Durham, and Cary respectively.¹ The Town of Chapel Hill operates Chapel Hill Transit, but the University of North Carolina at Chapel Hill and the Town of Carrboro financially support the system, so that service can be provided to Carrboro. Because of the constraints of operating only within jurisdictions that fund the service, there are two critical places in which two agencies come close to each other but do not connect: the area around the I-40-US 15-501 interchange in Durham (Chapel Hill and DATA) and Buck Jones Road in Raleigh (CAT and C-Tran).

A partnership approach to funding would help to eliminate these constraints and provide through services to help people reach destinations that are close but just outside of the city.

The North Carolina General Assembly created TTA as a unit of local government to plan and operate a public transit system in Wake, Durham, and Orange counties. Its current structure enables people to move between municipalities, in contrast to the local agencies, whose main goal is to enable people to move within a city. Unlike other areas, such as Pittsburgh and Miami, whose transit agencies were created to buy out private operators in the 1960s to harmonize schedules and fare structures, and create a single regional system, TTA overlaid a regional system on top of existing services.

Special services also operate for people who cannot access fixed-route transit services or who live in rural areas not easily served by transit. Each agency provides paratransit service for people with disabilities at the times and in areas where regular fixed-route services operate. Wake, Durham, and Orange counties also operate community and human services transport for such services as medical, shopping, and work trips, as well as operating services to and from parts of the counties not served by local or regional routes. Because paratransit service is geared toward and planned around the fixed-route services, customers may have to transfer in order to travel within the region. For example, someone in North Durham who needs to get to an appointment in Chapel Hill must coordinate with two paratransit providers (ACCESS, DATA's paratransit provider; TTA) to reach the destination. Streamlining services to provide comprehensive regional paratransit service will make it easier for patrons to use the service, especially because of the challenges faced when having to move some people with special needs more than twice. In addition, the county providers may be able to operate some fixed-route services for the general public in addition to the human services transport they currently provide. In North Carolina, some providers operate as consolidated urban and rural systems (for example, AppalCART in Boone and Watauga County; Wave Transit in Wilmington and New Hanover County; and Tar River Transit in Rocky Mount and Nash and Edgecombe counties), and in certain metropolitan areas, counties operate transit (Allegheny County, PA, including Pittsburgh; Miami-Dade County, FL; including Miami).

III. Methodology

In order to plan for future services as well as provision, a map displaying each agency's services was created using TransCAD GIS software. Two separate route systems were created, one showing TTA's current services, and the other showing each local agency's services. Because the local agency has different numbering and naming schemes², the route system for local agencies were given numbering and naming schemes similar to that found for New York City transit³. TransCAD automatically builds a data table according to the given route name, and attributes are added to facilitate selection of routes, type of route served, service time, and service area.

After building the route system, each agency's website was checked to find major points of interest as potential nodes for the modified local-regional system. The map would also

show places that showed discontinuities and places that could be connected if services were modified.

Average daily traffic counts from NCDOT were used to determine volumes of traffic on current routes to determine which roads may be heavily used to determine corridors of high demand for future routes. The roads studied would be roads going to municipalities adjacent to but not included in current services, which include Wake Forest, Clayton, Knightdale, Wendell, Zebulon, Morrisville, Holly Springs, and Fuquay-Varina. Although future roads would not be shown on a map, future roads were taken into consideration to plan services. Future services and modifications to existing services were shown on a new map, with changes noted.

IV. Findings

The findings and details of the plan are presented in outline format. The plan begins with a vision statement, detailing the different types of services provided, and gives policies for each agency for consolidation of services or forming partnerships to provide coordinated and streamlined services.

1.0. Vision statement

Transit in the region should be convenient, affordable, safe, and user-friendly. The agencies must collaborate as much as possible in planning and development in order to provide coordinated and seamless services, and work toward consolidation when feasible. This will allow services in each municipality to work together instead of competing against each other for funding and resources, and to operate services in such a way to avoid unnecessary duplication and overlap.

2.0. Fixed-route transit

There are currently five transit agencies that run fixed route service. Each agency can follow a set of policies that will integrate into a more streamlined regional service. The coordination necessary to provide streamlined and seamless service can be described similar to the fingers and thumb of a hand, the thumb representing regional service, and the four fingers representing local services.

2.1. The thumb: regional service

Triangle Transit Authority (TTA) is the regional transit provider. Just as the hand's functionality diminishes significantly without the thumb, TTA's service complements and strengthens each of the local providers by providing services between municipalities and to towns that have no other transit services (Apex, Morrisville, and Garner).

In some areas, TTA has duplicated a sizeable portion of some of the local agencies' services, most notably along NC Highway 54 in Durham between Southpoint Mall and

Research Triangle Park (RTP), and along Hillsborough Street in Raleigh (Fig. 1 and 2). In order to create a trunk-feeder system that allows local service to provide more intensive service along a corridor, regional service can be aligned realigned to provide limited-stop or express services between major activity centers. Regional service between Southpoint Mall and RTP would be provided along I-40, while modified local service would serve Highway 54 (Fig. 3). A corridor such as Hillsborough Street in Raleigh is more problematic to separate, because bypassing the corridor would cause buses to bypass a major activity center (North Carolina State University). This problem can only be solved with tools such as dedicated bus lanes with traffic signal prioritization, or an exclusive bus or rail guideway.

In addition to revamping existing services, expansion of services is needed to serve growing towns that currently have no transit service. Service to places like Holly Springs and Fuquay-Varina can be fairly auto-competitive when using new highways such as I-540 in order to prevent extending “local” service currently provided to Apex. Other towns, such as Wake Forest, Clayton, Knightdale, Wendell, and Zebulon, can benefit from expanded transportation choices, especially because recent growth in those towns will only further strain existing highways (Fig. 4).

2.2. The first finger: Durham

Durham is at the center of transit services because of geography. Local transit service in Durham is provided by the Durham Area Transit Authority (DATA). Current regional services between RTP, downtown Durham, and Chapel Hill run in a loop, crossing or sharing geography with some of DATA’s routes. As stated in the previous section, modifying regional and local services will eliminate some of the overlap and provide operations in a trunk-feeder format.

Some areas can also improve access to transit through community or employer shuttles in order to improve accessibility on the origin or destination end of a trip. For example, the area bounded by Lawson Street, Briggs Avenue, Riddle Road, and Alston Avenue may have greater access to transit and reduced travel time by operating a community shuttle that connects to local and regional routes, improving service over the one current route which provides direct access only to downtown Durham (Fig. 5). Other shuttle services include modified shuttle service in RTP that serves employers in three different zones (Fig. 6).

This could be achieved by operating a consolidated urban and rural service: fixed route service within the city, and community transit service serving rural areas of Durham County as well as the shuttles in RTP, which is outside city limits. Having the county support these services will allow TTA to divest of the costs of operating shuttles in RTP and provide a more cost-effective service before consolidation.

2.3. The second finger: Raleigh

Local transit service in Raleigh is provided by Capital Area Transit (CAT), which also provides service to a shopping center in Garner. TTA provides service to Raleigh from RTP, Cary, Apex, and Garner, so most of its routes are concentrated in the western part of the city. Service in Raleigh can be optimized by combining with transit in Cary (explained in greater detail in section 2.5) and expanding service into Garner.

Because local transit is mainly confined to the city in which it operates, a situation exists where two agencies' service comes within a mile of each other but does not connect (Fig. 7). In order to provide services that provide greater accessibility to people by removing the restriction of city limits to provide services, cities can share the costs proportional to how much of the service runs within each town. For example, service to Cary can connect people in Raleigh to places like Cary Towne Center and Crossroads Plaza, where they can reach jobs by being able to connect with Cary's other fixed routes (Fig. 8).

2.4. The third finger: Chapel Hill

Chapel Hill Transit (CHT) became highly successful because of its orientation to the University of North Carolina, compact urban form, excellent pedestrian amenities throughout Chapel Hill and Carrboro, and providing park-and-ride services at the edge of town for people outside of town to access the system. The university and the two towns have also encouraged people to ride by implementing a fare-free system in 2002.

A possible improvement that CHT can make would be to provide a connection to DATA at New Hope Commons shopping center off US Highway 15-501. Currently, CHT has a similar situation as Raleigh in that they are constrained to operating service within municipal boundaries (Fig. 9). By providing this connection, CHT would provide a connection to DATA, allowing TTA to run a limited-stop service along the 15-501 corridor. Although Chapel Hill has rejected the possibility of consolidation of their service into one agency, this enhancement of service would help connect the town better to the rest of the region and provide another option for people who live in Durham and work in Chapel Hill. It would also provide transit access to the retail area for neighborhoods close to the shopping center.

2.5. The fourth finger: Cary

Cary Transit (C-TRAN) operated only demand-response service throughout the town of Cary until 2005, when the agency implemented three fixed routes for the general public. As the fixed-route system is still relatively new, it will take time to build ridership and optimize the system, but there are possibilities for expansion and integration into a new regional system.

The recent growth of the neighboring towns of Morrisville and Apex provides an opportunity for C-TRAN to expand services there, with a similar financial arrangement that Carrboro entered with Chapel Hill Transit. Regional service would then be enhanced by local feeder service at times other than peak hours, the times that TTA currently provides service to Apex. Moreover, improved service between Cary and Raleigh has the

potential to attract riders who could not previously use transit because of its inconvenience.

3.0. Paratransit and supplemental services

Paratransit is the term used to describe public transit services that do not operate on fixed routes or schedules but are scheduled to accommodate people taking trips with multiple origins and destinations. Most paratransit providers provide service solely for people with disabilities who cannot use fixed-route services. Other paratransit services include community or employer shuttles acting as feeders to and from fixed-route services or subsidized taxis used for human services or rural transportation.

Under the plan for consolidation, paratransit services would also be consolidated in order to provide transport from one point to another within the system's service area. Scheduling and routing software would be used to optimize trips, separating local trips from regional trips.

V. Limitations

This paper compares current conditions to possible future conditions that would facilitate consolidation of transit agencies and streamlining of services. The main focus of the study is on the regional level, so alterations at the city and neighborhood level are very limited. Future research into travel patterns and needs of patrons can be done to fine-tune local service at the neighborhood level to ensure coverage of neighborhoods with a high usage of transit and equity issues.

VI. Conclusions

Reorganization of routes, schedules and types of services will make the overall system easier to use and more convenient for passengers. By removing some of the barriers to providing services between cities and allowing for more flexible financing, the transit system will become a regionalized system while still largely preserving local service. The main steps to take are listed below, though not in a particular order or priority:

- Reorganize DATA into a consolidated urban-rural system to provide fixed-route service within the city of Durham as well as human services and general transport to rural Durham County, as well as providing service within Research Triangle Park. Adjust the funding structure to support this new arrangement either by placing the agency under county administration or having the county provide financial support to the system.
- Set up fixed-route services in Wake County to be run by Wake Coordinated Transport Services. Fixed-route services would include service between Wake Forest and Raleigh as well as Knightdale, Wendell, and Zebulon to Raleigh.

- Establish expansion of C-Tran services to Morrisville and Apex with a funding arrangement similar to that of Carrboro with Chapel Hill Transit, and expand CAT services into Garner in a similar fashion.
- Have Durham and Chapel Hill fund a local route between the two cities so that TTA can run a limited-stop route along the US 15-501 corridor.
- Identify major activity nodes in the region for transit services to allow regional services to move quickly between the nodes, with local services providing services for intermediate areas.
- Harmonize fare structures, days of operation, and route numbering schemes.
- Allow a single agency to take charge of planning services and allocate operation of services.

References

- Balog, John N. *Guidebook for Attracting Paratransit Patrons to Fixed-Route Services*. Transportation Cooperative Research Program Report 24, 1997.
- Beimborn, Edward and Puentes, Robert. "Highways and Transit: Leveling the Playing Field in Federal Transportation Policy." Printed in *Taking the High Road: A Metropolitan Agenda for Transportation Reform*, Katz, Bruce and Puentes, Robert, eds. Washington, D.C.: Brookings Institution Press, 2005.
- Black, Alan. *Urban Mass Transportation Planning*. New York: McGraw-Hill, 1995.
- Bunting, Mark. *Making Public Transport Work*. Montreal: McGill-Queen's University Press, 2004.
- Cervero, Robert and Beutler, John. *Adaptive Transit: Enhancing Suburban Transit Services*. Report prepared for University of California Transportation Center, Berkeley, CA, 1999.
- Cervero, Robert. *Paratransit in America*. Westport, CT: Praeger Publishers, 1997.
- Katz, Bruce, Puentes, Robert, and Bernstein, Scott. "Getting Transportation Right for Metropolitan America." Printed in *Taking the High Road: A Metropolitan Agenda for Transportation Reform*, Katz, Bruce and Puentes, Robert, eds. Washington, D.C.: Brookings Institution Press, 2005.
- Litman, Todd. "Evaluating Rail Transit Criticism." Victoria Transport Policy Institute, October 9, 2006, accessed at <http://www.vtpi.org/railcrit.pdf>, October 31, 2006.
- Miller, Mark A. et al. *Transit Service Integration Practices: An Assessment of U.S. Experiences*. Berkeley, CA: California Partners for Advanced Transit and Highways. Accessed at <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1668&context=its/path>, December 31, 2006.
- Pratt, Richard H. and Evans, John E. TCRP Report 95: Bus Routing and Coverage: Traveler Response to Transportation System Changes. Washington, D.C.: Transportation Research Board, 2004.
- Pucher, John. "Renaissance of Public Transport in the United States?" *Transportation Quarterly*, Vol. 56, No. 1, Winter 2002 (33-49), accessed at <http://www.vtpi.org/tqtransi.pdf>, October 31, 2006.
- Steiner, Henry Malcolm. *Conflict in Urban Transportation*. Lexington, MA: Lexington Books, 1978.

Vuchic, Vukan R. *Urban Transit: Operations, Planning, and Economics*. Hoboken, NJ: John Wiley and Sons, 2005.

Endnotes

¹ DATA operates service to the TTA transfer center in Research Triangle Park and to the northern campus of Durham Technical Community College, but the amount of service operated outside the city of Durham is relatively small.

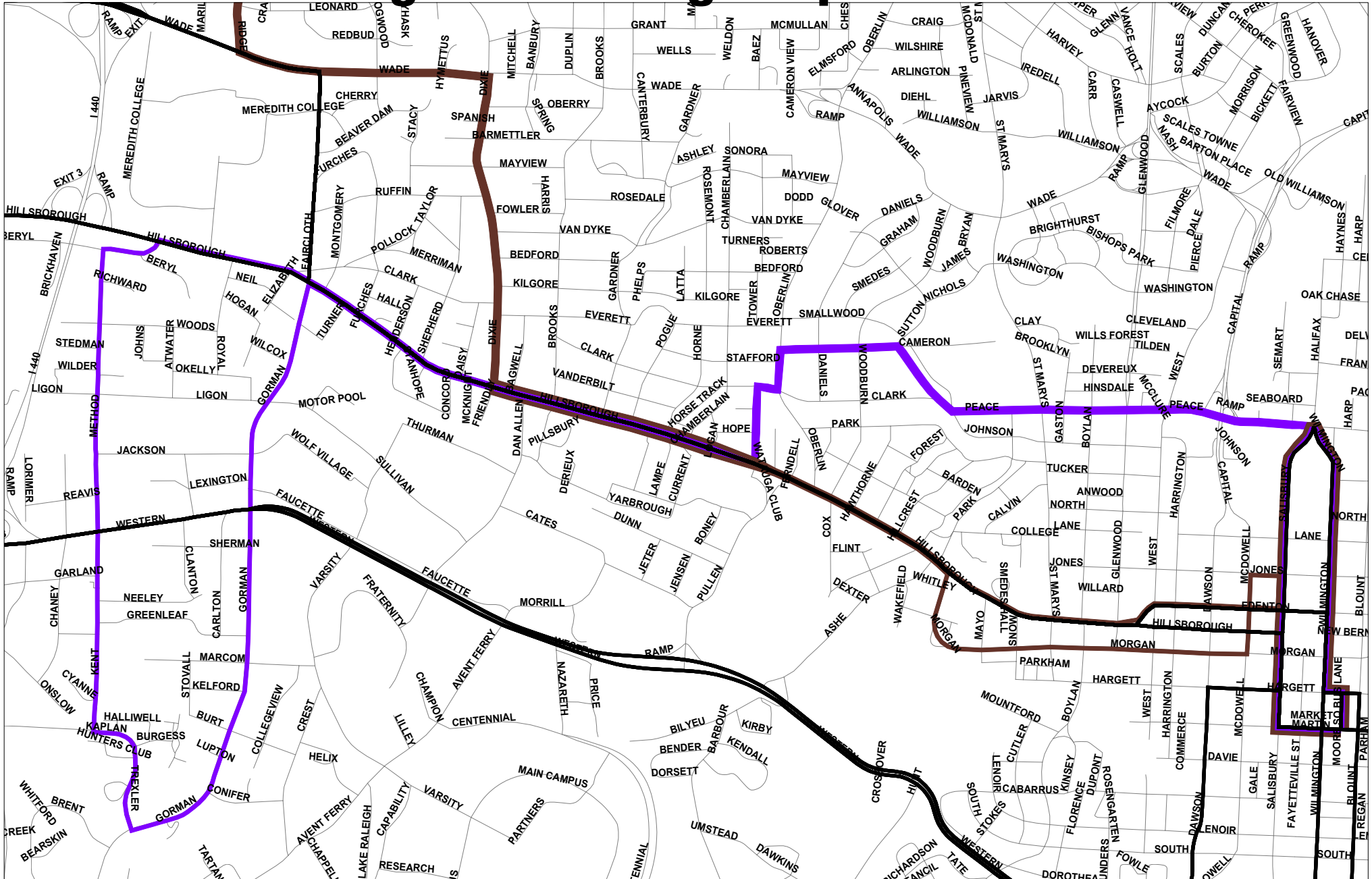
² CAT uses numbers and names; DATA uses only numbers, Chapel Hill uses letters and a description, and C-Tran only uses a name.

³ In New York, each bus is numbered with a letter representing the borough in which it runs and a number.

[illegible]

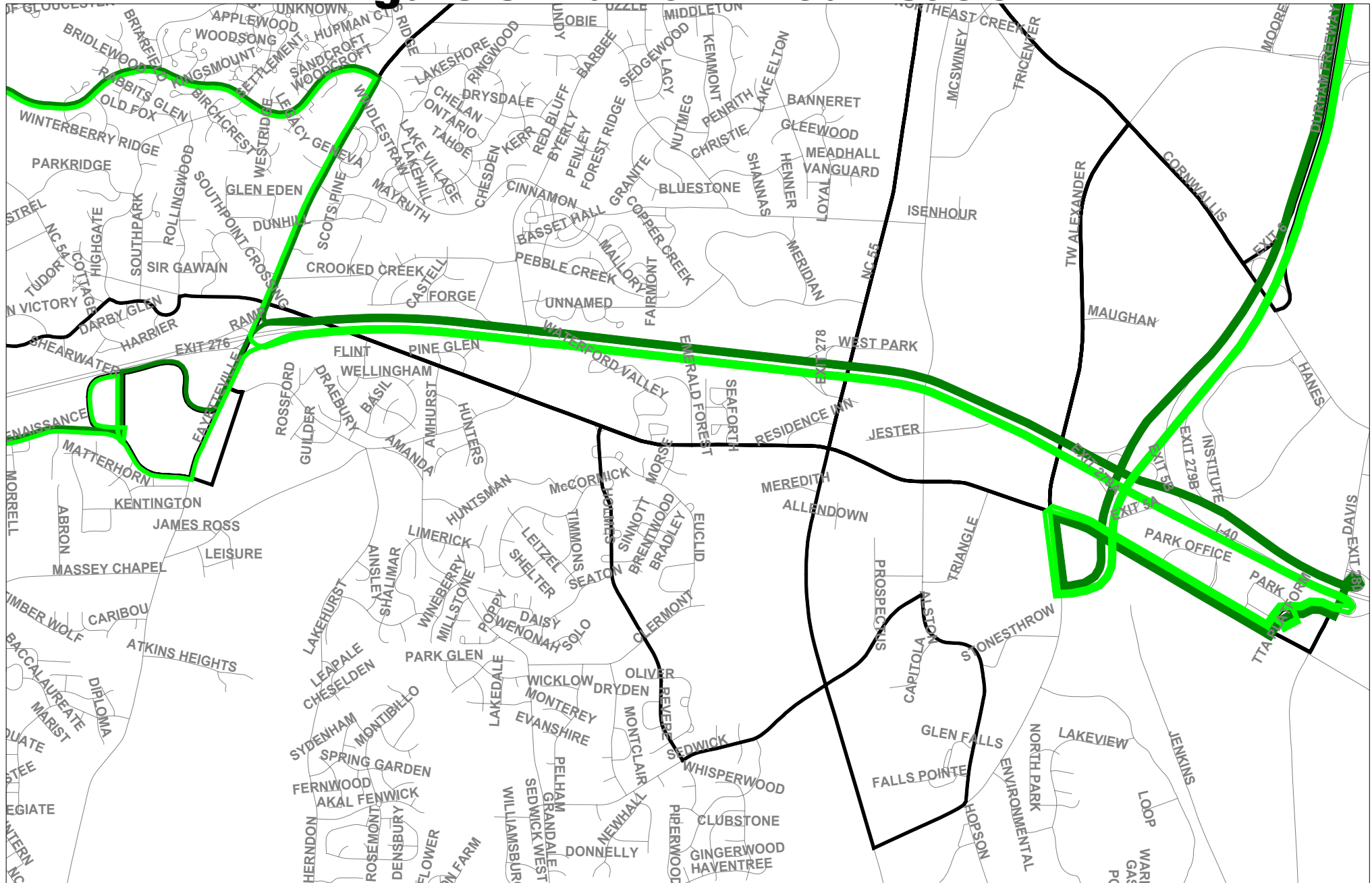
12

Figure 2: Raleigh duplication



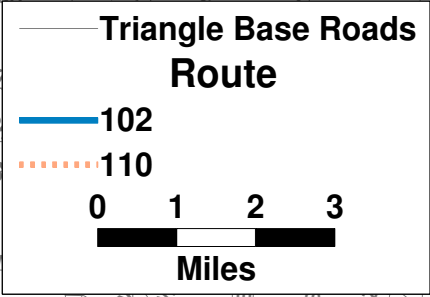
Raleigh's current routes in color; TTA's current routes in black

Figure 3: Durham modification



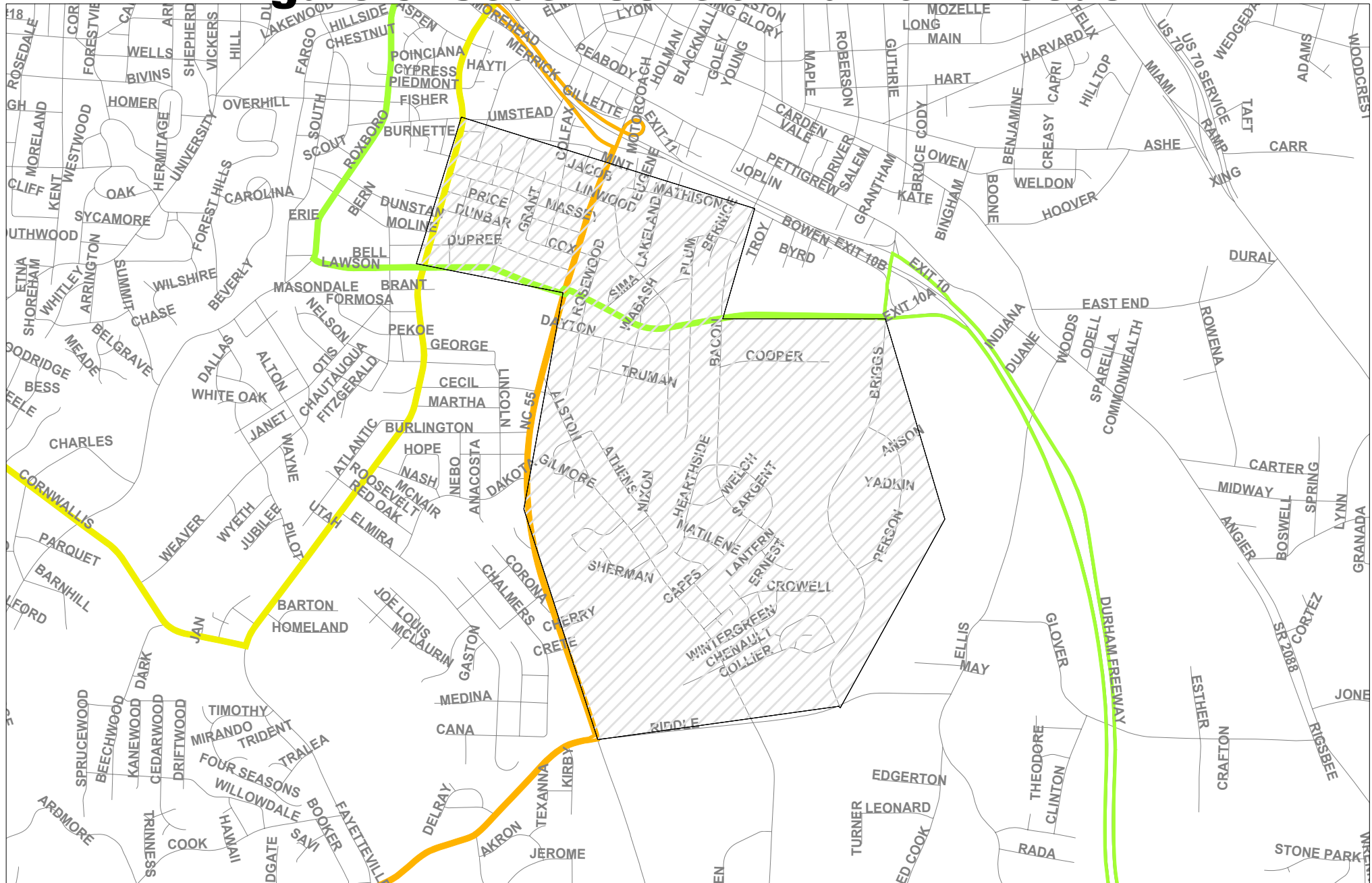
Modified service in Durham, showing TTA routes in color and modified local routes in black

Produced by Academic TransCAD



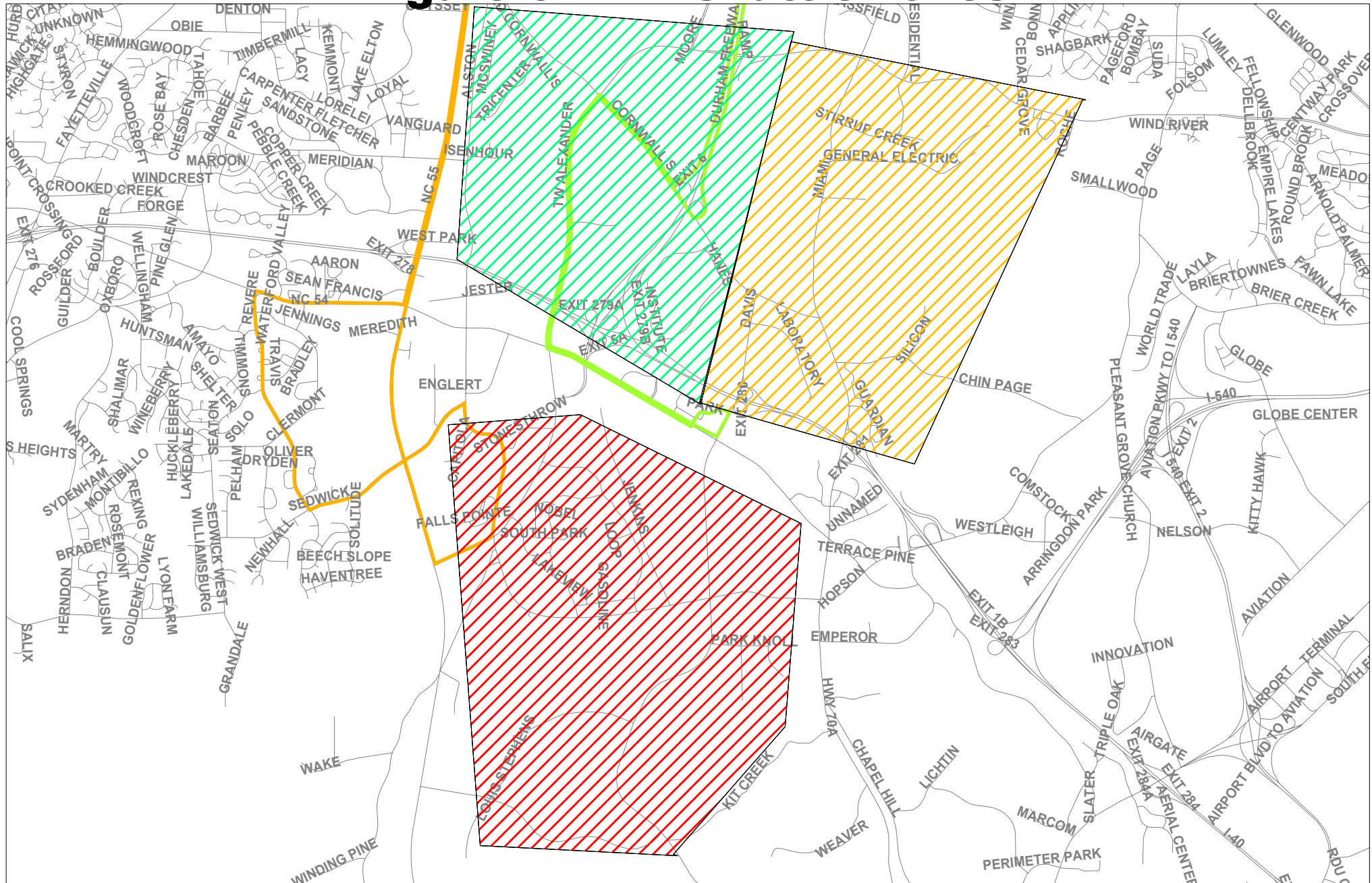
15

Figure 5: South Central Durham Feeder



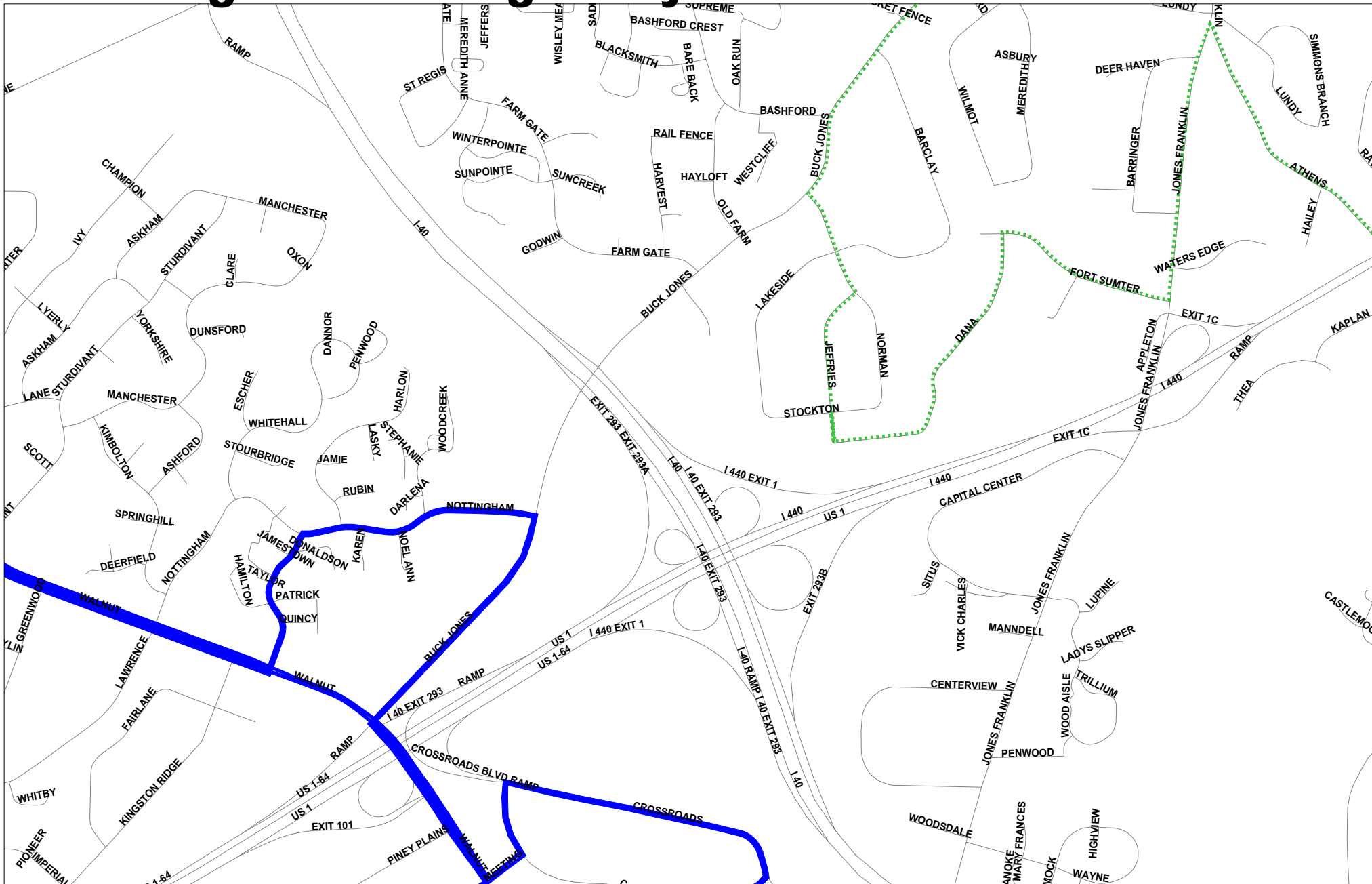
A feeder service with modified local service provides access to more routes and destinations.

Figure 6: RTP shuttle zones



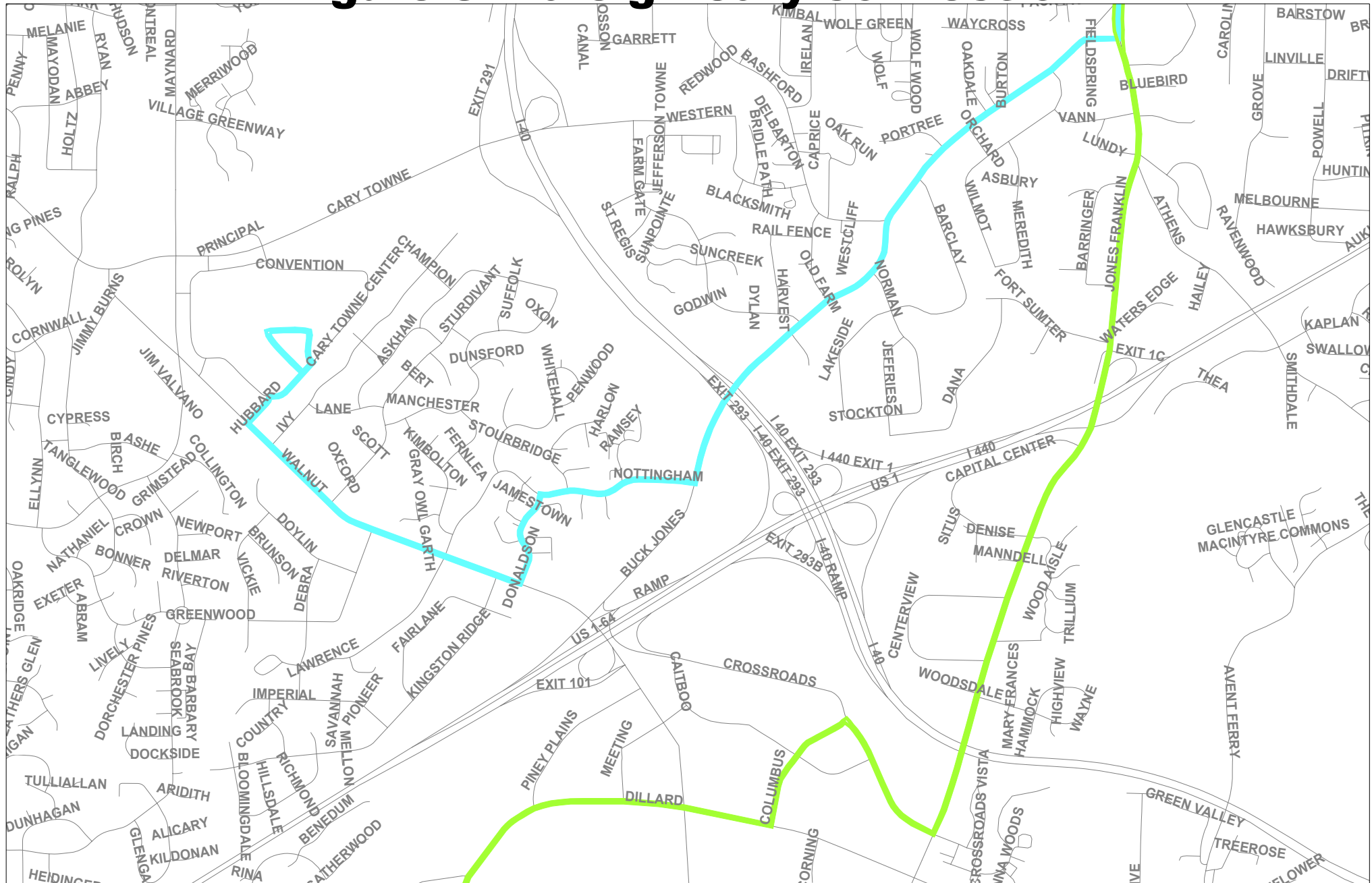
Feeder shuttles to fixed route can provide destinations to major employers.

Figure 7: Raleigh-Cary disconnected service



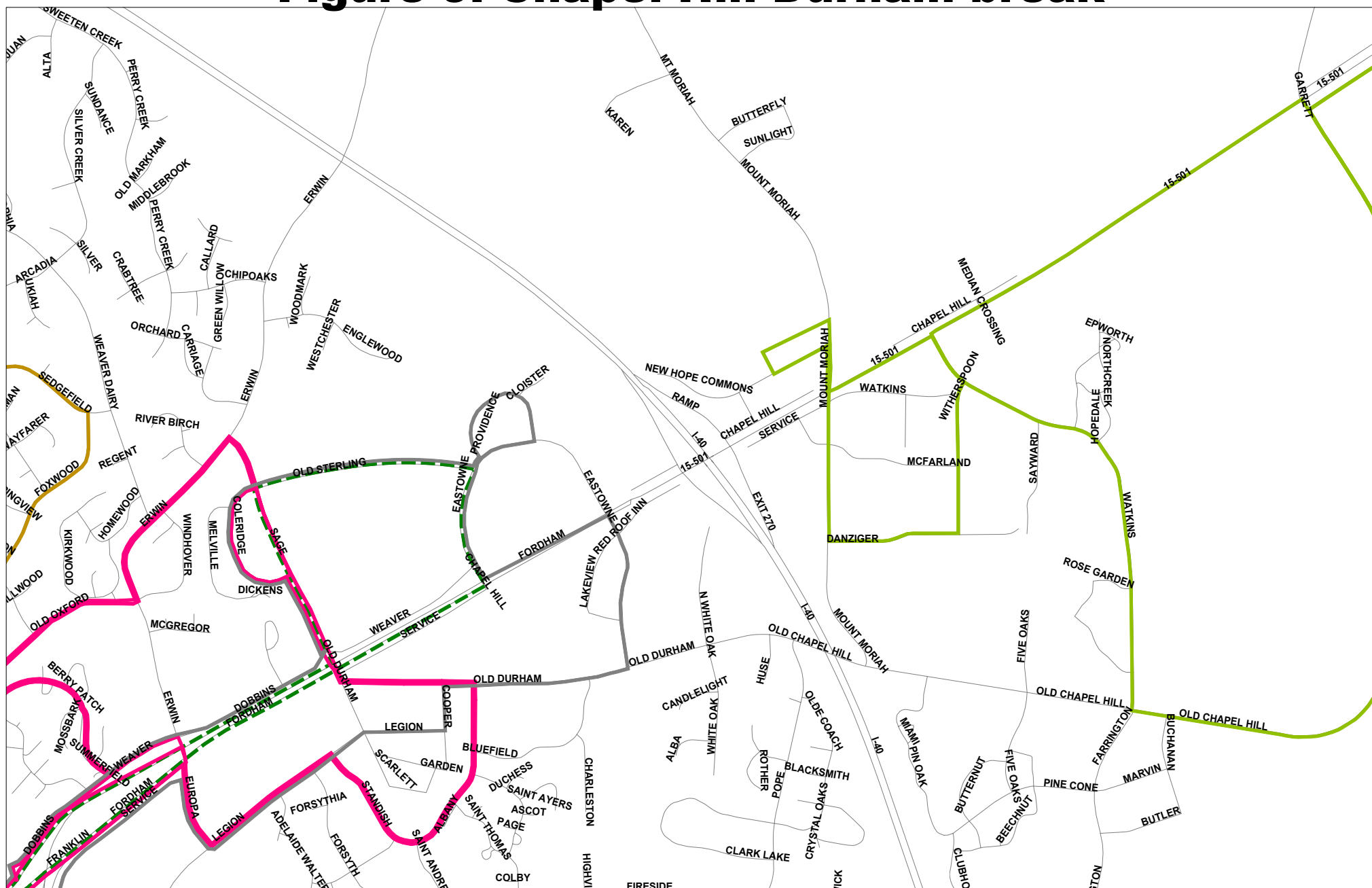
Raleigh and Cary's systems come within a mile of each other but do not connect.

Figure 8: Raleigh-Cary connection



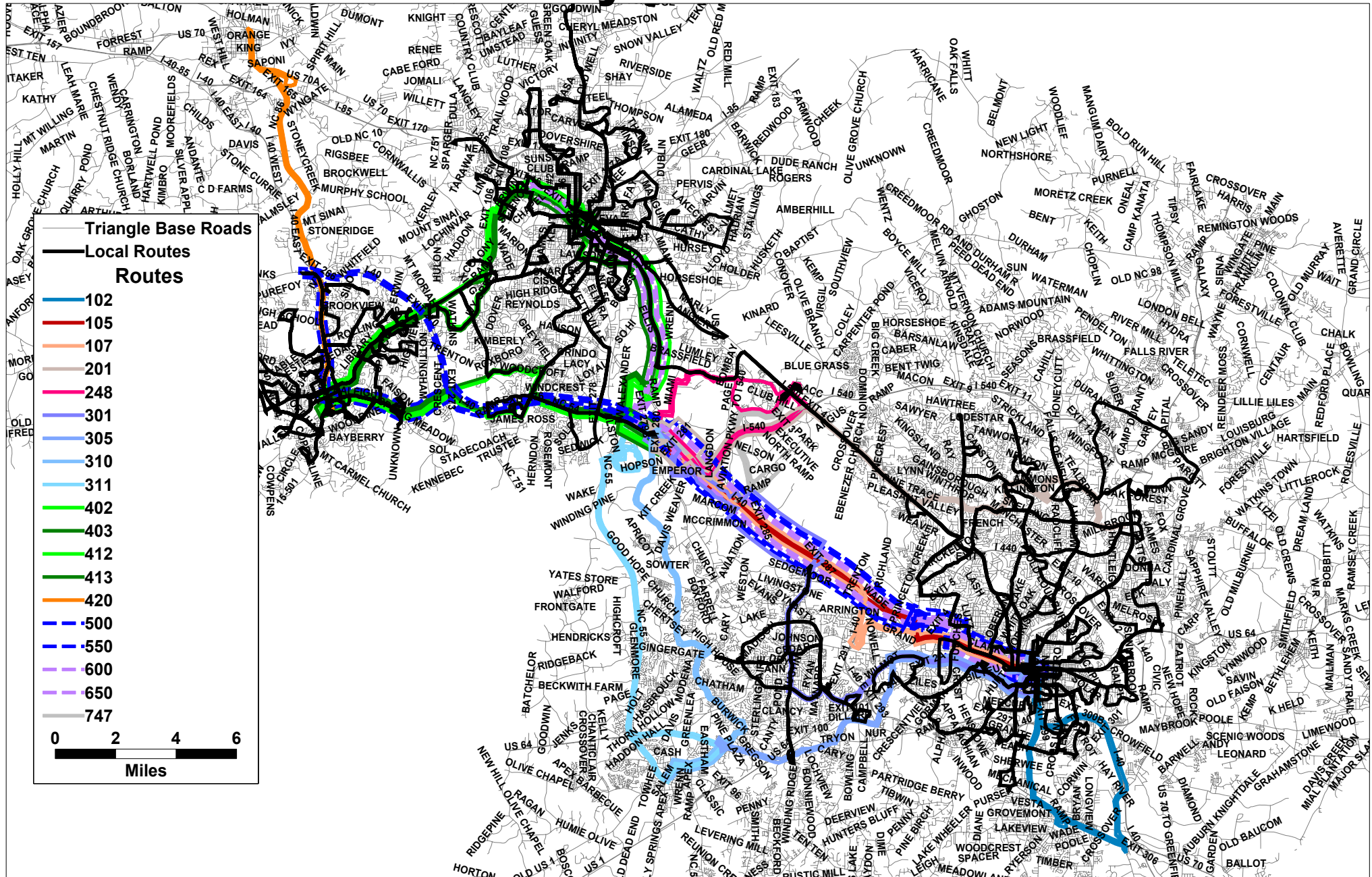
This type of route provides direct service between Raleigh and Cary.

Figure 9: Chapel Hill-Durham break

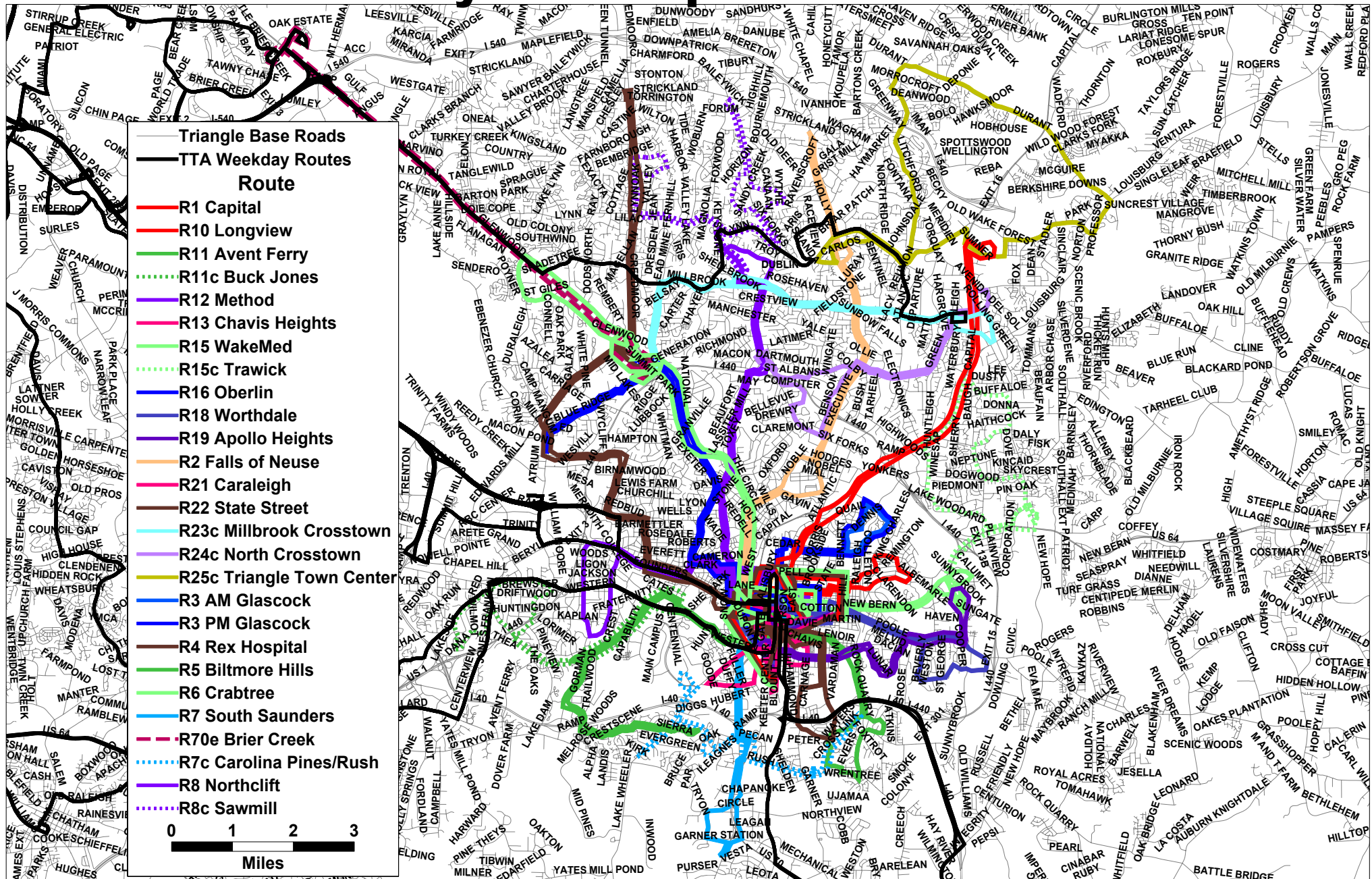


Chapel Hill and Durham's services come within 3/4 of a mile but do not connect.

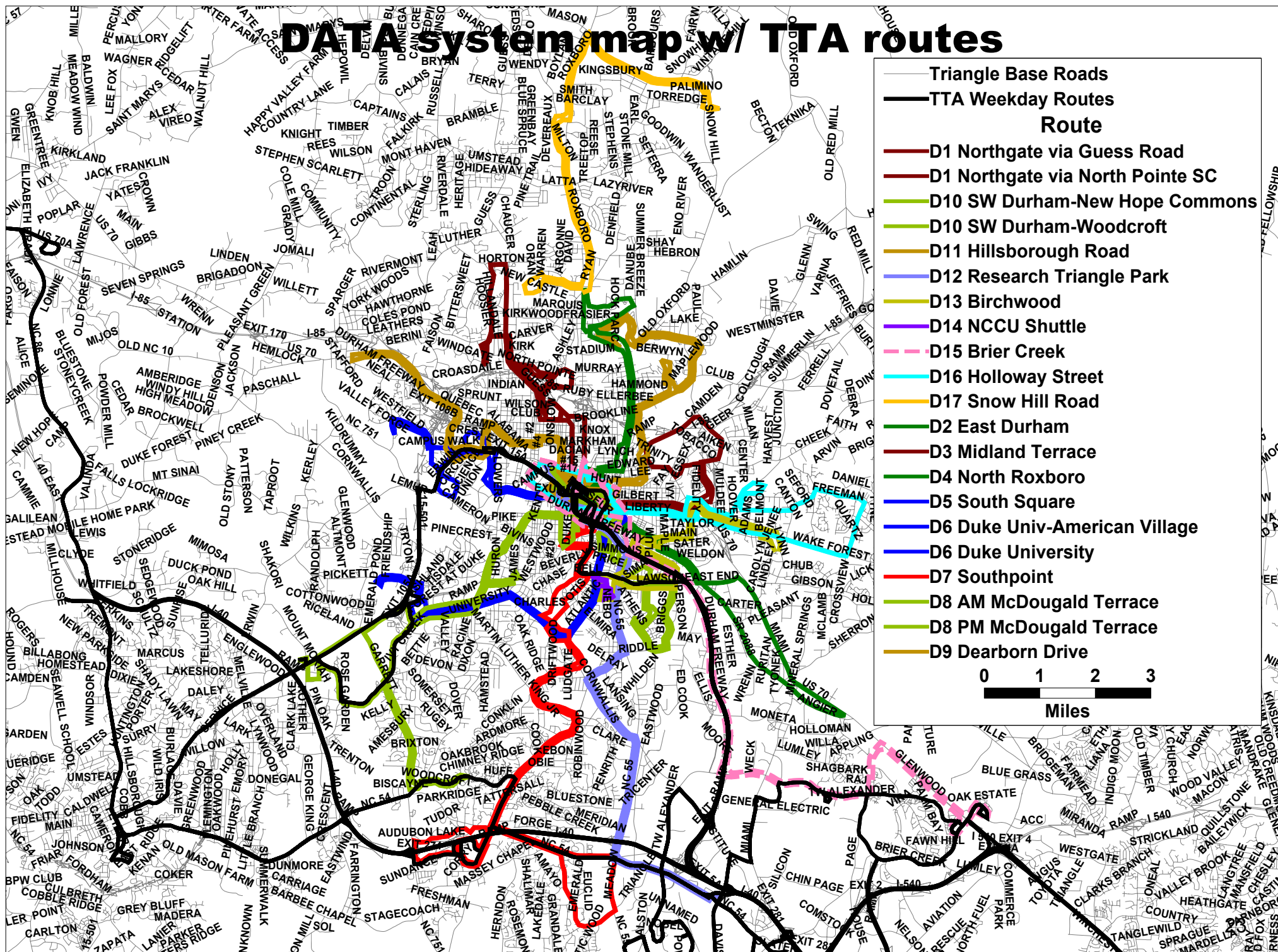
Current TTA system w/ local routes



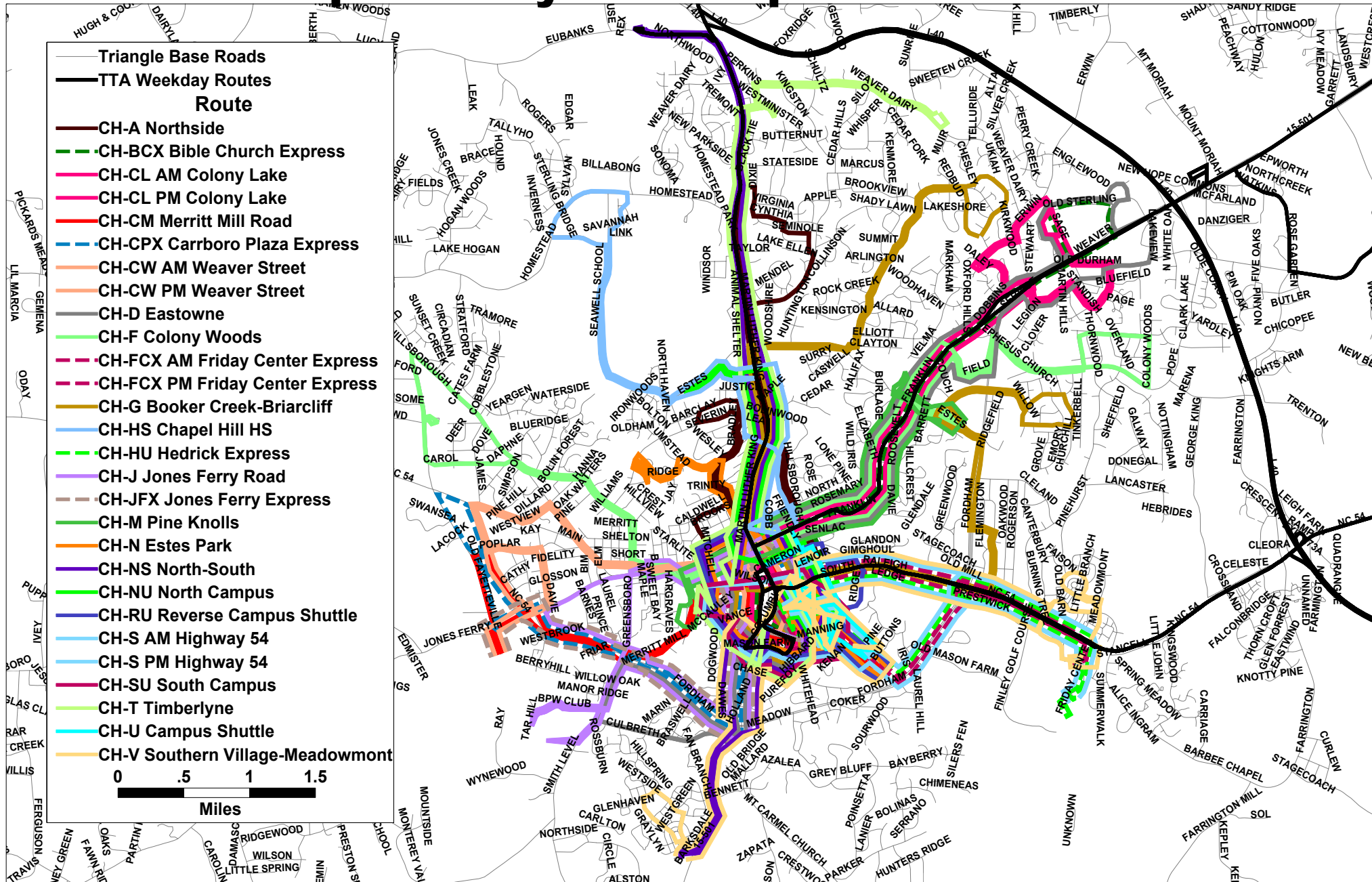
CAT system map w/ TTA routes



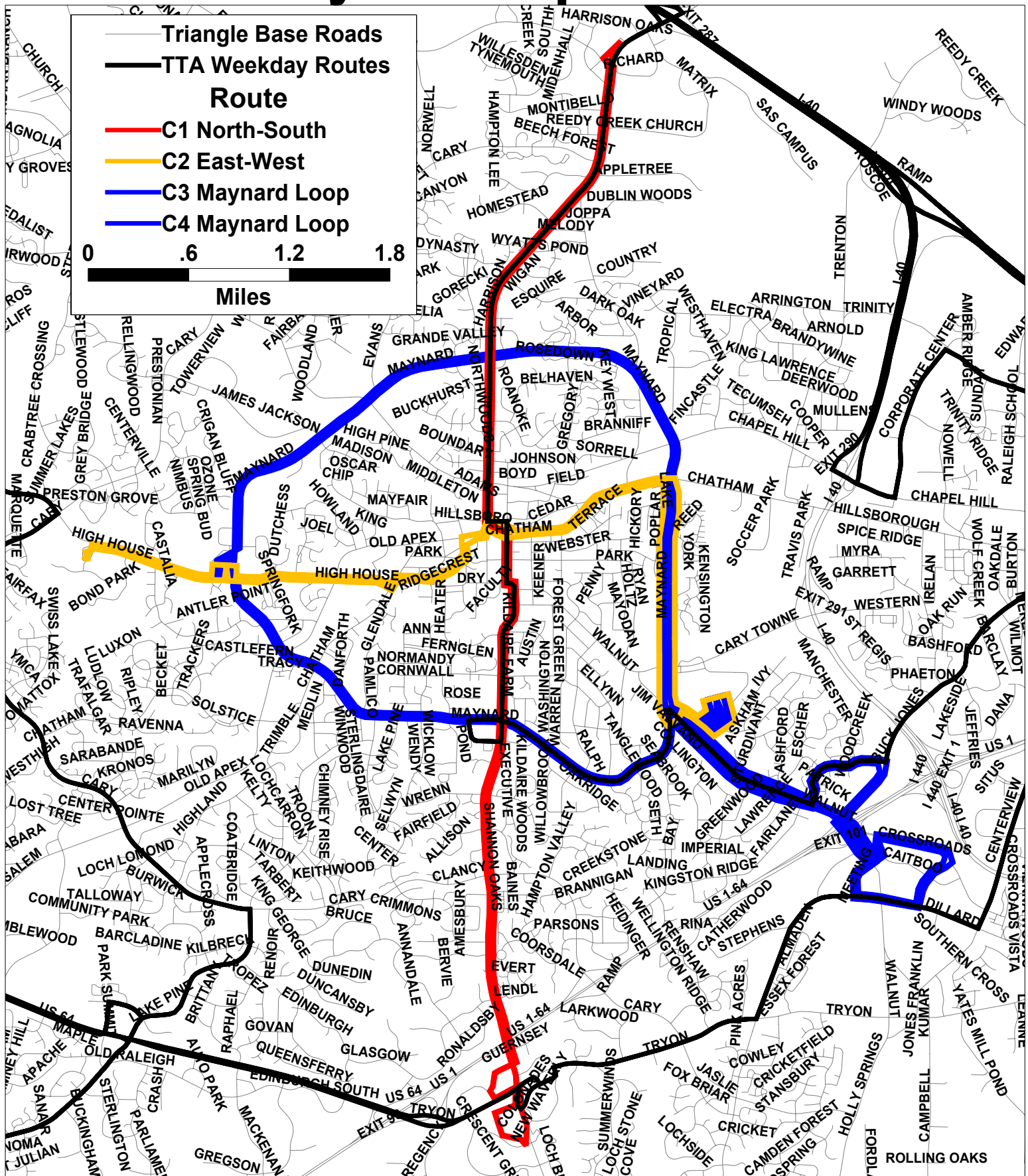
DATA system map w/ TTA routes



Chapel Hill system map w/ TTA routes



C-TRAN system map w/ TTA routes



TTA proposed system map

Produced by Academic TransCAD

