Central Midlands
Commuter Rail Feasibility Study

Final Report

July 2006

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SECTION 1: INTRODUCTION

1.1. PURPOSE AND SCOPE OF STUDY

The Central Midlands Council of Governments (CMCOG) conducted a planning study to assess the feasibility of commuter rail and other high-capacity transit modes (such as Bus Rapid Transit) in the Central Midlands region. A previous planning study completed in 2000 identified three corridors in the region that exhibited characteristics suitable for some type of commuter rail investment:

- Newberry to Columbia;
- Camden to Columbia; and
- Batesburg-Leesville to Columbia.

The next phase of study, described within this report, was commissioned to take a closer look at these three corridors and to establish priorities for investment in some type of high capacity transit. The Central Midlands region has grown in both population and employment like other cities in the southeastern United States, and has begun to experience traffic congestion in a number of areas. Regional leaders feel that providing transportation options, like transit, will help maintain the quality of life in Columbia and slow down the need for investment in roadways. Commuter rail is deemed as a long range transportation option in the three selected corridors, but the region is at the point where a discussion about major transit investments is both warranted and timely.

Although the 2000 study indicated that commuter rail is not anticipated to be feasible in the near term, this study revisited these projections to establish an action plan in preparation for service when it is deemed to be feasible. The SmartRide express bus service operating from Newberry and Kershaw County was used as a starting point for future high-capacity service, and this plan aims to develop a strategy for gradually building upon these services to create higher-level transit options and associated strategies. More intensive bus service with certain advantages over single-occupant vehicles was critical to the development of latent transit demand and to identify which travel patterns are best served by transit. The study identified which of these corridors have the densities and land use to support high capacity transit and where service can be effectively and efficiently implemented.

The study was comprised of the following components, described in subsequent sections of this report:

- **Baseline Assessment** – All information from past studies within the Region was reviewed to generate data and establish the goals for the study. In addition, trends in demographic data were analyzed to determine projected changes in the candidate corridors. Furthermore, a peer city analysis helped determine what characteristics are needed to support commuter rail, to provide insight into the barriers to implementation, and to learn from the experiences of other regions. Commuter rail projects in Albuquerque, NM; Burlington, VT; Charlotte, NC; Eugene, OR; Greensboro, NC; and Nashville, TN and were included in the peer review.
- **Technology Review** – There are several types of high capacity transit technologies that were screened to determine which were the most appropriate for the Columbia Region.

- **Definition of Alternatives** – Alternatives were defined to establish an equitable comparison among the three corridors.
- **Public Participation** – Input received from stakeholders and the community in general is summarized and highlighted.
- **Evaluation of Alternatives** – A set of performance measures was designed to test which corridor should receive priority for high capacity transit.
- **Recommendations and Implementation** – A plan was established outlining the next steps to be undertaken to implement high capacity transit in the preferred corridor.

In addition, this study also examined two potential rail connections between Columbia and the proposed Southeast (US) High Speed Rail Corridor that is slated to travel through the Upstate of South Carolina en route between Atlanta and Washington, DC. The existing rail corridor between Columbia and Charlotte as well as the existing corridor between Columbia and Spartanburg were analyzed to gain initial insight into the improvements necessary to accommodate passenger rail service as a connection to the future high speed rail line.

This study provided CMCOG with the information needed to determine if more detailed planning is warranted related to commuter rail in the region. In recognition of the strenuous planning process associated with major transit investments, this study was established to provide immediate benefit by outlining a series of steps that can be taken now to build toward future high-capacity transit service.

1.2. TRANSPORTATION PLANNING CONTEXT

Commuter rail has become an increasingly popular form of transit, with operations over 4,400 miles of track serving 1,153 stations across the country (Bureau of Transportation Statistics, 2006). As population increases and congestion worsens in cities across the country, alternative means of transportation are being explored by urban centers of all sizes. Many large metropolitan areas operate commuter rail service to provide travel options in highly-congested corridors. Commuter rail has been successful in major urban centers, and is being increasingly examined by cities with more moderate populations.

High-capacity transit modes such as commuter rail require a substantial population base within the subject corridor to make service viable. In addition, the land use patterns present in the corridor can have a substantial impact on potential ridership. By encouraging land use patterns that are supportive of high-capacity transit, jurisdictions along the candidate corridors can help create developments that will establish a larger base of potential riders than may otherwise be expected. The establishment of these policies will play a major role in the future viability of rail transit in the Central Midlands region.

Central Midlands Commuter Rail Feasibility Study

SECTION 2: BASELINE ASSESSMENT

Before the three candidate corridors were analyzed in detail, baseline information was gathered to provide additional background data regarding other related planning efforts and current and future demographic information about the corridors. In addition, an assessment of high-capacity transit efforts in comparable cities was conducted to provide context for this study in the Central Midlands region.

2.1. REVIEW OF RELEVANT STUDIES

Relevant transportation, population, and land use documents that have been developed for the Central Midlands region in recent years were reviewed to identify applicability and opportunities to build upon previous efforts. The documents that were reviewed are as follows:

Transportation Studies
- *Central Midlands Regional Rail Study, 2000;*
- *Long-Range Intermodal Transportation Plan 2025;*
- *Transit Element of the Long Range Transportation Plan;*
- *Central Midlands Regional Transit Authority (CMRTA) Transit Development Plan;*
- *South Carolina's Multimodal Transportation Plan: At A Crossroads;* and
- *South Carolina Southeast High Speed Rail Corridor Improvement Study.*

Population Studies
- *Regional Population Projections: 2005-2035;* and
- *Key Characteristics of the Lower Income Population of the Central Midlands Region of South Carolina*.

Land Use (Residential Development) Studies
- *2004 Central Midlands Region Building Permits;* and
- *2004 Multi-Family Rental and Condominium Survey.*

A brief description of each these documents and their relevance to potential commuter rail in the Central Midlands region is given below.

2.1.1. Transportation Studies

Central Midlands Regional Rail Study
In 2000, R.L. Banks and Associates, et. al. completed the *Central Midlands Regional Rail Study* to investigate the feasibility and effectiveness of a commuter rail system connecting Columbia and its surrounding areas. A secondary objective of the study was to determine the impact of commuter rail on additional enhancements to the area's roadways. The study examined the feasibility of commuter rail using a two-phase approach. In the first step, a preliminary assessment was conducted on nine corridors connecting to Columbia, including routes to Winnsboro, Camden, Eastover, Wateree, Woodford, Edmund, Batesburg, Newberry, and Carlisle. In the second step, the three highest-ranking corridors were evaluated in greater detail.

Three corridors, Camden, Batesburg, and Newberry, were further examined as part of the "second phase" of analysis. Ridership, traffic impacts, land use, capital costs, and financial planning were the criteria considered for a fuller examination. The study identifies the Newberry corridor as the best option; however, the report states that this corridor does not offer enough benefits from its evaluation to justify a commuter rail system in the near future. The study does suggest that a commuter rail evaluation should be revisited and recommends implementation steps to prepare the region for potential service in the future. The primary recommendations include the development of comprehensive and general plans that encourage greater densities of population and employment. The findings also encourage early coordination with Norfolk Southern and CSX, owners of the railroad rights-of-way that could potentially be used for commuter rail service.

Long-Range Intermodal Transportation Plan 2025

Completed in 2003, the Long Range Transportation Plan includes intermodal components to meet the requirements of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21) passed in 1998. The study advocates a multimodal approach to move people and goods to maintain and improve the economic vitality of the region and its residents' quality of life. Commuter rail and other premium transit modes are discussed as ways to connect Columbia and surrounding suburban and rural areas to reduce traffic congestion, improve air quality, and improve the mobility of transit dependent persons. Experience in other cities in the United States shows that increased mobility leads to a higher quality of life with more opportunities for employment, as well as better access to recreational and institutional facilities, such as hospitals and schools.

Commuter rail or other forms of premium transportation are an important component in fulfilling the 2025 Long-Range Intermodal Transportation Plan stated goals of:

- "Reduce congestion and provide access through multimodal solutions.
- Support economic development through provision of high-priority facilities.
- Preserve and enhance the natural and man-made environment."

This Plan recognizes the need to begin consideration of high capacity transit in regionally significant corridors to improve or at least maintain mobility. It also cites the need for appropriate land uses and a network of local transit services to make regional transit viable.

Transit Element of the Long Range Transportation Plan

Much of the Transit Element of the Long Range Transportation Plan is adapted from the Central Midlands Regional Transit Authority's (CMRTA) Transit Development Plan (TDP). The Transit Element of the Long Range Transportation Plan focuses on the issues, opportunities, and strategies for the region's public transit services, and also functions as a guide for future transit planning efforts. The transit element states that many of the region's major trip generators and attractors currently are served by transit, but that a number of additional activity centers are not served. Another important finding is that most trips are made close to residents' homes rather than into other areas of the region. Demand for transit service is expected to increase, especially in the suburban areas, which will present a significant challenge.

Many current transit routes in the greater Columbia area perform well in terms of ridership and efficiency while others need improvement, and CMRTA must implement specific service standards to appropriately judge route performance.

Columbia's long term transit plans aim to increase mass transit services, achieve financial sustainability, and explore high capacity transportation alternatives, such as commuter rail, bus rapid transit, and/or express bus routes.

Central Midlands Regional Transit Authority (CMRTA): Transit Development Plan

The CMRTA Transit Development Plan is intended to define the future role of public transit in the region. This plan can be used to guide the organization over the next twenty years, with a focus in financial sustainability. Focused on short-term (7 years), medium-term (15 years), and long-term (20 years) project phases, the plan discusses the transit environment (current and future), current services, community input, visioning process, and coordination opportunities. Subsequently, the plan summarizes the region's transit needs, establishes a financial sustainability strategy, and makes short, medium, and long term recommendations. Both medium and long term recommendations suggest the CMRTA continue to explore the feasibility of high capacity transit modes, including commuter rail, bus rapid transit, light rail, and streetcar. The report also includes a recommendation to expand service to underserved areas, portions of which could be served by potential commuter rail service.

South Carolina's Multimodal Transportation Plan: At Crossroads

Completed in 2002, South Carolina's Multimodal Transportation Plan: At a Crossroads presents a multimodal approach to investment in transportation infrastructure through the year 2022. The document describes necessary improvements to the existing transportation system and recommends improvements as well as strategies for resolving transportation issues. The study estimates a cost of $56.9 billion to construct highway, mass transit, and intercity rail over the next twenty years. These transportation infrastructure costs currently exceed available state and federal revenue by $45.6 billion. The study finds that many of the transportation system needs cannot be met with expansion of the highway system because of exorbitant costs, environmental constraints, community preferences, and other challenges. More importantly, the study finds that most efficient transportation solutions involve different modes and policies that support those modes.

The Multimodal Transportation Plan anticipates mass transit as an important component of the state's transportation system. Transit systems are anticipated to improve access to community facilities and enhance the performance of the state's transportation system. Commuter rail corridors are being evaluated in Columbia, Charleston, Greenville, and the Charlotte/Rock Hill region. Other passenger rail alternatives (such as high speed rail and intercity rail services) are also being evaluated which would provide intercity connections. With regard to commuter rail and other high-capacity transit modes, the Multimodal Transportation Plan articulates that the State will "work with MPOs to identify potential Bus Rapid Transit (BRT) and Light Rail Transit (LRT) corridors and busway corridors; work with MPOs to conduct feasibility studies and develop implementation plans for feasible corridors."

South Carolina Southeast High Speed Rail Corridor Improvement Study

The South Carolina Southeast High Speed Rail Corridor Improvement Study explores two high speed corridors, the Central Route and the Upstate Route, along existing railroads in South Carolina. The Central Route runs 205 miles through the state, passing through Cheraw, Patrick, McBee, Bethune, Camden, Columbia, Swansea, North, Norway, Denmark, and Fairfax enroute to Savannah. The Upstate Route traverses 122 miles through South Carolina, passing through Blacksburg, Gaffney, Spartanburg, Greer, Greenville, Easley, and Clemson. Although the planning and development of the Corridor is spearhead by a four-state coalition: Virginia, North Carolina, South Carolina, and Georgia, each state is pursuing its own rail program. However, all are set to link their rail programs to enable a regional high speed rail system. This study and plan is South Carolina's first examination of the physical feasibility of high-speed rail passenger rail service in the state. Subsequent discussions among the Southeast corridor coalition states have established the Upstate Route as a higher priority than the Central Route. Recognizing the potential importance of a rail link between Columbia and the regional high speed rail line, the scope of this commuter rail feasibility analysis includes a preliminary study of potential connections from Columbia to the Upstate alignment.

2.1.2. Population Studies

Regional Population Projection: Central Midlands Council of Government (2005-2035)

Completed in 2005, the Regional Population Projection for 2005 to 2035 updates the 2000 to 2025 projections for the four counties that comprise the Central Midlands region. These projections are derived from the US Census 2035 projections (calculated at the state level for 50 states) and then disaggregated by the South Carolina Budget and Control Board's Office of Research and Statistics to the county level. CMCOG planners further disaggregated these data to the tract level, using a Delphi method which relies on the guidance and local knowledge of area demographers and planners.

These new projections anticipate population growth to outpace current transportation infrastructure investment levels. The CMCOG Region is anticipated to grow from a population of 596,253 in 2000 to 844,880 in 2035, a growth rate of 43%. From 2000 to 2035, Lexington County is expected to have the a growth rate of 62%, followed by Richland County with 32% growth. The three proposed commuter rail corridors traverse some of these high growth areas. However, the population density and appropriate high capacity modes of transportation still need to be evaluated, through efforts such as the current commuter rail study.

Key Characteristics of the Lower Income Population of the Central Midlands Region of South Carolina

Completed in 2003, the Lower Income Population report uses 2000 US Census Bureau data at the block group and census tract levels to highlight key characteristics of lower income populations and their geographic concentrations. The study is useful for funding programs like Community Development Block Grant funds from the US Department of Housing and Urban Development (HUD). The designation of these special needs populations and their geographic concentrations are also important to transportation planners, because many of these low and moderate income persons are likely to be transit dependent. Transportation options for low-income residents help provide more opportunities for employment as well as better access to recreational and institutional facilities, such as hospitals, school, and libraries. Although commuter rail is not typically frequented by lower income persons because of its higher fares as compared to bus systems, it is still a viable alternative mode of transportation, especially in areas were no transit is available.

2.1.3. Land Use (Residential Development) Studies

2004 Central Midlands Region Building Permits

The 2004 Central Midlands Region Building Permit Study uses 1975 through 2004 building permit data to chart single family units and multi-family units' trends of new residential development in Lexington County, Newberry County, Fairfield County, and Richland County. The study finds that most new residential development, 96.3 percent, occurred in what the study defines as the Columbia Metro Area. The highest density of 2004 permits occurred surrounding the Camden Corridor, primarily in the corridor's endpoints (near downtown Columbia and Camden). The number of average permits in the corridor per square mile ranges from 53 to 143 permits, most of which are for single family homes. The Newberry and Lexington corridors also demonstrate high levels of building permit density, primarily at their endpoints. Essentially, these findings support the trend of continuing growth and the need for future infrastructure investments, including transportation to support these developments and their populations.

2004 Multi-Family Rental and Condominium Survey

The 2004 Multi-Family Rental and Condominium Survey is an annual survey of multi-family apartments and condominiums in Richland, Lexington, Fairfield, and Newberry counties. The study's data are based on questionnaires mailed to apartment managers, rental agents and developers, and subsequent telephone interviews. The current vacancy rate for non-subsidized apartments is 8.6% which is slightly higher than the figure of 6.7% from one year ago.

Low vacancy rates in the Greater Columbia area and relatively high rents have spurred large builders to enter the Columbia market. This type of growth is favorable to high capacity transportation, by helping to produce greater population densities. The momentum of these types of developments could be further encouraged with comprehensive plans and land use policies that provide incentives and supporting infrastructure to make them attractive to more developers and future residents.

2.1.4. Conclusion

The review of relevant transportation, population, and residential development studies illustrates that jurisdictions within the Central Midlands region (including nearby Kershaw County) should carefully consider transit alternatives to facilitate improved access and mobility around the region. As a result, these high-capacity transit modes could provide tangible benefits for residents of the Central Midlands region.

2.2. CURRENT AND FUTURE DEMOGRAPHICS

The Central Midlands region, with Columbia as its primary city, is a medium-sized metropolitan area. The five-county area including Richland, Lexington, Newberry, Fairfield, and Kershaw Counties had a 2000 population of 648,900 (U.S. Census). Richland and Lexington Counties alone were home to over 537,000 of these residents.

The population and employment densities in the study area were examined to identify the locations and relative densities of development clusters. These illustrations were then compared to projected densities in 2025 to determine how growth in the region is projected to occur.

Exhibit 2-1 displays the 2000 population density of the region. As shown in the map, the population is dispersed throughout the region, with the highest densities of housing in the urban core of Columbia, east of downtown and in the University of South Carolina area. It is also notable that there are higher concentrations of residents along the Camden and Newberry corridors (extending to Sandhill and Irmo, respectively) than in other areas.

Exhibit 2-2 shows the projected population density in 2025. As can be seen in the map, growth is projected to continue in a fairly dispersed manner, with population densities increasing marginally throughout the urban area. Minor increases in density can be seen along the three corridors.

Exhibit 2-3 illustrates the 2000 employment density (locations of jobs) in the region. It is notable that downtown Columbia has a strong concentration of jobs, although other clusters are evident in suburban areas, particularly along the Newberry and Camden corridors.

Exhibit 2-4 projects the distribution of jobs in 2025. Although an increase in the number of jobs in downtown Columbia is expected, job growth is projected to occur throughout the region, primarily in suburban areas.

These projections for both population and employment densities indicate that the Central Midlands region is anticipating growth to occur in a scattered matter, with additional sprawl-oriented development in suburban areas. For transit to become a more viable option, the region must take steps to focus this growth in major corridors, where residents and employees could easily access a high-capacity transit service as a travel option.

More detailed information regarding the demographic characteristics of each corridor and station area is provided in Section 6.

Exhibit 2-1: 2000 Population Density in the Central Midlands Region

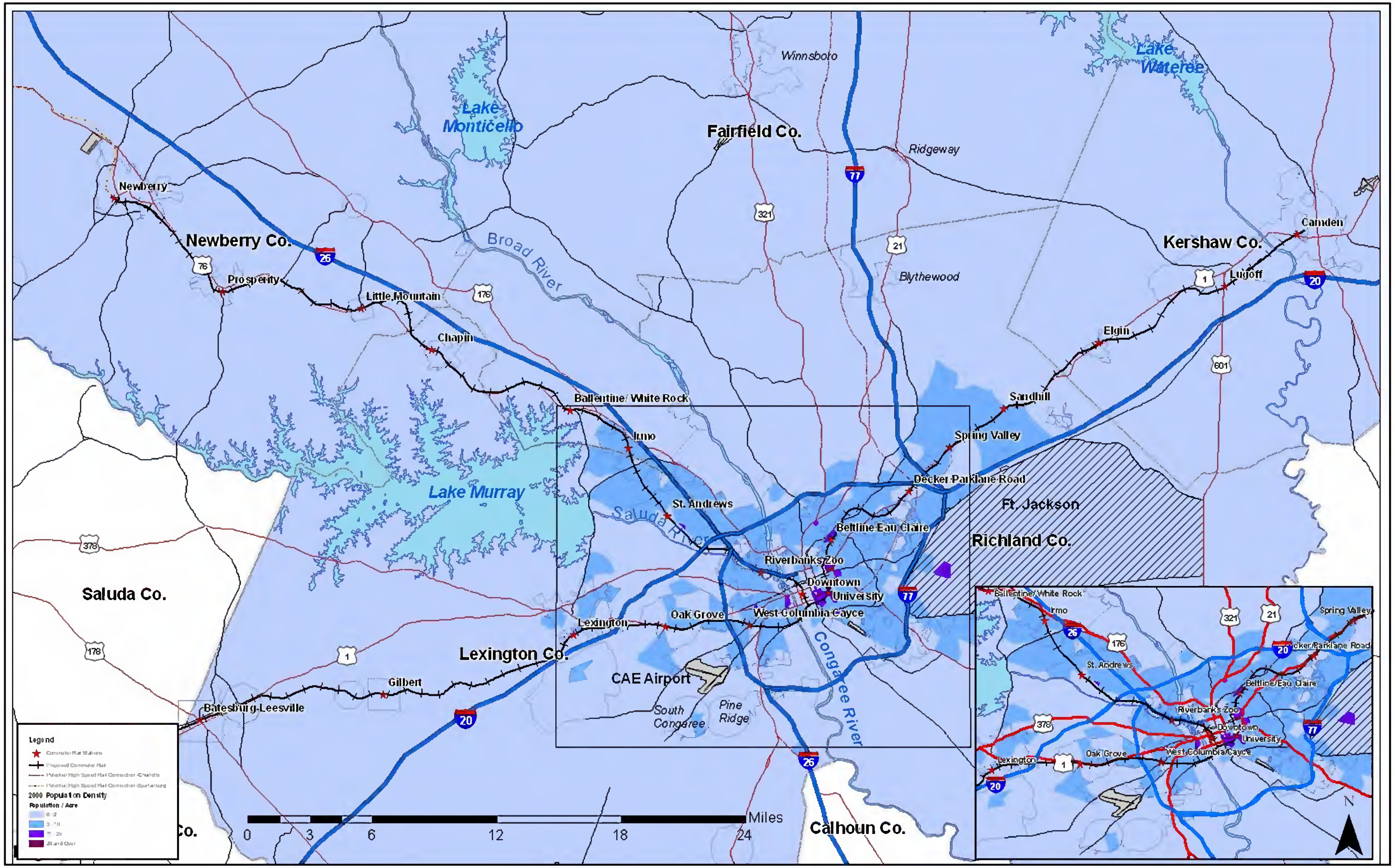


Exhibit 2-2: 2025 Population Density in the Central Midlands Region

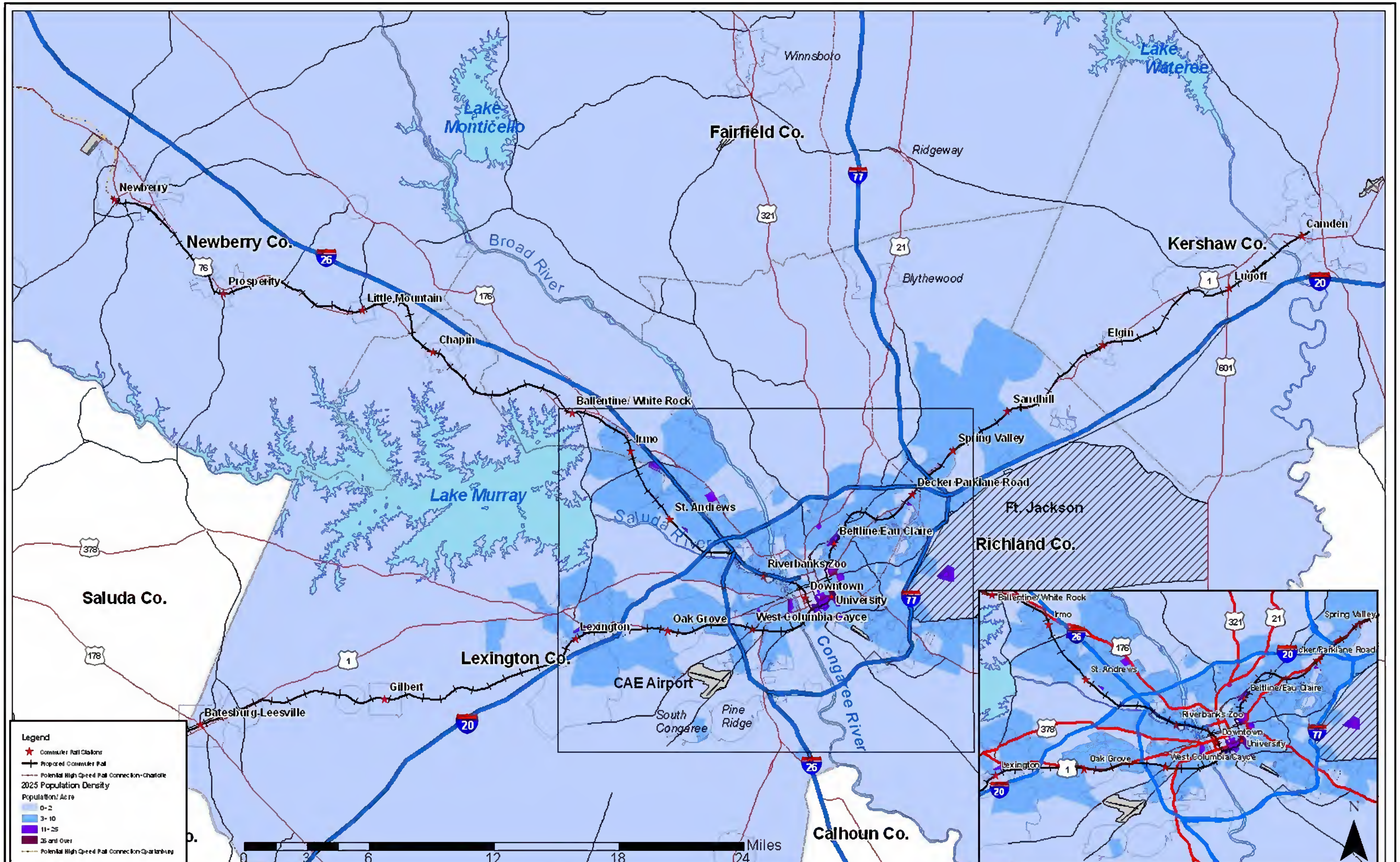


Exhibit 2-3: 2000 Employment Density in the Central Midlands Region

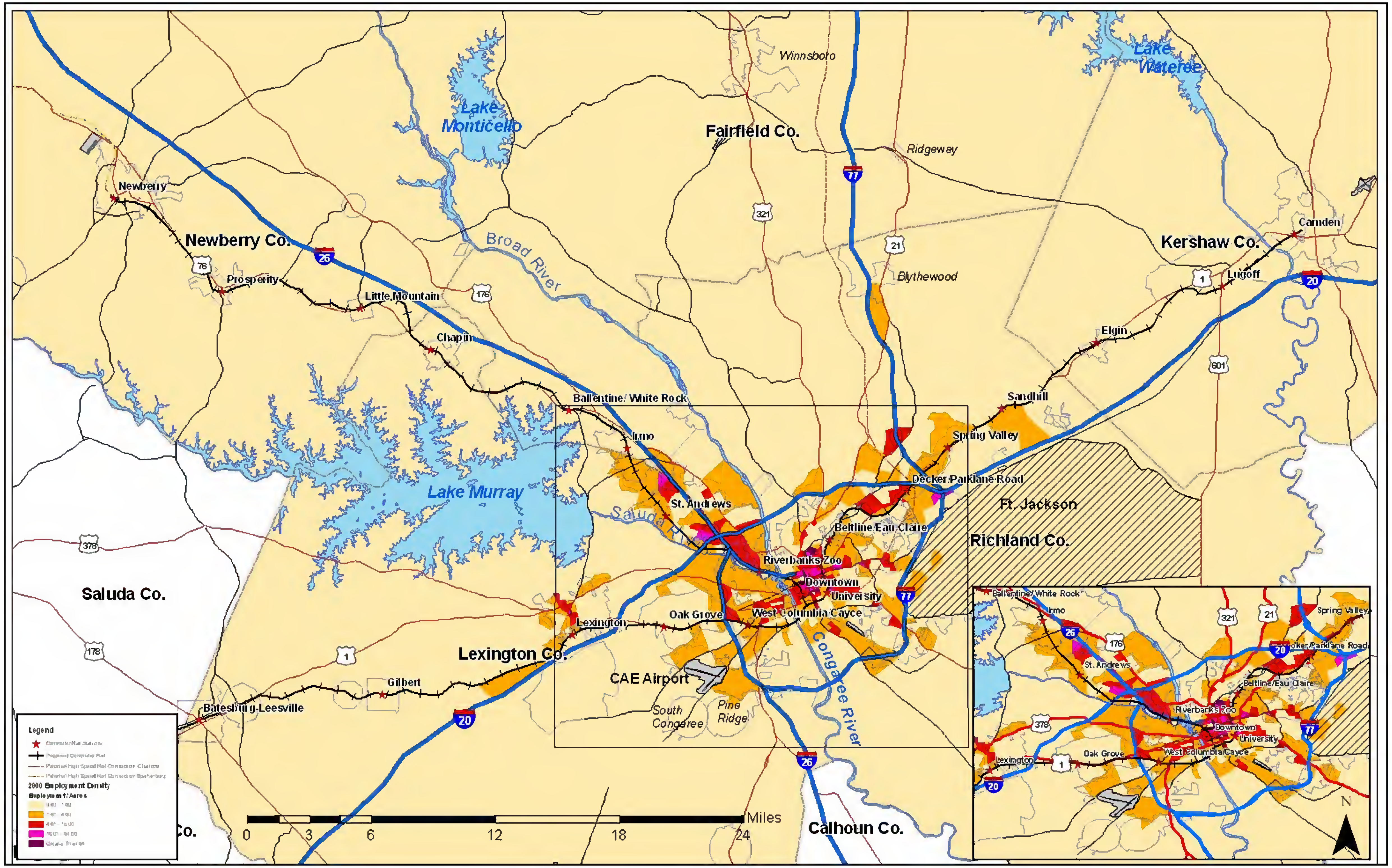
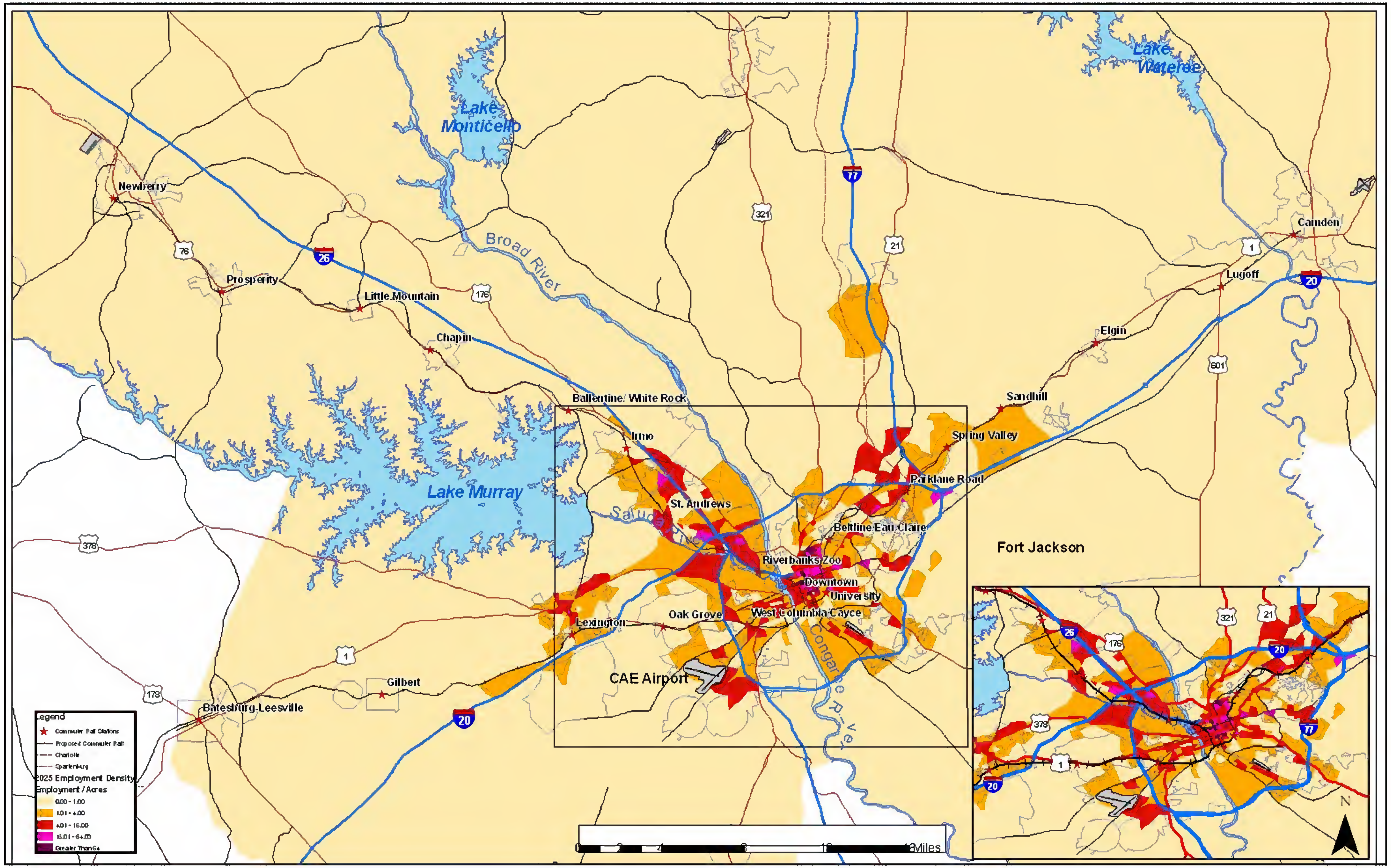


Exhibit 2-4: 2025 Employment Density in the Central Midlands Region



2.3. HIGH-CAPACITY TRANSIT IN COMPARABLE CITIES

The purpose of the peer cities evaluation is to examine the commuter rail and high-capacity transit experience of other cities of a comparable size in order to consider their approaches and learn from their experiences. Current and previous projects are discussed based on a literature review (including a review of agency web sites) and telephone interviews conducted with peer cities' transportation project staff. The six peer cities examined are as follows:

- Albuquerque, New Mexico;
- Burlington, Vermont;
- Charlotte, North Carolina;
- Eugene, Oregon;
- Greensboro, North Carolina; and
- Nashville, Tennessee.

These cities were selected because they are in the process of exploring mass transit alternatives that include commuter rail and BRT. Just as importantly, these cities are more moderate in population than the largest cities in the country. Many medium-sized cities are now considering high-capacity transit service, and Columbia is much more comparable to these cities than to the largest cities that already have extensive rail transit services.

Each of the six peer cities has some aspect(s) that are helpful to better understand long-term improvements in public transportation for the greater Columbia region and approaches taken by other cities to meet these challenges. More details are provided on the following pages.

- **Albuquerque, New Mexico** is expecting to launch a new commuter rail service in 2006. Commuter rail is one of many multimodal solutions to meeting challenges of insufficient transportation infrastructure of a growing region.

- **Burlington, Vermont** operated a commuter rail from December 2000 to February 2003; lack of ridership spurred its termination. Burlington's experiences are useful for its lessons learned.

- **Charlotte, North Carolina** has selected commuter rail for one of its major transportation thoroughfares; a Draft Environmental Impact Statement is being prepared and the corridor may be operational as early as 2009-2010. Charlotte's experience is helpful, because it provides a regional illustration of the process that Columbia would need to follow to pursue a major transit investment.

- **Eugene, Oregon** is seeking to build ridership and support through a Bus Rapid Transit system prior to committing the substantial resources that rail transit requires. Eugene's incremental approach to building ridership and supporting land uses for a progression to a higher capacity mode in future provides an interesting approach that could helpful to the Central Midlands region's aspiration for commuter rail in the future.

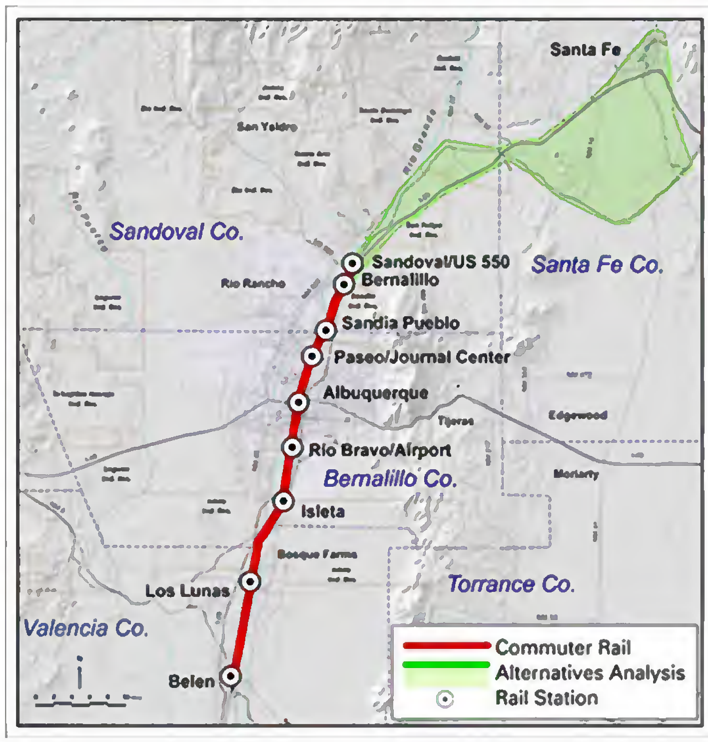
- **Greensboro, North Carolina** is in the process of evaluating four corridors, with both commuter rail and BRT being considered. Greensboro, like Columbia, is still in an early stage of study in the project development process.

- **Nashville, Tennessee** is anticipated to launch commuter rail service in 2006. It has adopted a "no frills" approach by working to establish rail service on an extremely small budget, then using the experience to build local support for additional transit investments in the region.

2.3.1. Albuquerque, New Mexico

General Background

The New Mexico Rail Runner Express commuter rail is proposed to extend 65 miles between Belen and Bernalillo (in the Albuquerque area) in Phase I, and from Bernalillo to Santa Fe, approximately 25 miles further in Phase II (beginning operations in 2008). It will serve seven stations in Phase I and add two stations in Phase II. The commuter rail line will operate on existing rail purchased from Burlington Northern Santa Fe Railway.



http://www.mrcog-nm.gov/Rail_Runner.htm

The cost of the initial Rail Runner service is estimated at $125 million, which includes $50 million for the purchase of right-of-way. The Mid-Region Council of Governments and the New Mexico Department of Transportation (NMDOT) purchased ten passenger cars and five locomotives to serve the Belen alignment. The commuter rail project has a designation of $300 million in state funds. These funds comprise a portion of Governor Richardson's Investment Partnership (GRIP), a $1.6 billion transportation package aimed at alternative means of transportation and highway improvements to concurrently spur local job creation.

The Belen to Santa Fe Commuter Rail project is viewed as an integral part to assist New Mexico's transportation infrastructure to accommodate present and future population and employment growth. This corridor has many of the commercial, financial, educational, and institutional centers of the state. It also has nearly doubled in population in the past 30 years and currently is home to 883,000 people, nearly half of New Mexico's population. This region also attracts an estimated one to two million visitors per year. In addition, the Belen to Santa Fe Corridor is important geographically, because the corridor is home to the Albuquerque International Airport, State Capital (in Santa Fe), and seven Native American Pueblos. By 2025, population in this corridor is expected to reach 1.3 million persons, growing 50 percent from current figures.

Interview Findings

The Belen to Santa Fe Commuter Rail project is viewed as a progressive approach to accommodating future growth in the region. It is one of many alternatives taken by the New Mexico Department of Transportation, the Governor, and local jurisdictions to meet future transportation infrastructure needs and relieve negative externalities related to growth, such as traffic congestion, air quality challenges, and stymied economic growth.

The impetus to the commuter rail corridor is part of a larger multimodal solution to meeting the region's current and future (population and employment) growth and its needs for transportation and other supporting infrastructure. In September 2003, New Mexico's State Legislature passed the Governor Richardson's Investment Partnership into law, a $1.6 billion transportation package for highway reconstruction and improvement of Interstate 25, as well as commuter rail and other infrastructure components. Rail Runner is under construction and is anticipated to begin revenue operations in 2006. The extension to Santa Fe is anticipated to open in 2008. Subsequent expansions are in the planning stages.

Rail Runner is highly supported throughout the great Albuquerque region. The main selling point of the commuter rail has been that it is seen as an opportunity to make a positive change with regard to increasing traffic congestion in the greater Albuquerque to Santa Fe corridor. Physical, political, and environmental constraints provide few alternatives besides a high capacity mode of transit to alleviate traffic. More highway capacity in the corridor would be difficult to construct, because the environment is highly protected by local residents and new highway options would need to infringe on sovereign Native American "Pueblos".

Thus far, the greatest challenge of the commuter rail project has been the acquisition of the rail right-of-way. However, the rail acquisition has gone fairly smoothly in comparison to comparable projects around the country. Because Rail Runner's capital funding came through a state of New Mexico initiative, the project did not require all the rigor and regulation of the federal funding process. As a result, Rail Runner is anticipated to take only two years to implement as opposed to an average of 10 years which it has taken comparable commuter rail projects around the country (that sought federal funding). An important lesson learned has been securing the funding prior to implementation and avoiding the Federal funding process if possible. Not only is Rail Runner anticipated to open in two years from its inception, but the cost of the project has been very competitive even with the acquisition of the rail right-of-way.

For More Information

http://www.nmrailrunner.com

2.3.2. Burlington, Vermont

General Background

The Champlain Flyer was a passenger commuter rail service that operated along a 13-mile segment of the Vermont Railway corridor between Burlington and Charlotte, Vermont. The commuter rail service offered eighteen trips in the weekday and limited weekend operations, serving four stations: Burlington, Charlotte, Shelburne, and South Burlington. These communities are suburban communities that stretch along sparsely populated areas.

The initial feasibility study for the Chaplain Flyer was conducted in 1993. It commenced operations in December of 2000, but its tenure was short-lived; it terminated in February 2003 due to lack of ridership. The project cost was nearly $8 million and operating cost approached $1 million per year.

The Champlain Flyer was supported and implemented by former Vermont Governor Howard Dean. It was conceived as an alternative to Route 7 which was experiencing traffic congestion and construction disruptions. Project funds were provided at an 80/20 percent split between federal and state governments. No local funds were required by the state to match federal funds.

Survey Findings
The Champlain Flyer had many opponents from the time it was first being planned. Many were skeptical of its feasibility and transportation benefits to relieving traffic congestion. The project incurred extra costs, to mitigate noise and provide additional safety gates. Nonetheless, important lessons were learned for local residents if they desire to restart the commuter rail services in future, as well as for comparable sized cities around the country that are considering a commuter rail project.

These lessons learned are as follows:

- Build more support with existing transit service; increase ridership and avoid competition for ridership.
- Start with a modest and reasonable operating plan and strive to steadily increase a ridership base.
- With regard to operations, hire commuter rail service professionals, and not just freight railroad professionals for improved customer service.

2.3.3. Charlotte, North Carolina

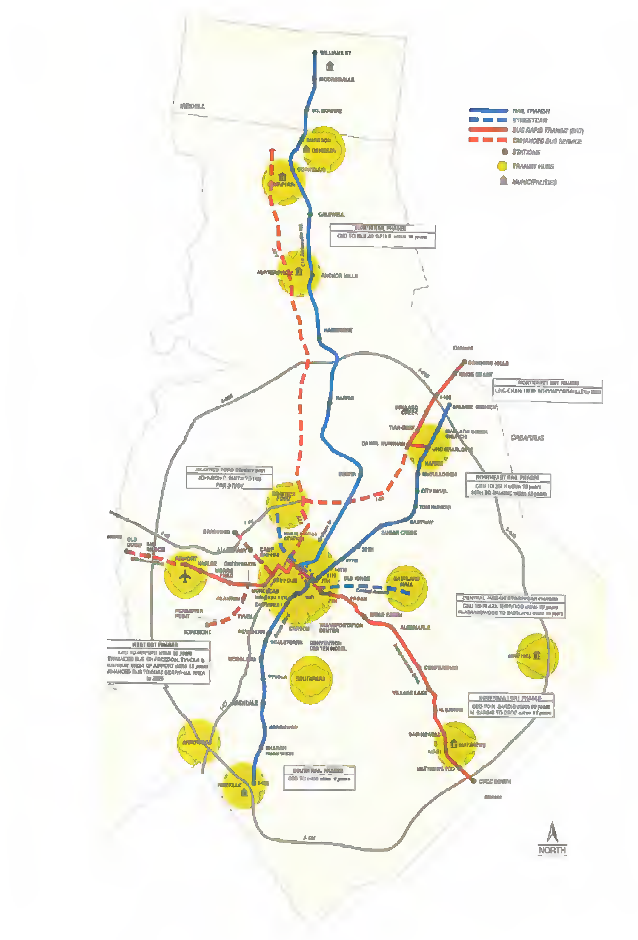
General Background
The North Corridor Commuter Rail Project is proposed to extend from Uptown Charlotte to the town of Mooresville in Iredell County, approximately 30 miles away. The alignment will traverse portions of the towns of Cornelius, Davidson, and Huntersville. The North Corridor will operate on existing, lightly used Norfolk Southern rail line.

In the best case scenario, the North Corridor Commuter Rail system would be fully operational in the 2009-2010 timeframe. Capital costs are currently estimated at $275-$290 million, plus the cost of the Charlotte Gateway Station, a proposed multimodal hub serving commuter rail trains, streetcar, local and express buses, cars, and intercity transportation that include Amtrak trains and Greyhound buses. The North Corridor commuter rail service will have 25-35 daily trains, serving 11 initial stations and operating at speeds up to 79 miles per hour.

In November 1998, following public support of a half-cent sales tax increase to support implementation of the 2025 Integrated Transit/Land-Use Plan, the City of Charlotte and the

Charlotte Area Transit System (CATS) conducted an extensive 24-month Major Investment Study (MIS) of potential transit options in the North Corridor. The results of the MIS affirmed the 2025 Plan's concepts, and commuter rail was chosen over Bus Rapid Transit and light rail transit as the locally preferred alternative for the North Corridor.

Once the MIS was completed, the project moved into the Conceptual Engineering/ Environmental Impact Statement (CE/EIS) phase of the federal project development process. During this phase, CATS' staff developed design alignment options for the commuter rail corridor. The study is also identifying potential environmental, social and economic impacts of constructing the transit system and recommend measures to mitigate any adverse impacts. Additionally, it will generate public and agency comments as input to the decision-making process. CATS plans to conclude its CE/EIS activities, culminating with its submission of the Environmental Impact Statement to the Federal Transit Administration in the Fall of 2006.



http://www.charmeck.org/Departments/CATS/Rapid+Transit+Planning/T.P.+-+2025+System+Plan.htm

Survey Findings

The community in the greater Charlotte area is overwhelming supportive of the project. It is seen as a proactive step for accommodating future growth in the region. In 2000, there were 150,915 persons in the North Corridor. By 2030, population is expected to reach 352,749 persons, growing 134 percent. Employment is anticipated to increase from 79,927 to 211,193, increasing 164 percent. Other selling points include Transit Oriented Development (TOD), which is also viewed as another proactive approach to growth. Obstacles the North Corridor project has faced are the community's perception of a slow process to get commuter rail service. Funding is also a challenge, because the alignment extends into Iredell County which does not have a sales tax like Mecklenburg County to support its transportation projects. The project will likely be funded 50% with federal funds, 25% state, and 25% local. Noise and vibration concerns have been expressed but are not a major issue. A major factor the success of the project has been a comprehensive public involvement plan.

For More Information

http://www.ridetransit.org

2.3.4. Eugene, Oregon

General Background

Eugene, Oregon's local transportation authority, Lane Transit District (LTD) is implementing a Bus Rapid Transit system in Eugene and Springfield. The project will be completed in phases, with the $22 million first phase linking the two downtowns along a four mile corridor with eight stations. It is scheduled to open in September 2006. To be called EmX[1] (and pronounced M-X), the transit system will use futuristic-looking, 60-foot-long buses. These vehicles will operate on exclusive transitways for major portions of its routes and will use Intelligent Transportation Systems to help reduce travel time and increase speeds.

The Eugene/Springfield transportation decision makers considered a light rail system, but they recognized that the Eugene/Springfield region lacks the population density and financial resources necessary to support the huge investment required by light rail transit. However, stakeholders view EmX as a tool to help lay the groundwork for the development of light rail service in the region "at a point in time that it makes sense for the region, presumably decades into the future."

EmX is expected to yield a 20 percent cost savings as compared to the current fixed bus routes in the corridor. Projections anticipate a 50 percent increase in ridership, moving. EmX is currently scheduled for 12 minute headways. This first corridor (Franklin Corridor) is designed to have approximately 60% of the route with exclusive lanes (transit ways) for the EmX vehicle. By 2020, travel time savings is projected to be about 40 percent.

Survey Findings

EmX is perceived as a practical and innovative solution for current and short term future transportation needs. It also serves as a building block for the more expensive light rail solution which is not currently feasible for the region. EmX will use technologies such as queue jumpers, bus-only lanes, and signal priority to achieve a similar service as light rail but at a cost that is more affordable for smaller communities, like Eugene/Springfield.

The first EmX corridor is under construction and anticipated to begin revenue operations in December 2006. Subsequent expansions are in the planning stages; the LTD's long term goal is to have EmX operational on all major corridors, totaling five corridors and one beltway. At the current rate, the system is anticipated to be complete in 25 years, extending a total of 75 miles. This incremental development approach is being called "Progressive Corridor Enhancement". It allows for faster implementation of transit improvements while the commitment to complete the design on all planned EmX corridors remains unchanged.

http://ltd.org

[1] The name EmX has local connections. Eugene/Springfield is located in the Willamette Valley, sometimes referred to as the Emerald Valley. EmX – for Emerald Express – is derived from this name.

Most people in the Eugene and Springfield area are in favor of EmX. There are some residents that preferred light rail, but LTD staff convinced them that it was not a viable option at in the near future. On the other hand, there are residents that believe that BRT will not work for the region. Staff convinced this contingent by agreeing to transfer transitways to mixed flow traffic if BRT failed.

EmX gained momentum when it was incorporated into the regional transportation plan as a viable approach to meet the region's transportation challenge in the future. The main challenge EmX has had was the acquisition of right-of-way for transitways and road widening. Transitways and road widening create problems acquiring property, removing surface parking, and avoiding trees.

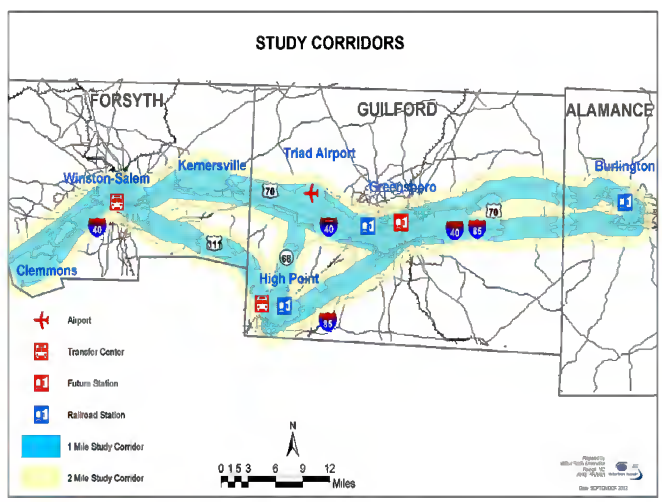
The first phase of EmX is estimated to cost $22 million dollars. The federal government is funding most of project, with $4-$5 million in local matching funds. The BRT corridor right-of-way is owned by city, county, and state jurisdictions. LTD also acquired right-of-way to widen the corridor but has relinquished ownership to the jurisdiction in which it lies. The transportation authority will also be responsible for maintenance of the corridor, including signalization. The key lessons learned in the project are as follows:

- A political champion is needed to push the project forward.
- Strong partnerships are needed between different agencies and their staffs.
- Implementation takes longer than people anticipate. Public Involvement takes a lot of work, including block to block visits to local residents and business owners. There is a large investment in time and energy.

For More Information
http://www.ltd.org

2.3.5. Greensboro, North Carolina

General Background
Greensboro, North Carolina's Piedmont Triad Regional Mobility project is studying alternatives and transportation modes on a region-wide basis. Four corridors are being considered: one east-west corridor (Burlington – Clemmons) and three north-south corridors (High Point to Greensboro, High Point to Piedmont Triad Airport, High Point to Winston-Salem). The first phase of the Regional Transportation Alternatives Study was completed in the fall of 2003.



http://www.partnc.org

The Burlington – Clemmons corridor is 60 to 65 miles long with potential shorter segments of 30-38 miles long. The three north-south corridors are approximately 18 to 23 miles long. The east-west corridor has 14 potential stations and the three north-south corridors have 5 to 7 potential stations. The cost of each of the four rail alternatives has not been determined at this early stage. The technologies being considered are rail (DMU) and Bus Rapid Transit.

The "Corridor Planning" phase has been completed for the Piedmont Triad Regional Mobility project. It is the first stage of the five step process of the Federal Transit Administration's "New Starts" project development process[2]. Local and state leaders are seeking long-term improvements in public transportation in the Triad area of North Carolina. Population growth and travel trends indicate that the Triad region needs these improvements before it encounters major congestion and development problems.

Estimates indicate that the Winston-Salem to Greensboro commuter rail would conceivably provide a viable transportation choice to 70,000 – 90,000 employees within a one-mile radius of the alignment. It would serve two major hospitals, three universities, one coliseum, one major mall, and three central business districts.

The number of vehicle miles of travel (VMT) in the region is estimated to increase from 20.8 million in 1994 to 40 million in 2025. Although this growth in population and vehicular traffic is significant, transportation professionals are evaluating the type of high capacity transit mode that is most sustainable and feasible for the region. They recognize that there are necessary land use measures that must be adopted to ensure supportive types of development around the proposed stations.

Survey Findings

The Piedmont Triad Regional Mobility project has mild support in the region. There is skepticism for the region's need of commuter rail and its cost. As stated by agency staff, commuter rail faces five major challenges to move forward in the region:

1. The "New Starts" process is complex and cumbersome. The rules can change and the analytical requirements are unclear. Essentially, the technical component is confusing and rigorous.
2. Public education on the process needs to be on-going, extensive, and engaging. The voters need to be behind the project.
3. The political process is slow to move the project forward. The project needs a champion to marshal the effort.
4. Funding is a significant hurdle. The FTA process is highly competitive, and federal funds will only cover 50 percent at best. The remaining monies must come from state and local funds. In North Carolina, the State has committed to 25 percent, so the remaining 25 percent needs to come from local sources.
5. Land use needs to be modified and consistent to support high capacity transit. Transit Oriented Development (TOD) policies need to be adopted to assist and support fixed transitways. Reducing setbacks, decreasing parking space quotas, and other policies that are constraining to transit corridor and station siting must be addressed. These land policies need to include measures to encourage transit supportive services.

[2] The five stages of the "New Start" program are: Corridor Planning, Preliminary Engineering (PE), Final Design, Construction, and Operation.

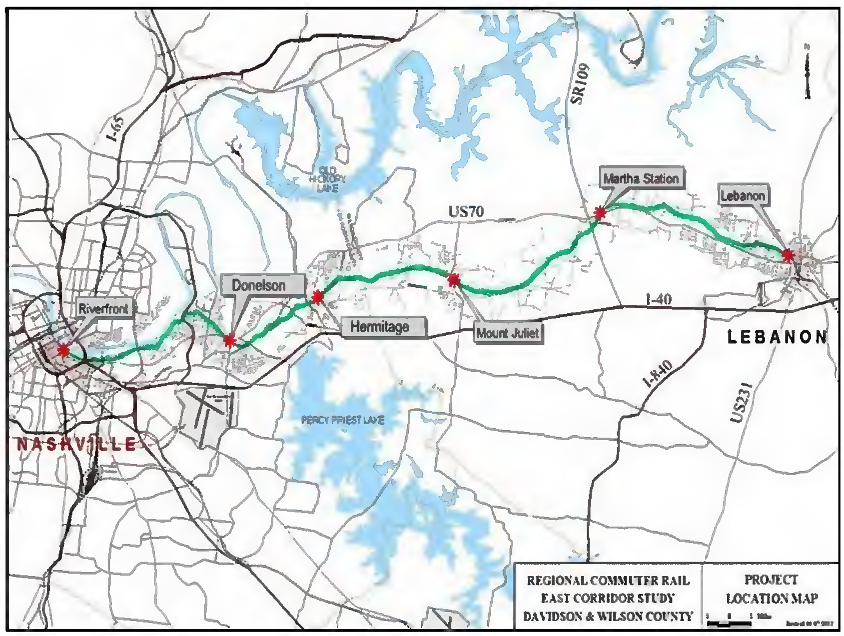
The main selling point for commuter rail is that commuter rail provides an alternative to achieve satisfactory mobility and accessibility in the future, as well as a viable mode choice as traffic worsens in the region.

A primary lesson learned of this project is to conduct a "Peer Cities" analyses to know what other places are doing and to learn from their successes and mistakes. Charlotte is seen as a good example of a success. The city had its funding aligned, so commuter rail in the region has avoided many problems that other jurisdictions have encountered.

For More Information
http://www.partnc.org

2.3.6. Nashville, Tennessee

General Background
The Music City Star commuter rail line is proposed to extend from downtown Nashville to Lebanon, 32 miles to the east. The commuter rail service will operate on an existing single track section between Nashville and Lebanon which is owned by the Nashville & Eastern Railroad Authority, a public agency.



http://www.musiccitystar.org

The Music City Star East Corridor started construction in November 2004 and service is expected to be initiated in 2006. It is envisioned to be the first phase of a transit network of corridors connecting to six other corridors. The East Corridor of the Music City Star is estimated to cost $39.8 million for implementation, plus $3 million in estimated annual operating costs. Nashville's "no frills" approach has been assisted by purchasing low cost coaches, cab cars, and locomotives[3]. The Music City Star's service will have three daily trains in the morning peak and afternoon peak periods. It will have operating speeds up to 65 mph.

The East Corridor was chosen as the first commuter rail line to build, because of the existence of a public railroad and available capacity. This low-budget starter line is intended to spur more

[3] The Federal Transportation Administration allowed Chicago's rail transit authority, Metra to transfer vehicles (seven coaches and four cab cars) to Nashville's Regional Transportation Authority at virtually no cost. Three former Amtrak F40 locomotives were also purchased at a low cost, and then rehabilitated.

public support to encourage more local funding for expansion of the envisioned commuter rail system.

Survey Findings

Most people in the greater Nashville-Davidson area are supportive of the commuter rail project. It is seen as a major step to accommodating future growth in the region. The Greater Nashville has a population of 1.2 million persons and hosts 9 million tourists each year. By 2025, population is expected to grow by 42%, with job growth of 69%. The region already has extremely congested arterials and is currently underserved by transit. In the last several years, traffic congestion has progressively worsened in the region. Local residents agree that alternatives are needed to keep ahead of this congestion. Downtown Nashville is very “walkable,” so commuter rail presents an attractive option.

Other selling points for the Music City Star are the anticipated land use benefits surrounding commuter rail alignment and its stations. The main obstacle the Music City Star East Corridor project has faced is the perception of a minority of residents in some communities that fear commuter rail would lessen their “quality of life” and depreciate their home values. Therefore, it is important to spend much time and effort informing and educating people about the project. Regardless of the effort and time, there still will be a group(s) that has a perception that will not change, no matter the facts and situation.

The Federal government is funding 80% of the capital costs of the project, the state is funding 10%, and local government is providing the remaining 10%. Governmental assistance for operations will be funded 60% by Davidson County and 40% by participating cities in Wilson County. These funding proportions and responsibilities have been one of the Music City Star’s greatest hurdles. Federal funds for the commuter rail were pursued through the New Starts funding program. In hindsight, the interviewee indicates that this strategy may have been a mistake, because the project went through the rigor of the full funding process but for fewer transportation funds. The lesson learned is to “bite the bullet” early and secure all the funding needed. Next, the project must be successful to win local support for further expansion of the system.

For More Information

http://www.musiccitystar.com

Central Midlands Commuter Rail Feasibility Study

SECTION 3: TECHNOLOGY REVIEW

3.1. PURPOSE OF TECHNOLOGY ASSESSMENT

A technology review is needed to evaluate and compare the characteristics and attributes of various mass transit modes. The primary function of this feasibility study is to evaluate commuter rail as a transit option in three major corridors. However, it is important to examine other modes of high-capacity transit, not only as a precursor to commuter rail, but also to determine the most appropriate technology for these corridors.

The potential implementation of other transit technologies in the short–term can help build latent demand for a higher capacity technology in the future. This incremental approach is being used successfully in other cities. For example, in Eugene, Oregon, the local transportation authority has taken a staged approach to meeting current and future mass transit needs of its residents. The City's transportation authority, Lane Transit District (LTD), is building a bus rapid transit (BRT) corridor along a heavily traveled transit route. LTD plans to expand these services into five other corridors and a beltway, incrementally by 2030. The transportation authority will then reevaluate ridership along the corridors to decide whether moving into light rail transit (LRT) would be a sustainable action, since LRT requires significantly more resources to build and operate.

Population and employment growth in the Central Midlands region will increasingly exacerbate traffic congestion and potentially reduce the mobility and accessibility of its residents. As it has occurred in other regions of the country, negative impacts to the quality of life result. It becomes increasingly difficult to meet transportation demand solely with the expansion of the highway system because of exorbitant costs, environmental constraints, community preferences, and other challenges. More importantly, experience in many urbanized areas nationally, as well as internationally, indicates that the most effective transportation solutions involve a menu of different mobility options (modes of travel) and policies that support those modes.

There are a number of characteristics that must be considered to achieve a better understanding of each transit technology and how it compares to other technologies, including the following:

- Description of transit technology;
- Capacity (the number of persons that can be accommodated);
- Catchment area (defined as the distance people are typically willing to travel to a station or stop);
- The distance between stations or stops along the alignment;
- Necessary population density, minimum ridership, or supportive land uses for an appropriate transit technology;
- Typical corridor length (for example, LRT = 5 to 15 miles & commuter rail = 15 to 100 miles);
- Average / maximum speeds of vehicles;
- Cost per mile;
- Power supply (diesel, overhead catenary, electrified third rail, etc.);
- Guideway (exclusive transitway, mixed traffic, grade-separated alignment, etc.);
- Suspension (steel wheel on rail or rubber tire); and
- Example cities with the specific mode in operation.

These data elements provide an idea of how mass transit technologies have been applied in other cities.

3.2. MASS TRANSIT MODES AND TECHNOLOGIES

Potential transit technologies that meet the mobility and accessibility needs of the transit corridors examined in this feasibility study were identified and reviewed. These vehicle options are categorized as "fixed guideway" and "non-fixed guideway." For each technology, an overview of the technology is given, along with example cities where the mode operates. This section also includes emerging engineering and design trends for commuter rail and BRT, which are heavily considered in the candidate corridors.

3.2.1. Fixed Guideways

Commuter rail systems are an electric or diesel propelled railway vehicle that provides service between a center city and surrounding suburbs. Typically, services are regional in nature, with stations spaced between two and five miles apart, and alignments stretching 15 to 100 miles.

- Commuter rail services are generally built on existing tracks at grade crossings; sometimes sharing the track with freight rail providers.
- These vehicles range in length from 150 to 500 feet (engine and coaches).
- Operating speeds range from 30 to 60 miles per hour (mph).
- Service frequencies are between 20 and 30 minutes, but vary for each area.
- The typical implementation cost per mile also varies vastly from $3 to $25 million per mile.
- Boston, New Jersey, New York, Dallas-Fort Worth, San Jose-San Francisco, and Los Angeles are examples of successful commuter rail systems.
- Albuquerque and Nashville are in the process of starting commuter rail service, with service in both cities projected to begin in 2006.

There are three main commuter rail vehicle technologies that can be considered in the United States: locomotive-hauled, standard Diesel Multiple Unit (DMU) and lightweight DMU.

1. Locomotive-hauled trains are diesel powered vehicles that generally use locomotives that are semi-permanently installed to one end of the train. These vehicles are single or bi-level. Locomotives operate well anywhere with railroad track, but produce more noise and pollution than the DMU vehicles. These vehicles have trouble in long tunnels because of the fumes that accumulate. The newer locomotives produce less noise and pollution and some operate with a gas turbine engine or overhead power line.

2. Diesel Multiple Unit vehicles are self-propelled commuter rail trains that do not require locomotives to push or pull them. Standard DMUs are now compliant with regulations of the Federal Railroad Administration (FRA) and are able to operate with freight or intercity passenger trains.

3. Lightweight DMU trains are "designed for regional passenger service in low density non-electrified corridors up to 30 miles in length that link city centers and mid-sized towns with suburban surroundings. Lightweight DMUs do not meet the FRA's standards for crash worthiness and are not allowed to operate with freight traffic unless separated spatially or temporally (DART 2030, 8)."

Heavy rail systems consist of steel-wheel, electric powered vehicles operating in two or more cars on a fully grade-separated right-of-way, in subways or aerial structures. Services are regional and urban with stations spaced less than one mile apart in the urban core and up to five miles apart in the periphery.

- Heavy rail systems extend along high density urban areas and surrounding suburban areas.
- Heavy rail vehicles have a service frequency of five to ten minutes (during peak periods), and operate at speeds of 50 to 80 mph.
- Implementation costs range from $50 to $250 million per mile.
- Washington D.C., New York, San Francisco, Chicago, and Boston are examples of cities with successful heavy rail systems.
- These cities have high population and employment densities and long histories of public transportation use.

Light rail transit systems operate with an overhead power supply and have the flexibility to maneuver in mixed traffic. Services are urban and/or regional and their alignments are in the center of streets, on the side of streets, or in separate right-of-way. Stations are spaced approximately one mile apart and station types vary from simple sidewalk signs to more elaborate station platforms.

- Light rail system alignments typically range from 5 to 15 miles.
- Service frequencies range from 5 to 30 minutes and operate at speeds from 20 to 60 mph.
- Denver, Minneapolis, Dallas, Houston, and Salt Lake City are examples of cities with a current light rail system in operation.

- Cities with light rail are mainly large metropolitan areas with continued population and employment growth.

High speed rail (HSR), also known as high speed intercity rail, serves long distances with extended distances between stations. HSR emphasizes stable high speeds, low noise, and reduced track wear. These systems usually connect urban centers and require extensive upgrades of existing railroads tracks. *This mode is included in the review for informational purposes only. A connection from Columbia to either Charlotte or Spartanburg to the proposed Southeast High Speed Rail Corridor is being examined as part of this project.*

- In Europe, HSR operates at speeds between 150 to 200 mph. Future planned speeds are being engineered to 225 mph for commercial use.
- In the United States, "Acela" operates up to 150 mph in the Northeast corridor (Boston-New York-Washington D.C.).
- Capital costs for HSR range from $40 to $80 million per mile.
- California, Texas, and Florida are investigating the feasibility for this mass transit mode for their states.
- Amtrak, Boston to Washington D.C., Paris, France, and Frankfurt, Germany are examples of existing systems.

Bus rapid transit (BRT) utilizes buses to provide high capacity premium transit services on existing roadways or "transitways[4]." Intelligent Transportation Systems may also be utilized to help the BRT vehicle travel faster, through signalization priority and other innovations.

- Services are regional and urban along standard roadways, high occupancy vehicle lanes (HOV), and/or transitways (in medians or curbside).
- Station spacing ranges from ¼ mile to two miles and routes usually extend from five miles to more than 15 miles.
- BRT vehicles not only have the flexibility to operate on exclusive transitways, HOV lanes, expressways, or standard mixed flow streets, but in Minneapolis, Minnesota, these vehicles operate on shoulder lanes of the regional highway network. "Bus-only shoulder lanes" total 220 miles in Minneapolis area highways and freeways. Thirty-six miles will be added this coming year.
- BRT vehicles vary in length and are able to hold 40 to 85 passengers, depending on the vehicle type[5]. Operating speeds range from 20 to 40 mph.

[4] Transitways are dedicated rights-of-way for BRT; on existing roadways, BRT can travel on high occupancy vehicle (HOV) lanes.

- Service frequencies are generally between 8 and 20 minutes.
- Cost per mile varies from $4 to $40 million.
- Boston, Pittsburgh, Cleveland, and Los Angeles are examples of some cities with BRT. Eugene, Oregon is in the process of starting BRT service in the later part of 2006. The cities with BRT options range from large to medium sized cities.

Unlike a conventional bus system, BRT relies on an integration of technology, operating plans, and patron interfaces to create a high-quality service with faster travel times, greater reliability, safety, user-friendliness, and passenger comfort. BRT systems have five major technology elements; each having a variety of potential applications: vehicles, guideways, control systems, fare systems, and passenger information.

- Currently, many American cities are implementing stylish futuristic looking vehicles to appeal to patrons. These buses tend to be sleeker and quieter than a standard bus.
- Many of these BRT vehicles operate in guideways for a portion of the route, helping to decreases travel time.
- These guideways can be dedicated bus lanes, HOV lanes, or shoulder lanes only available to buses.
- Speed and reliability are further increased with control systems (ITS) to enable signalization prioritization and other innovations.
- Fare collection systems add to a speedy operation by reducing dwell time; in addition, these systems add to safety by reducing the need for cash.
- Finally, passenger information systems provide real time service information to help customers better plan their trips and to help overcome other communication barriers.

High-quality services are met through strategic operating plans. Route structure, service frequency, stop/station spacing, service span, network structure, and degree of integration to transit services determine the quality of a transit service.

3.2.2. Non-Fixed Guideway

Express bus transit can be implemented to transport commuters between suburban areas and major employment centers. Express buses can reduce travel times for commuters through the use of high-occupancy vehicle lanes. Express bus services in some form are available in many cities that have urban bus services. For example, express buses can run along a normal bus route but with limited stops. The frequencies of these buses are usually 10 to 20 minutes and vehicles operate at average speeds of 15 to 19 mph. Typically, express buses are diesel-

[5] Standard BRT vehicles hold 40 passengers; articulated vehicles accommodate 65 passengers; and double articulated vehicles serve up to 85 passengers.

powered, but liquefied natural gas (LNG), compressed natural gas (CNG), and fuel cell buses are also being used. The cost of infrastructure for express bus service is $1 to $2 million per mile. Station types can be simple sidewalk signs or more elaborate platforms.

Conventional bus transit is the most common mode of urban public transportation, and describes the standard urban fixed-route bus services that are provided in many cities around the world. Buses operate on diesel, CNG, LNG, and other technologies.

- CNG and LNG fueled buses are cleaner than diesel-powered buses, but produce the same level of noise and vibration.
- Fuel cell buses have more clean air benefits than the natural gas operated vehicles. They also have the added advantage of reduced noise and vibration impacts, as well a providing a promise of more efficient power generation, improved reliability, and lower maintenance costs. However, this technology is still in its infancy.

Commuter vanpools accommodate from 7 to 15 daily commuters in a van. Commuters meet in a designated location (or are picked up at their homes), and the designated driver operates the vehicle to and from work locations.

- Vanpools are suited from long-distance travel markets that can not sustain a fixed transit route. In terms of operations, vanpools are flexible, environmentally friendly, and may provide travel time savings through the use of high-occupancy vehicle lanes.
- The average travel distance is approximately 35 miles, the average operating speed is approximately 30 mph, and capital costs range from $25,000 to $35,000 (per vehicle).

3.2.3. Summary of Modal Characteristics

Exhibit 3-1 provides a summary of key attributes of various mass transit technologies, as described above.

Exhibit 3-1: Summary of Transit Characteristics

Central Midlands Council of Governments: Commuter Rail Study
Mass Transit Modal Characteristics

Mode	Description	Capacity	Catchment area	Service Area	Areas Served (Extent of Line or Route)	Average Speeds	Station or Stop Spacing	Development cost per mile	Power Source	Right-of-way	Operational Cities (a Few)
Vanpools	Vanpools are ridesharing arrangements where persons pool their resources to use one vehicle to commute to work or school. Employers and/or public agencies many times subsidize the cost of the van.	8 to 15 passengers	Park and Ride (5-8 miles away) or home pickup	Various	Various	20-25 MPH in mixed traffic, 35-50 MPH in HOV lanes	One or two meeting locations or home pickup	Various	Gas/Diesel	Mixed traffic	Many
Local Fixed Route Bus	Bus route services operate along standard thoroughfares with frequent stops.	40 to 50 passengers	1/4 mile	Various	Urban, suburban, and rural areas	12-15 MPH	1 block to 1 mile (2-3 blocks most common)	Various	Diesel/CNG	Mixed traffic	Most urban areas around the country
Express Bus	Express bus service is designed to transport commuters between suburban communities and major employment centers.	40 to 60 passengers	Park and Ride (5-8 miles away)	Various	Urban / suburban communities	15-19 MPH in mixed traffic, 35-50 MPH in HOV lanes	Limited stops (1/2 mile or more)	$1-2 million	Diesel/CNG	Mixed traffic and HOV lanes	Many
Bus Rapid Transit	BRT is a type of limited-stop service developed in the 1990s that relies on technology and/or dedicated lanes to help speed up service.	40 passengers per standard vehicle, 65 per articulated vehicle, and 85 per double articulated	1/3 mile	5- 15 miles or more	Urban / suburban communities	20-40 MPH	Limited stops comparable to LRT spacing of 1/2 to 1 mile	$4-40 million	Diesel/CNG	Operates on exclusive transitways, HOV lanes, expressways, or standard streets	Boston, Los Angeles, Seattle Pittsburgh
Trolley	Trolleys are the oldest version of light rail and operate in much the same way as a streetcar.	40-60 passengers	1/3 mile	Typically, short distances	Urban cores, tourist or scenic sites	10-30 MPH	1/4 mile	$2-12 million	Overhead electric wire	Generally, operates in mixed traffic	San Francisco, New Orleans, Charlotte, and Memphis
Streetcar	Streetcar is a smaller version of light rail service. It consists of single or multiple unit cars that operate in mixed traffic receiving power from an overhead wire.	95-110 passengers	1/3 mile	<10 miles	Dense urban cores and adjacent areas.	10-15 MPH	1/4 mile	$10-30 million	Overhead electric wire	Generally, operates in mixed traffic	Portland and Tacoma
Light Rail	Light rail transit consists of passenger vehicles rolling along steel rails electrically-powered from an overhead wire.	Up to 200 plus passengers	1/2 mile, approximately a 10 minute walk	5 to 15 miles or more	Dense urban & Suburban Areas	20-40 MPH	1/2 mile to 1 mile	$10-$60 million	Overhead wire or electrified third rail	Operates in mixed traffic or separate right-of-way.	Houston, Dallas, Denver, Los Angeles, Salt Lake City, and Portland.
Heavy Rail Transit	Heavy rail transit systems are electric railways with the capacity for a heavy volume of passengers. These systems operate in exclusive right-of-ways either elevated, underground or at-grade and require an electrified third rail.	150-190 passengers; large cities 480 to 1,200 (w/ standees)	1/2 mile, approximately a 10 minute walk	5 to 15 miles or more	Dense urban cores and adjacent areas	50-80 MPH	Urban core approx. 1/2 mile and 1 to 5 miles in the periphery	$50-250 million	Electrified third rail	Separate right-of-way	Atlanta, Chicago, New York City, and Washington D.C.
Commuter Rail	Commuter rail is a train with coaches pulled by a locomotive or motorized coaches called Diesel Multiple Units or DMUs. Commuter rail passengers typically use the train to commute from an outlying area into the city for work.	90 to 300 passengers	Typically, 2 to 5 miles, but large park and rides may extend to 8 miles at end points.	Typically, 10 to 50 miles, but can be longer.	Suburban and rural areas at the origin, and an urban center or large employment clusters near the destination	40-60 MPH	5 to 8 miles	$3- 25 million	Diesel-powered locomotives or diesel-powered self-propelled rail cars	May share with freight rail	Los Angeles, Chicago, Philadelphia, Boston, and Dallas / Fort Worth
Intercity Rail	Intercity rail, like Amtrak, provides service between cities.	Approximately 400 passengers	Medium to large cities	Long-distance service between cities (100 miles or more)	Designed for long hauls with corresponding stops.	70 MPH	In select cities or towns.	N/A	Diesel - some electro-diesel		Worldwide. In United States, the Northeast corridor is most popular

Source: URS Corporation, 2005; Reconnecting America 2005; DART 2004; Jeff Zupan 2005

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3.3. DENSITY THRESHOLDS FOR MASS TRANSIT MODES

A popular question with regard to mass transit modes relates to the minimum population density needed to make a particular mode of transit (such as commuter rail) "feasible". Unfortunately, there is no standard answer to this question. Every urban area in the United States is unique, with numerous characteristics that help to define the viability of transit in the region. A city's size alone is not necessarily a good predictor of transit feasibility. For example, there are some comparatively small cities with light rail services that are regarded as much more successful than rail services offered in larger cities.

Although many factors affect the success of transit in a region, the area under consideration must have enough of a mass of potential transit customers to make a major investment worthwhile. Recognizing the uniqueness of each city and each transit project, researchers in recent years have generally avoided development of minimum density thresholds that could easily be used as a means to justify the implementation of a project without fully understanding the local conditions.

The most widely-referenced density thresholds were developed in 1982 (Boris Pushkarev and Jeffrey Zupan, "Where Transit Works: Urban Densities for Public Transportation"). The authors clearly state that the thresholds should be used as guidelines only, and are not a substitute for site-specific analysis. With this caveat, the following guidelines were offered as minimum density thresholds for transit technologies:

- Limited bus service (20 buses / day) = 4 dwelling units / acre
- Intermediate bus service (40 buses / day) = 7 dwelling units / acre
- Frequent bus service (120 buses / day) = 15 dwelling units / acre
- Light rail (5-min. peak headways) = 9 dwelling units / acre
- Rapid rail (5-min. peak headways) = 12 dwelling units / acre
- Commuter rail (20 trains / day) = 1-2 dwelling units / acre

Most of these thresholds follow a logical pattern of higher population density requirements for more intensive transit technologies. The exception to this pattern is commuter rail, which is reported as having a low minimum density threshold (even lower than that of "limited bus service"). However, an important note with this low minimum threshold for residential density is the need for a large, concentrated downtown area. According the these authors, commuter rail may not be appropriate in areas with less than approximately 90 million square feet of non-residential floor space. In comparison, according to CMCOG's Spring 2004 *Region Report*, downtown Columbia has approximately 5 million square feet of office and retail space. The figure of 90 million square feet of non-residential floor space is questionable based on current conditions, as only the largest cities in the county meet this criteria (for example, San Diego has approximately 10 million square feet of downtown office space, but still has a successful commuter rail system). Albuquerque has approximately 3 million square feet of downtown office space, and is initiating commuter rail operations in 2006.

More recent research was completed in 1996 for the Transit Cooperative Research Program (Report 16, "Commuter and Light Rail Transit Corridors: The Land Use Connection"). Similarly to the earlier research, one of the key findings of this study states, "Commuter rail service requires dense CBDs (central business districts) but can operate in low-density residential areas". The study states that a primary indicator of potential commuter rail ridership is the number of jobs and employment density in the central business district, which is much more important than the number of people residing in close proximity to the rail line in outlying areas.

This research notes that by its nature as a long-distance, premium transit service, commuter rail tends to draw riders from a larger area than other transit modes. Therefore, lower density areas can support commuter rail because passengers will travel longer distances to reach the station than they would for other modes. As a premium service, commuter rail also tends to draw higher-income passengers than other transit modes. Thus, higher average incomes in a given area tend to offset a lower population density. Likewise, areas with high population densities may not generate many commuter rail passengers if the average income of the area is low.

This research provides an impetus for the consideration of commuter rail centered on medium-sized cities such as the Columbia region. Residential population densities are not the most important consideration, although some potential riders must be living near the stations and encouraging transit-supportive development near stations would provide a tremendous boost to the viability of a proposed rail line. As illustrated by this research, it is important to have a strong central business district that is a major employment destination for the region. With a string downtown in place, residents in outlying areas may be willing to travel a notable distance to a commuter rail station.

3.4. APPROPRIATE MODES FOR THE PROPOSED CORRIDORS

This technology review illustrates how different modes of transit can be appropriate in various settings. For example, heavy rail and light rail were determined to be appropriate in densely urban cities that have the population and employment to support these high-capacity modes. The Central Midlands region is experiencing significant growth, but will not have the population and employment densities necessary to support light or heavy rail for some time. However, the region's population density may support other types of high-capacity transit, such as express bus, BRT, and commuter rail. The length of the corridors and population density of the service area (see more detailed descriptions of these features in Sections 4 and 5) are the key characteristics that lend support to these specific modes.

Express bus currently operates in two of the three corridors and serves as a base from which further transit enhancements can be developed. As transit ridership grows, more intense levels of express bus can be implemented. Eventually, further enhancements such as BRT services and even commuter rail may become warranted. While all three corridors may warrant high capacity transit sometime in the future, they will all reach that point at different times. Therefore, phased implementation of a menu of transit strategies can be tailored to each specific corridor. While this study focuses primarily on the evaluation of commuter rail, a phased approach with different levels of transit service should be considered in each corridor. This approach is described in detail in the Implementation Plan presented in Section 7.

SECTION 4:
DEFINITION OF ALTERNATIVES

4.1. DESCRIPTION OF POTENTIAL COMMUTER RAIL CORRIDORS

As mentioned earlier, three specific commuter rail corridors are being considered in this feasibility assessment:

- Batesburg-Leesville to Columbia;
- Camden to Columbia; and
- Newberry to Columbia.

These three corridors are illustrated in Exhibit 4-1. A detailed description of the existing track and infrastructure conditions in each corridor is given in Appendix A.

4.1.1. Batesburg – Leesville Corridor

The Batesburg-Leesville corridor extends approximately 33 miles from Columbia to Batesburg-Leesville paralleling Interstate 20 and US 1 headed west from Columbia. Norfolk Southern owns the track, and approximately seven daily freight trains currently operate along the corridor. No transit service currently operates in this corridor.

The initial assessment of stops includes stations at the following locations:

- Downtown Columbia;
- West Columbia / Cayce;
- Oak Grove;
- Lexington;
- Gilbert; and
- Batesburg-Leesville.

4.1.2. Camden Corridor

The Camden Corridor extends 38 miles from Columbia east to Camden, paralleling Interstate 20 and US 1. The existing track is owned by Norfolk Southern (5.6 miles of track within Columbia city limits) and CSX Transportation (32.6 miles, from Columbia city limits to Camden). An average of five freight trains use this track on a daily basis, in addition to two Amtrak trains (in the late night hours).

The initial assessment of stops includes stations at the following locations:

- Downtown Columbia;
- University of South Carolina / Five Points;
- Beltline/Eau Claire;
- Parklane/Decker;
- Spring Valley;
- Sandhill;
- Elgin;
- Lugoff; and
- Camden.

The Camden-Lugoff SmartRide service provides express bus service between downtown Columbia and Camden, with three stops in Camden and one stop in Lugoff before traveling to Columbia. This service, operated by the Santee Wateree Regional Transit Authority, has two trips inbound to Columbia in the morning, and two trips outbound to Camden in the afternoon.

The fare is $1.50 per one-way trip, or $15.00 for a weekly pass. A monthly pass is available for $55.00.

4.1.3. Newberry Corridor

The Newberry Corridor runs for approximately 48 miles from Columbia to Newberry, generally parallel to Interstate 26 and US 76. The track is owned by Norfolk Southern (5.4 miles of track within Columbia and Newberry city limits) and CSX Transportation (42 miles of track, primary in the rural and suburban areas.) This track is an active freight line, with 15-19 freight trains in the corridor on a daily basis.

The initial assessment of stops includes stations at the following locations:

- Downtown Columbia;
- Riverbanks Zoo;
- St. Andrews;
- Irmo;
- Ballentine / White Rock;
- Chapin;
- Little Mountain;
- Prosperity; and
- Newberry.

Currently, the Newberry Express SmartRide service provides express bus service between downtown Columbia and Newberry, with intermediate stops in Little Mountain and Chapin. This service, operated by the Central Midlands Regional Transit Authority, has two trips inbound to Columbia in the morning, and two trips outbound to Newberry in the afternoon. The fare is $3.00 per one-way trip, or $20.00 for a weekly pass.

4.2. OPERATING OPTIONS IN EACH CORRIDOR

For each of the three corridors, two operational alternatives were developed – an enhanced bus alternative and a commuter rail alternative. Potential ridership will be assessed for each of these "high-capacity" modes. The operating options described below are illustrated in Exhibit 4-2.

4.2.1. Batesburg – Leesville Corridor

Enhanced Bus Alternative

- Batesburg-Leesville to Downtown via US 1 (alternate Gilbert stop located on US 1 at Peach Festival Rd.)
- Approximate one-way travel time = 60 minutes
- Four AM peak trips; two midday trips; four PM peak trips

Commuter Rail Alternative

- Serves all stations between Batesburg-Leesville and Downtown
- Approximate one-way travel time = 70 minutes
- Four AM peak trips; two midday trips; four PM peak trips

Exhibit 4-1: Study Corridors

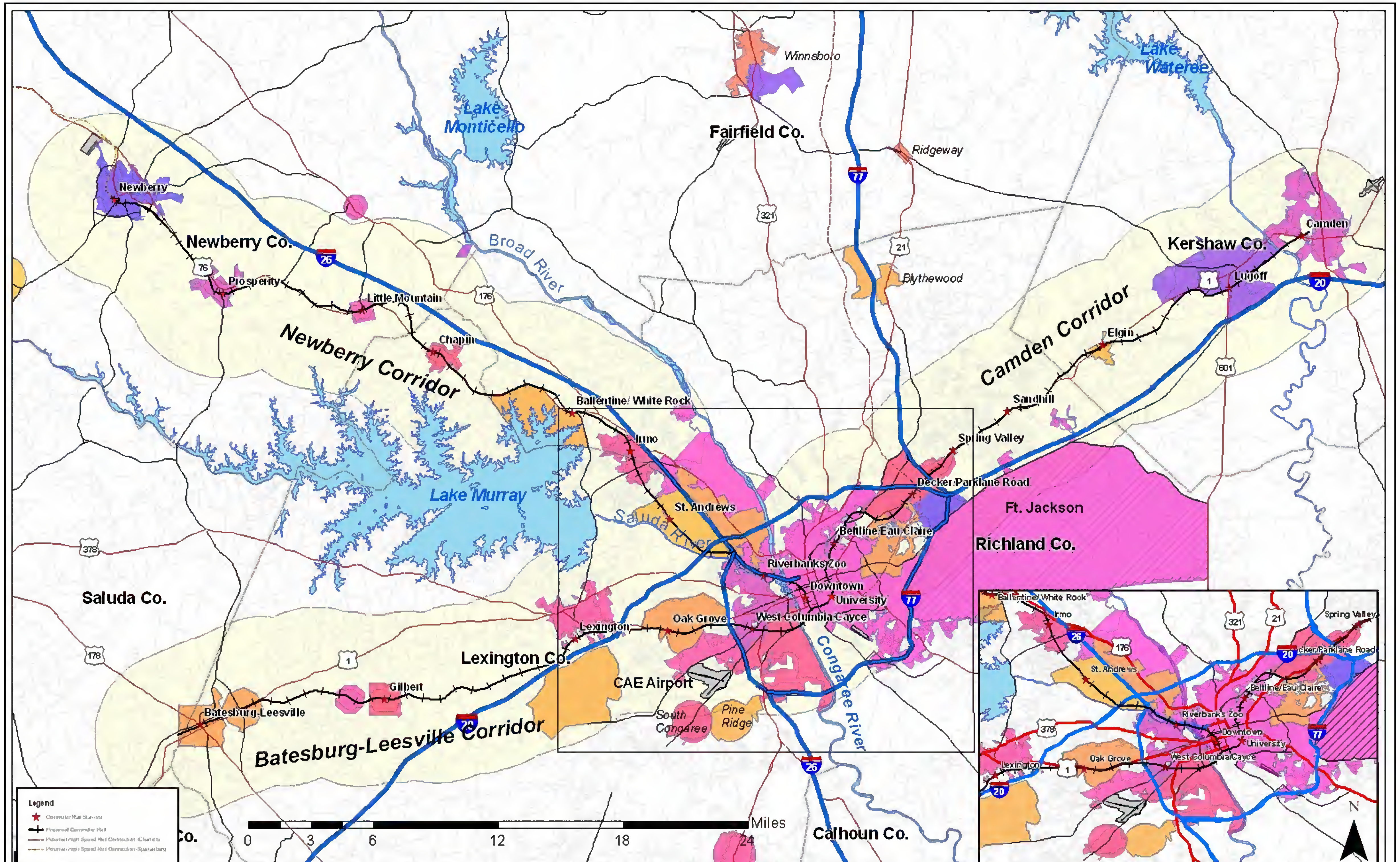
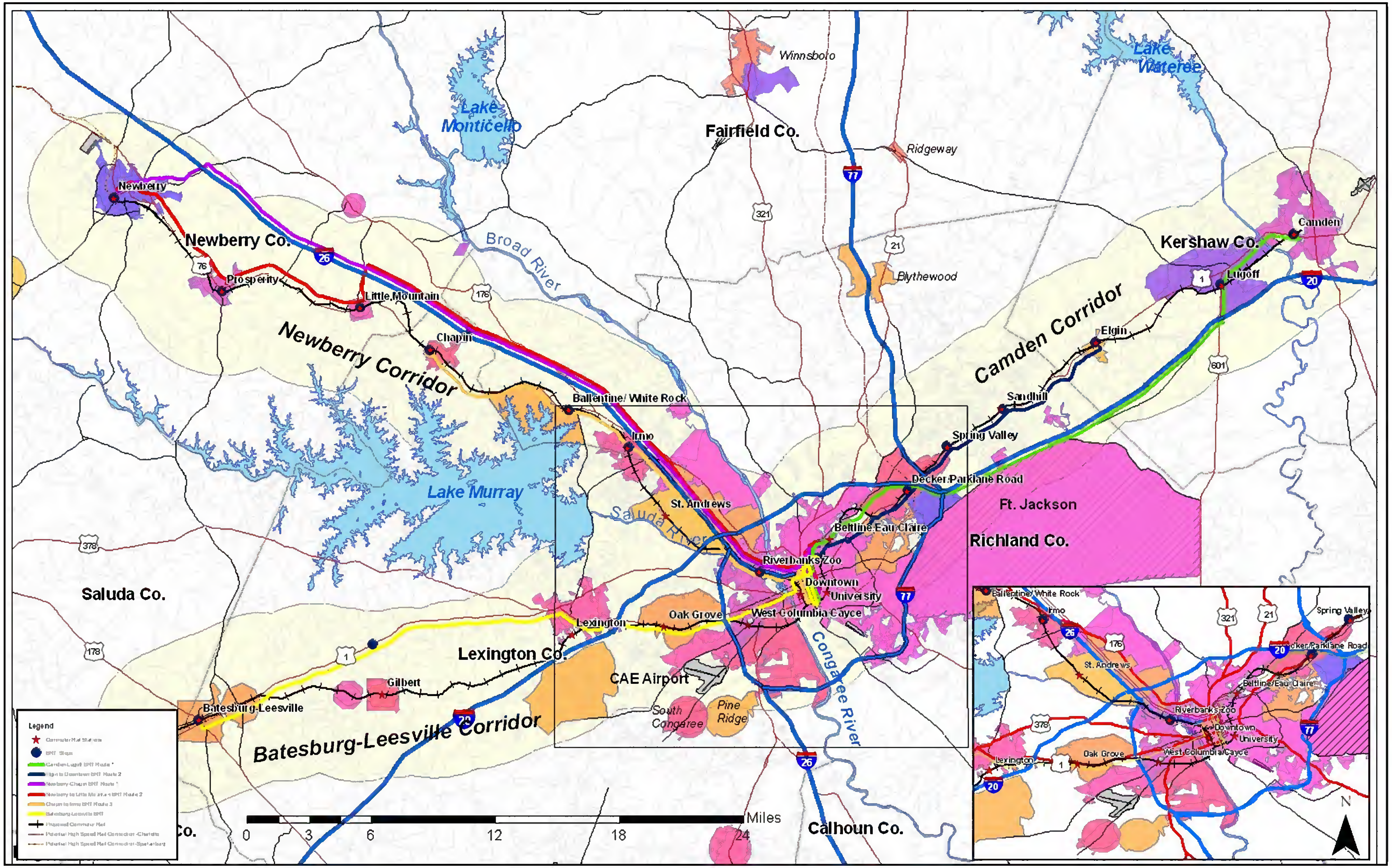


Exhibit 4-2: Operating Alternatives in Each Corridor



4.2.2. Camden Corridor

Enhanced Bus Alternative (two routes)

1. Camden / Lugoff to Downtown via I-20 / SC 277
   - Stops in Camden and Lugoff, then continues non-stop to Downtown
   - Approximate one-way travel time = 60 minutes
   - Four AM peak trips; four midday trips; four PM peak trips

2. Elgin to Downtown via Two Notch Rd. (US 1) / SC 277
   - Stops at Elgin, Sandhill, Spring Valley, Parklane/Decker, then continues non-stop to Downtown (no new bus service to Beltline – currently served by CMRTA)
   - Approximate one-way travel time = 40 minutes
   - Four AM peak trips; four midday trips; four PM peak trips

Commuter Rail Alternative

- Serves all stations between Camden and Downtown
- Approximate one-way travel time = 60 minutes
- Four AM peak trips; two midday trips; four PM peak trips

4.2.3. Newberry Corridor

Enhanced Bus Alternative (three routes)

1. Newberry to Downtown via I-26 / I-126
   - Stops in Newberry and Chapin (at I-26), then continues non-stop to Downtown
   - Approximate one-way travel time = 60 minutes
   - Two AM peak trips; two midday trips; two PM peak trips

2. Newberry / Prosperity / Little Mountain via US 76 / I-26 / I-126
   - Stops in Newberry, Prosperity, and Little Mountain, then continues to Downtown (with one stop at Riverbanks)
   - Approximate one-way travel time = 70 minutes
   - Two AM peak trips; two midday trips; two PM peak trips

3. Chapin / Ballentine / Irmo via US 76 / I-26 / I-126
   - Stops in Chapin, Ballentine, and Irmo, then continues to Downtown (with one stop at Riverbanks)
   - Approximate one-way travel time = 45 minutes
   - Four AM peak trips; two midday trips; four PM peak trips

Commuter Rail Alternative

- Serves all stations between Newberry and Downtown
- Approximate one-way travel time = 70 minutes
- Four AM peak trips; two midday trips; four PM peak trips

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Central Midlands Commuter Rail Feasibility Study

SECTION 5:
PUBLIC PARTICIPATION

5.1. PUBLIC PARTICIPATION TECHNIQUES

The public participation process for the Commuter Rail Feasibility Study was designed to obtain input from a wide cross-section of people who live, work, or otherwise care how the transportation needs of the Central Midlands region will be met. The goal of the public participation process is a well-informed public that contributes to decisions in a meaningful way. As part of this planning study, the consultant team made a concerted effort to inform the public about project progress and findings and to seek input from the public to guide the development of the plan. The team communicated with residents and stakeholders primarily through stakeholder interviews and a series of public forums.

5.2. STAKEHOLDER INTERVIEWS

A series of stakeholder interviews was conducted to gather background information and obtain insight from individuals who have expressed interest and involvement in establishing commuter rail service within the Central Midlands region. Personal or telephone Interviews were conducted with the following individuals:

- Charlie Compton, Planning Director – Lexington County
- Jim Duckett, Assistant Town Administrator – Town of Lexington
- Mitzi Javers, Executive Director – CMRTA
- Glennith Johnson, Deputy Director for Mass Transit, South Carolina Department of Transportation
- Michael Juras, SC DHEC Bureau of Air Quality
- Chip Land, Deputy Director Of Planning/Zoning – City of Columbia
- Ike McLeese – Columbia Chamber of Commerce
- Lill Mood, CMRTA Board Member and representative of Midlands Friends of Public Transit
- Pat Smith, Mayor – Town of Springdale and Board Chairman – CMRTA
- Joan Taylor, Administrator – Town of Batesburg/Leesville
- Norman Whitaker, Executive Director – CMCOG
- Avery Wilkerson, Mayor – City of Cayce

Several additional stakeholders were contacted multiple times to request an interview, but no response was received by the consultant team.

The same general questions were posed to each stakeholder. The responses below are paraphrased from the interviews and are illustrative of the range of responses received. The paraphrased responses are in random order, not attributed to specific individuals.

Do you think there is a need for commuter rail service in the Central Midlands region?
Stakeholders are mixed regarding the current "need" for commuter rail transit. However, several stakeholders noted that even if there is a need now, implementation of commuter rail is highly unlikely in the near future due to funding and political constraints.

Sample responses:

- There is no need for commuter rail service for a long, long time because the state has continued to expand roadways, which undermines mass transit. We have done nothing to discourage the use of personal vehicles. Consequently, residents have not been forced to consider it. CMCOG used to do annual occupancy studies. I haven't seen any from them lately. However, the last results from a national study (of occupancy rates) that I saw show that there are 1.1 persons per vehicle. I don't even see this when I'm driving around Central Midlands. I see a 1:1 ratio.
- Rail is definitely needed in the Midlands. Public transportation should be an important part of the overall transportation infrastructure.
- The 'need' would not justify the expense. While traffic is getting worse in the area, Columbia really doesn't have a problem.
- There is a need but the elected officials don't think that the need exists.
- Needed but absolutely not 'doable'.
- I do because of the rising cost of fuel and the fact that so many cars are on the roads. This may be one of the best ways to reduce vehicle congestion.
- We'll need it in the future but we must have a solid plan, and we must start now building a constituency to support the fact that it's (commuter rail) needed.
- Commuter rail is a long shot at this time, but a gradual implementation of enhanced transit services is needed.

Have you heard requests for such a service from your community?
Some stakeholders report hearing questions about potential rail service, but there does not appear to be a strong groundswell of support from the citizenry.

Sample responses:

- When doing presentations, I get asked about rail. Progressive thinkers are asking questions. Of course, the transit dependent that really need it aren't at the forums.
- No, not really. I'm pretty informed and hear some talk about it. However, I'd suspect that 98% of the population has no idea of this plan or even this Study. What's on everybody's radar is that the current travel time to get somewhere in this vicinity is increasing and that there is excessive traffic in parts of the Central Midlands Region.
- The discussion of some type of rail service in the State, but not necessarily with any specificity, always comes up when I'm doing presentations to civic associations, church groups, and senior citizens. Comments are made in the "planning circles" that it is a natural expectation of the general public that our area will have some sort of commuter service. However, once the discussion always comes around to costs, no matter the group, discussions quickly end.
- In specialized communities, such as planners, there's talk of a need. Citizens have not made requests. It's not on their 'radars'.
- No. All I hear is, "I don't want any buses coming here!" The mention of a choo-choo train would get me committed to an asylum. Sometimes I hear folks saying, "I wish you'd do something about the traffic. But this definitely doesn't mean, 'I want commuter rail.' In fact, I have heard 'We don't want 'those' people in our area."
- No, not recently. What talk has occurred has been the result of the recent meetings.

What segments of the community would be attracted to such a service?
Stakeholders generally think that suburban commuters living in close proximity to the corridors would use the service. Additionally, lower-income residents may be attracted to the service.

Sample responses:

- I'd think that the folks in Batesburg & Leesville would be some of the first to jump on the bandwagon. Other areas would be Western Lexington County, Newberry, and Camden. Those folks in Camden who work in Columbia would, I suspect, really like this alternative. Northeast Richland County where the greatest growth is occurring is also having the greatest traffic issues. I'd think that it (NE Richland County) would be a target for ridership.
- Not the folks living in Lexington.
- You'd probably get the same people from Newberry who are currently riding the express bus into Columbia. I don't think that there would be the same stigma with trains that currently exists with buses, i.e. the impoverished and car-less. However, there wouldn't be a draw unless the operation of personal vehicles becomes so costly, even more so than now, and the highways are so clogged that it takes an inordinate amount of time to get around, especially to and from workplaces. Essentially, the people that might be attracted would be those that finally say, "It's taking me too long to get there – wherever 'there' is - and it might be quicker on a train."
- Primarily the folks in suburban settings. I don't see any cross commuters because most folks around here would travel from their residences in the suburbs to downtown to work (intercity).
- Rail is needed for people that do not own cars, as well as for potential riders who do not want to ride buses.
- The transit dependent would use it, not the commuters who already have their 4-wheels parked in their drives.
- Folks in the low to moderate income levels.

What operational characteristics must the service have to be successful?
Without exception, stakeholders realize that a commuter train in and of itself will not be successful. To ensure the viability of the service, effective bus connections must be available to transport riders between the rail station and their ultimate destination. Stakeholders are concerned about the future of CMRTA and its ability to serve as a foundation for commuter rail.

Sample responses:

- The rail must be convenient to people. It must be in a good location. There must be amenities, such as a shelter to protect the riders against the weather, bathrooms, and a snack bar where folks can get snacks and drinks. You also can't run a train to everyone's door. Buses to get the folks to the train would also be needed. Right now, we have no buses.
- Must have bike paths and more bus routes (example: currently there is no bus service to the malls that exist here.). The bus routes, new or existing, must have better headways and include stops at the passengers' intended destinations, or at least in close proximity to where the folks want to go. The number of changes in the modes of transportation is also a factor. Studies have shown that if a person has to change modes more than twice, another alternative than mass transit will be used. For example, if I ride a train and then have to do more than transfer to one bus, I probably won't ride. Funny how it's

too much to have to ride the train, transfer to a bus, then walk. Folks in South Carolina are not like New Yorkers. My concern is that we have no system (transportation mode) in place to support commuter rail.
- We'd have to take away everyone's cars to even get to the point of talking about what rail would look like. Also, someone with a lot of influence will have to convince the railroads to share their existing lines.
- We must have a good bus system in place to support rail. Right now, folks here aren't even willing to support the RTA. If the bus system is cut, it will be the death of any potential for rail.
- It has to be clean, efficient, and user friendly. There will have to be a reliable feeder bus system to support the rail. Folks must be able to get to the rail, and right now, that's pretty suspect.
- Must have a good feeder service such that when one exits the train there is another transportation alternative to get the person where s/he wants to go.

What is a reasonable fare for such a service?
Stakeholders are mixed with regard to a reasonable fare for the system. Some stakeholders use existing bus fares as a starting point for comparison.

Sample responses:
- Unsure. To provide all that the rider wants, it would not be "reasonable".
- Since the current riders of the Smart Ride system are paying $20 per week, it is reasonable that $20 would be a starting point. However, everyone recognizes that rail is more expensive to operate, so $30 per week does not seem to be an unreasonable expectation. The RTA's bus fare is now $1.25 and it's going up to $1.50. With bus fare increases, who knows what rail would cost in the future?
- $1 each way with a free transfer. If you charge more than $1.50, the studies show that there would be a loss in ridership. Right now a fare hike is planned for the bus system (RTA). Who knows what is going to happen to it?
- Folks in Lexington won't pay one dime for rail and they sure won't go for any taxation to pay for it. They already think taxes are too high, but they like having the good schools that are here.
- $3 to $4 for a one-way trip. Possibly a monthly pass for $50. If the ride costs more than the daily parking fees for downtown, folks won't ride. They'll choose to just drive their cars. Now with the increase in fuel prices, I suspect that the parking fees may increase slightly; but I don't know that for a fact.
- I'm really unsure how much is reasonable. A $10 one-way fare is probably unrealistic, but the costs have got to be covered.

Would you support local government funding to help sustain the service? If so, what are possible funding sources?
Most stakeholders agree that local government funding would be extremely difficult to obtain for commuter rail. Several interviewees noted that local officials have not made any commitment to supporting CMRTA, so they would be even less likely to support commuter rail.

Sample responses:
- Funding for transit is far down the list, and there are no slush funds available.

- If I was a decision maker, you bet I would; but that's the reason that I'm not a politician. Our politicians are not going to support funding for rail. Why, they haven't even supported funding for the RTA. To fund mass transit, we need to have dedicated sales tax for both the RTA and rail. However, our government hasn't made the connection between rail and a good bus system. This has to happen before the officials are willing to dedicate funds.
- I would personally support funding but I'm not a politician and they're the ones that you'd have to get the vote of confidence. Possible funding sources come from five possibilities: dedicated millage; sales tax increase; license tag stipend; corporate support; and additional funds from the Highway Fund. You would need money from four out of the five to improve current conditions. For commuter rail to be successful, you would need all five.
- I think our town would support the system if the amenities were there and folks would use it. I really think, too, that our town would assist by providing the building for a station and the utilities and possibly some of the upkeep of the building. To fund something like this, you'd definitely need grants and the Legislators would have to step up and provide some funding. For the Town's part to cover its expenses, this would mean an increase in the local taxes. I think folks here would accept a tax increase if the increase was not too high.
- At this point, there would have to be a major sales job with the politicians. Without a dedicated stream of funding, this is not a reality. Taxes, of course, would probably be affected. Monies would have to come from the outlying counties that don't currently pay into CMRTA, like Kershaw and Newberry.
- No, I'd be run out of town. Knowing the politicians as I think I do, I don't think that they will either if they want to remain in office. Elected officials really don't understand transit, and I'm not really sure that they want to figure it out.

What are potential barriers to implementation for commuter rail and high capacity transit?

Stakeholders noted several major hurdles for commuter rail service, including political barriers, cooperation with freight rail operators, and the stigma associated with transit in the Southeast.

Sample responses:

- There's the awareness from citizens that there's got to be a simpler lifestyle. We must also have a reorganization of the work culture. Non-transit dependent citizens must also be willing to advocate for mass transit. There must also be the transit amenities, like more pedestrian- and bicycle-friendly systems in place to support mass transit. If people don't feel safe or secure trying to get to a rail line, they're not going to ride.
- First, there's lack of funds. Second, there's politics. Public transit is only on the radars of Columbia residents. Third, there's the matter of perception and the barrier of who actually uses transit.
- There is no funding support for rail at the State level, and freight carriers must be willing to work with transit.
- I think the fact that the rail would not be accessible to everyone will be a detriment to its passage. No one is willing to pay if they can't have access to it. I also think the biggest hurdle is getting the railroads to agree to share its tracks. I bet that it'll take 20+ years for them to agree on that.

- Citizens' current flexibility and their freedom to move around freely in their own vehicles. Then there's the money, or lack thereof. And the bus system that already exists (CMRTA) is being challenged by the mayoral candidates.
- Obtaining the use of the rail lines. Then there will have to be a change in philosophy, besides the cost of the operation. The South is not an area that values public transit. It's seen as only for the poor people and not the general population. This is not Washington, DC or New York City. One thing that could force some folks to think harder about this is the air pollution and mitigation regulations that must be in place by 2009.
- The pointed head planners and big dreamers would have to convince many others of the need.
- There is no "champion" in the region for transit funding.

Do you support changes in land use policy to create a more transit-supportive environment in these corridors?
Stakeholders made few remarks with regard to land use policy. Clearly, the concept of transit-supportive development has not been strongly considered in the Central Midlands region.

Sample responses:
- Yes, we have already experienced some of what it takes to make changes. Right now, we have old vacant buildings that would be perfect for renovation. Some would, of course, possibly be demolished.
- I think the decision makers would want to look at each proposal on its own and not in conjunction with a large project. All too often, things become too bureaucratic and overly expensive. The politicians seem to do better looking at individual projects, one at a time.
- Local government officials are reluctant to adopt land use controls. There are no real constraints to continued growth and sprawl, and sprawl is not a major concern at this time.

Would you use commuter rail? Would you use other technologies, such as express bus / Bus Rapid Transit?
Some stakeholders indicated that they would use commuter rail, whereas others would not use it. Interviewees cited several reasons for not using commuter rail, including the convenience of personal automobiles.

Sample responses:
- I would not ride on a regular basis because of my work schedule. I have such an unpredictable schedule that requires me to have a vehicle to get around.
- You bet, especially if I have to go to Columbia. The other technologies would be centered on up to date buses.
- I would not use commuter rail, to be honest. There's the convenience factor in driving, and it supersedes any cost right now.
- Yes. We'll also need to do enhancements and have a really good bus system, good sidewalks, and bike lanes to support the rail.
- No.
- Probably not, as a general rule, because I reside and work in the same community. If I were a commuting rider, I would definitely consider it.

5.3. PUBLIC FORUMS

A series of three public forums was held to provide the public with background information about the study and to seek their input on their issues and concerns with the need for commuter rail in the region. One forum was held in each of the three corridors, and an additional forum is to be held in May 2006 to summarize the findings of the study and to accept comments on the Draft Report.

The forums were originally intended to be structured as open houses; however, based on the questions received and level of participation from the public, a presentation was given at the beginning of each forum summarizing the scope and purpose of the study, as well as background information including a discussion of various transit technologies and commuter rail projects that have been or are being implemented in similar settings. A question-and-answer period then followed.

Forums were held at the following three locations:

- Newberry Corridor - Chapin Town Hall; March 7, 2006;
- Camden Corridor - Lugoff-Elgin High School; March 8, 2006;
- Batesburg-Leesville Corridor - Lexington Municipal Complex, March 9; 2006; and

In addition, a Final Public Forum was held at the Richland County Library on June 2, 2006. A summary of the proceedings of that meeting is included in Section 8.

The forum in Chapin has the highest level of participation, with approximately 40 attendees. The Lugoff forum attracted about 25 participants, and approximately 15 people attended the Lexington forum. The majority of attendees were supportive of the concept of commuter rail, and wanted to learn more about the project.

As part of the forum, participants were asked to use stickers on a large display board to indicate their responses to a series of questions intended to gauge the overall opinion on commuter rail. As expected, most of the responses were solidly in support of commuter rail. By no means are these answers representative of the total regional population, but they are not intended as such. These answers merely illustrate the feedback received from attendees at the forums.

Exhibit 5-1 shows the responses to the question, "Do you feel that the Columbia area would benefit from commuter rail?". All attendees responded affirmatively to this question. Exhibit 5-2 illustrates responses to the question, "Would a nearby commuter rail station be a positive factor in where you might choose to work or live?" The vast majority of respondents indicated that the availability of commuter rail would impact their housing or employment locations.

Exhibit 5-1:
Do you feel that the Columbia area would benefit from commuter rail?

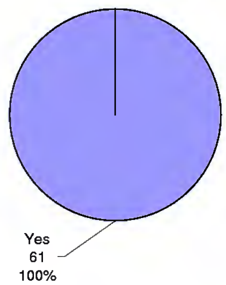


Exhibit 5-2:
Would a nearby commuter rail station be a positive factor in where you might choose to work or live?

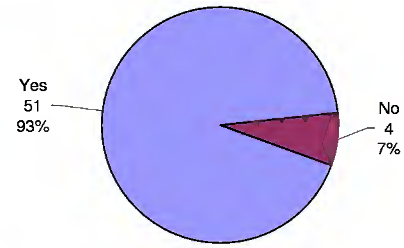


Exhibit 5-3 displays the responses to the question, "Mass transit, like roads, requires funding from tax dollars. Would you support such an initiative?" About 90% of the forum attendees indicated that they would support the use of tax dollars for transit service. Exhibit 5-4 shows how attendees responded to the question, "Would you use a commuter rail system if it offered a reasonable alternative to your normal transportation?" As expected, nearly all respondents indicated that they would use commuter rail.

Exhibit 5-3:
Mass transit, like roads, requires funding from tax dollars. Would you support such an initiative?

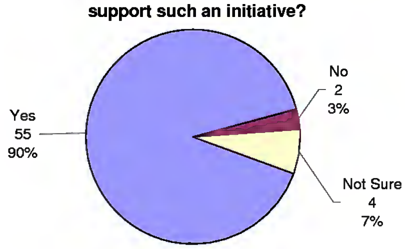


Exhibit 5-4:
Would you use a commuter rail system if it offered a reasonable alternative to your normal transportation?

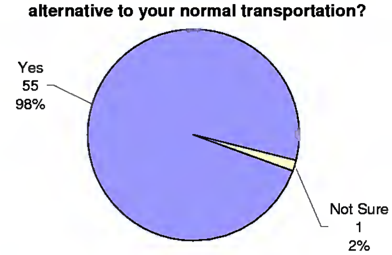


Exhibit 5-5 illustrates responses to a land use-related question regarding the type of station site that would be most attractive to potential users. Approximately 62% of the respondents indicated that they would be attracted to a station surrounded by a mixed-use environment that could include housing, shopping, and employment centers. Approximately 30% of the respondents prefer a park-and-ride facility with easy access to major highways. Exhibit 5-6 demonstrates that participants are in favor of additional travel options, as 100% responded affirmatively to the question, "Do you believe that we should have more transportation choices than we have now?"

Exhibit 5-5:
Which train station description would most attractive to you?

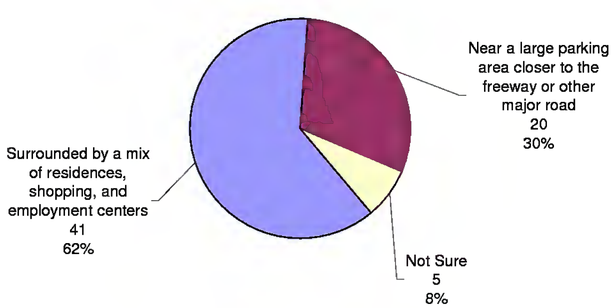
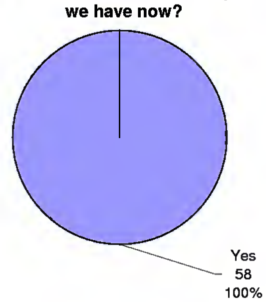


Exhibit 5-6:
Do you believe that we should have more transportation choices than we have now?



SECTION 6:
EVALUATION OF ALTERNATIVES

6.1. EVALUATION METHODOLOGY

A technical evaluation process was used to compare the merits of the three individual corridors and to determine the "most promising" corridor, so that an implementation plan and action items can be developed according to the unique characteristics of each corridor. In a larger sense, the evaluation process also assesses the merits of high-capacity transit in general, so that strategies can be developed to prepare the Central Midlands region for future implementation.

The analysis methodology, criteria for evaluation, and results of the analysis are fully described below.

The feasibility of commuter rail service in each of the three regional corridors was determined through analysis with regard to six specific criteria:

1. Potential ridership;
2. Access to stations / land use support;
3. Potential cost of implementation;
4. Ease of implementation;
5. Public opinion; and
6. Comparison to peer systems.

These criteria represent a combination of objective and subjective measures, which is appropriate for this initial level of analysis. The purpose of this evaluation is two-fold: to identify the relative differences between the corridors to determine the one that best exhibits the desired attributes, and to assess the merits of the corridors in absolute terms to determine the true feasibility of service, even in the "best" corridor.

The first five criteria illustrate the relative differences in the corridors. For each criterion, each corridor was assigned a relative ranking of 1^{st}, 2^{nd}, or 3^{rd} to indicate the "best", second-best, and third-best corridors under that particular measure. It should be noted that two of the criteria used are "potential ridership" and "potential cost of implementation", which are the most important criteria for consideration by the Federal Transit Administration (FTA), should commuter rail in the Central Midlands region advance into the FTA planning process.

The sixth criteria, "comparison to peer systems", was used to compare the projected ridership and cost of the three Central Midlands corridors in absolute terms to other commuter rail projects across the country. This comparison provides insight into the potential competitiveness of a Central Midlands project as compared to existing commuter rail systems.

These six criteria were presented to the steering committee, and committee members were asked to assign weights to each of the criteria to illustrate which measures are most important in the comparison of corridors. The weights assigned by the steering committee were similar to those assigned independently by the consultant team, verifying the relative importance of each item. After scoring each criterion for each corridor, the individual scores were weighted according to the percentages below. The sum of the weighted scores for each criterion represented the overall score for each corridor. The following percentages were used to weight the criteria:

1. Potential ridership:	25%
2. Access to stations / land use support:	20%
3. Potential cost of implementation:	25%
4. Ease of implementation:	15%
5. Public opinion:	15%

The comparison to peer cities was evaluated separately as an absolute comparison technique rather than a relative comparison technique, so it is not included in the weighting scheme illustrated above. These criteria are described in detail in Section 6.3.

6.2. RIDERSHIP ESTIMATION PROCESS

As noted above, potential ridership and potential implementation cost are the most heavily weighted criteria in the corridor assessment process, and are primary considerations in the Federal Transit Administration project evaluation process. A sketch planning ridership model was developed to establish a preliminary estimate of patronage for the candidate corridors as part of the overall evaluation.

The ridership methodology used for this feasibility study differs from the process typically used in more detailed phases of study. As a transit project advances in the federal planning process, a transit component of a regional travel demand model must be developed as an analysis tool. However, at this early stage of planning, potential ridership is not calculated directly from the regional travel demand model. There is not currently a unified demand travel demand model for the region, but three models that are not integrated. Furthermore, the existing models do not contain a transit mode choice component.

In consideration of the level of detail associated with this initial feasibility study, an alternate patronage forecasting methodology was used. Potential transit ridership was estimated by a sketch planning methodology detailed in two reports published by the National Cooperative Highway Research Program (NCHRP). The baseline ridership is defined as the daily recurring trips, such as those to work, to school and regular shopping trips that form a stable daily base patronage.

6.2.1. Description of Methodology

Forecasts of ridership are estimated using quick-response travel estimation techniques based on NCHRP Reports 187 and 365. This methodology utilizes an “impedance” model, which compares travelers’ likelihood of using commuter rail as compared to the highway mode, based on the relative costs and travel times associated with each mode. The ten-step mode choice methodology employed here has been applied by the Consultant on similar efforts. However, this study required additional innovations due to data limitations. Each step is followed by a brief description.

1. Regional Model Estimates (person trips). Forecast year (2025) vehicle trip data were taken from three travel demand models covering the study area. CMCOG maintains separate urban area and rural area travel demand models which were not designed to

be directly integrated. In addition, due to its service into Kershaw County, the Camden corridor required data from a third travel demand model, operated by the Santee Lynches Council of Governments (SLCOG)[6] which is not integrated with either of the CMCOG travel demand models. To account for these limitations, a spreadsheet disaggregation and allocation model was developed to adjust and normalize vehicle trip data to the entire study area. These data were validated with internal and external trips to and from cordons (external stations) in the study area. County travel flows from journey to work data, using the 2000 Census Transportation Planning Package (CTPP), were also examined to validate trip data and assure reasonable travel patterns within the study area. These adjusted and normalized vehicle trips were then converted into person trips using data for average persons per vehicle calculated from the 2000 CTPP data.

2. Aggregate Traffic Analysis Zones (TAZ) into Districts. Person trips were grouped using the existing 814 transportation analysis zones (TAZs) within the study area. The TAZs were aggregated into 30 districts to more effectively manage and represent the Columbia transportation model data for ridership estimation. Most districts were defined by the area surrounding a potential commuter rail station, illustrating areas of potential ridership for each station. Larger districts were established for areas further away from a candidate commuter rail corridor. The 30 districts used for ridership analysis are illustrated in Exhibit 6-1.

3. Define Transit Services/Operations Assumptions. Operational and service descriptions were developed to reflect the travel profile and hours of operation for each of the proposed transit alternatives, summarized as follows:

   - All commuter rail alternatives will serve all their line stations.
   - For commuter rail - four AM trips; two midday trips; and four PM trips.
   - BRT on alternative routes vary in duration, schedules and number of stops

   These transit services/operations assumptions are detailed in Section 4.

4. Define Service Matrix of Reasonable Trips. A matrix was developed to define the trips that might reasonably use the proposed transit alternative, identified by district-to-district origins and destinations. This process helps to avoid the potential of "unreasonable" trips being included in the ridership estimates (e.g. trips originating in a district far removed from any of the three candidate corridors are highly unlikely to use commuter rail). Every theoretical and probable trip was considered.

5. Calculate Highway/Rail Travel Times. Highway travel times between each district were based on the travel times taken directly from the regional travel demand models. Travel times for the proposed transit alternative were taken directly from the operations profile for the transit alternatives (as described in Section 4).

[6] SLCOG data presented the additional challenge of having a horizon year of 2020, so they were projected to 2025, using a linear projection calculation.

6. Calculate Highway/Rail Costs. Highway costs were calculated based on multiplying a perceived cost per mile by the adjusted "as the crow flies" distances between districts. The basis of the perceived automobile cost is explained in more detail under the impedance factor and mode choice explanation that follows in step 7. Transit service assumptions were made based on policy decisions detailed for each alternative in the operations plan (as described in Section 4).

7. Determine Impedance Factors. Impedance is a measure of a person's disutility or propensity not to use a certain mode. The higher the impedance, the less likely a person is to use the particular mode in question. The travel time and cost information calculated for the previous steps were combined in the mode choice step to calculate an automobile (highway) and transit impedance matrix between all districts. The following equations were used to determine impedance factors for the study area to determine mode split percentages for the potential transit alignments.

Highway impedance is determined by the equation:

$$\text{Impedance}_{Hwy} = (\text{In Vehicle Travel Time})_{Hwy} + (\text{Costs})_{Hwy}$$

Transit impedance is determined by the equation:

$$\text{Impedance}_{Trnst} = (\text{In Vehicle Travel Time})_{Trnst} + (\text{Out of Vehicle Travel Time})_{Trnst} + (\text{Costs})_{Trnst}$$

Mode split percentage is then determined by the equation:

$$\text{Mode Split Percentage (Transit)} = 1 / (1+[\text{Impedance}_{Trnst} / \text{Impedance}_{Hwy}]^{\wedge} b)$$

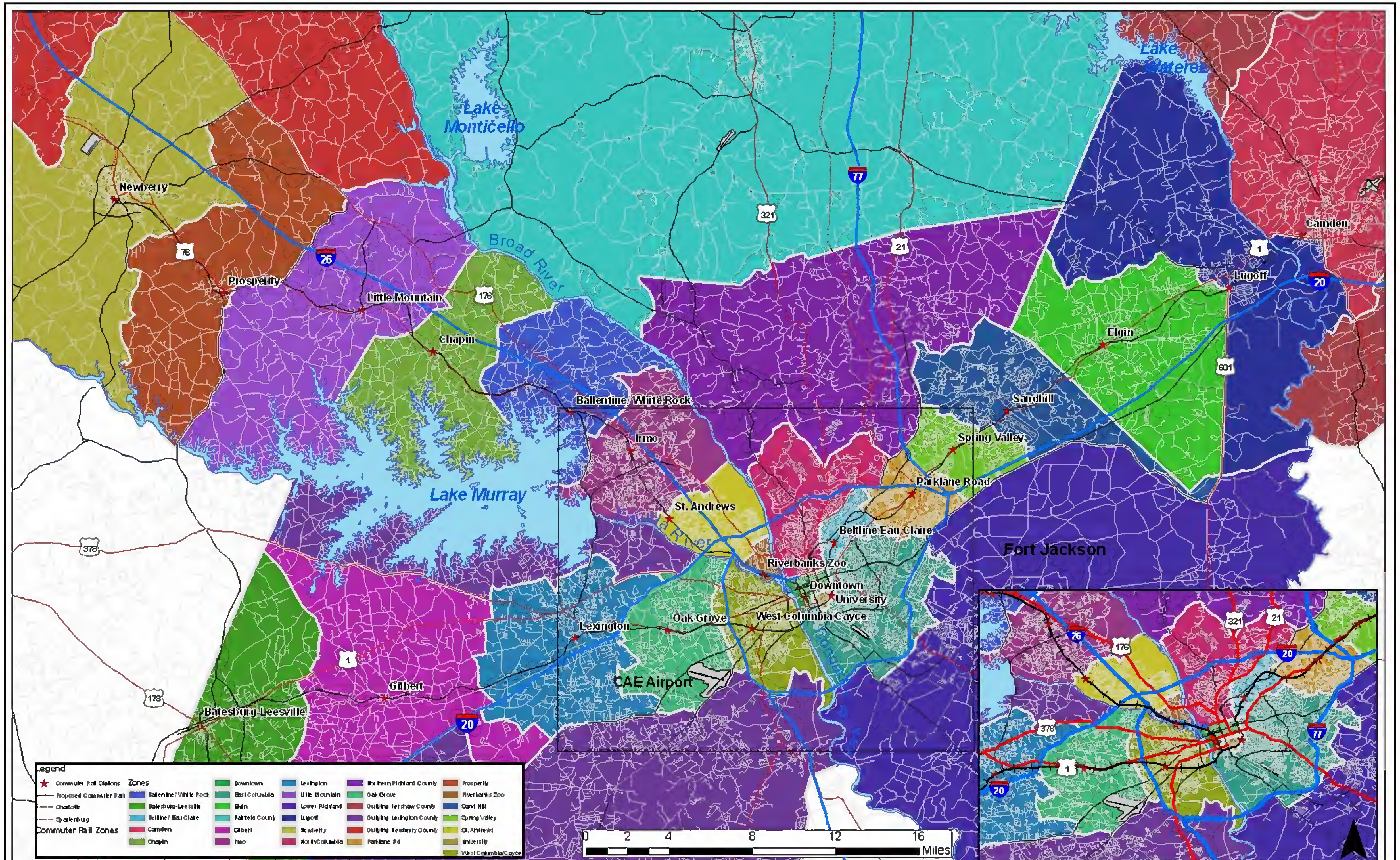
*where **b** = mode split power factor*

Mode choice is the process in which the overall travel demand between a given origin / destination pair is split by illustrating which of the available modes will be taken, in this case using transit and automobile (highway) modes.

A logit model is one of the most commonly used models for implementing the mode split. The logit model compares the utility of travel between the different available modes. The utility, and relative attractiveness, of a mode can be based on a combination of many factors, usually travel time, convenience and cost of the mode between the origin and a destination. Travel time can have multiple components, including in-vehicle time representing time the traveler is actually in a vehicle and out-of-vehicle time including time spent traveling which occurs outside of the vehicle (e.g. time to walk to and from transit stops or parking places, waiting time, and transfer time). Out-of-vehicle time represents "convenience".

For transit trips, travel cost is based on a transit fare, while for auto trips, cost is determined by adding the parking cost to the length of the trip as multiplied by a unit cost per mile. Auto cost is based on a "perceived" cost per mile (usually in the order of 5-7 cents/mile, 7 cents was used for the CMCOG model) which includes fuel and oil costs but not ownership, insurance, maintenance and other fixed costs (total costs of automobile travel are in the order of 35-50 cents per mile).

Exhibit 6-1: Districts for Ridership Analysis



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This lower "perceived" cost per mile was used because travelers typically consider only the costs that are associated with an individual trip when making mode choice decisions. The higher figure that includes all costs of operating an automobile includes a high percentage of sunk costs that will be incurred regardless of whether or not an individual trip is made via commuter rail (e.g. insurance costs must be paid regardless of whether or not an individual trip is made via commuter rail or automobile).

No mode bias factor was used in this model. Such a factor generally would be used to represent other characteristics or travel modes which may influence the choice of mode (such as a difference in privacy and comfort between transit and automobiles). In this model, travel time and cost differences for each mode are the basis for each mode choice decision. For example, a bus system and a rail system with the same time and cost characteristics will have the same utility values. Even though it is recognized that there are qualitative differences in the perception of various modes, there are no special factors that allow for the difference in attractiveness of alternative technologies. However, upon reviewing the final results, there was an over-representation of short transit trips which are unlikely to actually occur. Therefore, a factorization process was used to reduce the projections for this type of trip – a similar process to adding a convenience penalty to the model.

8. <u>Calculate Full Service Ridership Estimate.</u> Base model trip matrices were used in the impedance matrices of the previous step to provide a "full" unrestricted ridership estimate. This full service estimate assumes no adjustments for frequency or hours of transit service. The data collected during this step of the process were used to further refine the full service patronage estimate.

9. <u>Apply Peak Period and Hourly Factors.</u> Peak period and hourly factors were used to adjust the full service estimate of Step 8 to reflect appropriate hours of operation and frequency assumptions (as described in the operations plans).

10. <u>Final Patronage Estimates.</u> Final estimates reflect results from each of the previous steps, culminating in the application of peak period and hourly factors to the full service estimate. These estimates were adjusted to only accommodate demand that are reasonably met by commuter rail and not all demand. The initial results indicated significant short-distance travel between one station and the next, as compared to the longer-distance commute trips to which commuter rail is oriented. Recognizing that commuter rail does not effectively serve these short trips due to its relatively infrequent service and relatively high cost, the numbers of daily boardings were reduced for these short trips between adjacent and nearby stations. Furthermore, in some of these areas, bus service is currently available. Transit dependent individuals are assumed to take the bus in areas where bus services are available recognizing its more frequent service and lower fares than commuter rail.[7]

[7] Daily boardings for the University and Downtown stations were not adjusted. All the trips from the immediate station were subtracted. Boardings at the next to the immediate station were reduced to ten or twenty-five percent with incremental increases until reaching 100 percent.

6.2.2. Scenarios Examined

The operating options described in Section 4 were examined together to account for the enhanced service and increased potential ridership resulting from the planned availability of some form of high-capacity transit service in all three corridors (which would potentially enable regional residents to travel between corridors to destinations beyond downtown Columbia). Two overall service scenarios were examined with regard to the potential operating options in each corridor:

Scenario 1: Enhanced bus service is available in all three corridors; and
Scenario 2: Commuter rail service is available in one corridor; enhanced bus service is available in the other two corridors.

Results of the potential ridership analysis for each corridor are presented later in this section with respect to these two service scenarios.

In the examination of these service scenarios, several baseline assumptions have been made:

1. There is some level of "high-capacity" transit service in all three corridors (as illustrated in the two service scenarios);
2. The commuter rail options assume the use of train sets consisting of locomotives and passenger cars;
3. Bus Rapid Transit / enhanced bus options assume the use of over-the-road coaches with additional transit amenities (e.g. real-time passenger information, attractive and comfortable waiting areas) to increase the attractiveness of the service; and
4. Local / regional bus service with an attractive level of service is available to serve as feeders to and from stations.
5. Commuter rail and BRT options use a distance-based fare ranging from $3.00 to $5.00, depending on the trip length.
6. The assumed parking cost in downtown Columbia is $5.00 per day.
7. The average wage in Columbia is $12.38 per hour (2003).

6.3. DESCRIPTION OF CRITERIA

The following paragraphs describe the criteria used in the evaluation of each candidate commuter rail corridor. As stated earlier, the criteria represent a combination of objective and subjective criteria. Corridors were assigned a relative ranking of 1st, 2nd, or 3rd under each measure.

6.3.1. Potential Ridership

The assessment of potential ridership is based on the estimated patronage results obtained through the sketch planning model developed for this project. Service scenarios were examined that include commuter rail service on one corridor, and enhanced bus service on the remaining two corridors. The potential commuter rail ridership was isolated for each of the three corridors, and compared to illustrate relative differences.

Commensurate with this early stage of analysis, the ridership projections are general in nature, and are shown as a range to illustrate the uncertainty associated with analysis at this level of detail.

6.3.2. Access to Stations / Land Use Support

Station "Catchment Areas"

Land use support is an important consideration in helping to develop the full ridership potential of commuter rail service. Although commuter rail passengers will typically travel greater distances to access the train than they would for other transit technologies, the presence of (or potential for) supportive land uses such as higher-density residential areas in close proximity to stations helps to create additional ridership opportunities. As part of their project evaluation process, the Federal Transit Administration pays close attention to land use plans associated with major transit investment projects.

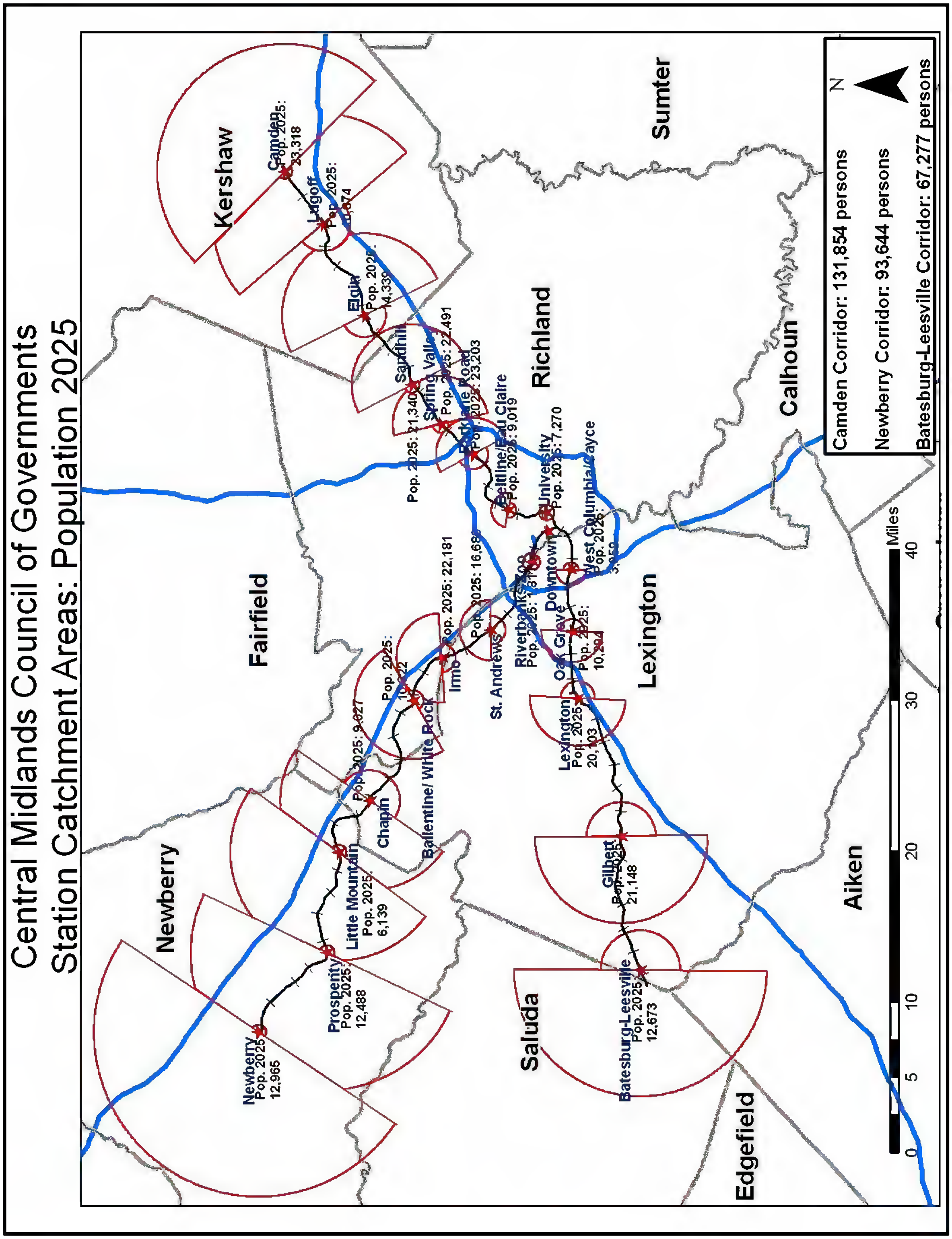
In a related consideration, the "catchment area" for each station was defined. This area indicates the extent to which people are likely to travel to reach a commuter rail station. People from outside the "catchment area" may still use commuter rail, but the greater distance to the station acts to discourage ridership from these more distant areas.

The catchment area for each commuter rail station was defined as a function of the distance between the station and the primary destination stop in downtown Columbia. Recognizing that people living farther away will likely travel greater distances to a station than people living closer to Columbia, the catchment area was defined based on a radius of ¼ of the distance between the subject station and downtown Columbia (for example, a 7-mile radius defines the catchment area for a station 28 miles from downtown Columbia, whereas a 4-mile radius defines the zone for a station 16 miles from downtown Columbia). The calculations of these radii are applicable to the "external" catchment area for each station (areas on the side of the station farthest away from downtown Columbia).

The extent of these areas was then modified in recognition of the fact that people tend not to travel "backward" to reach a station. People may travel a short distance toward a station further away from their destination, but the action of going "the wrong way" to access a station significantly reduces the distance people will travel; in many cases, people will travel to the next "downstream" station instead. For the areas on the side of the station closest to downtown Columbia (the "internal" catchment area), the radius defining the catchment area was defined as 1/10 of the distance between the station and downtown Columbia, up to the distance where the "external" catchment area of the next "downstream" station begins. Minimum and maximum thresholds for the "internal" catchment area were then applied as a minimum radius of ½ mile, up to a maximum radius of ¼ of the distance to the next "downstream" station. The extents of these catchment areas are illustrated in Exhibit 6-2.

To illustrate potential ridership attributes, the 2000 and 2025 populations and number of households with a household income of greater than $50,000 were calculated for each catchment area. Station areas with more total households and more high-income households illustrate areas with more potential commuter rail passengers. These data were then aggregated by corridor to rank the corridors by number of potential patrons.

Exhibit 6-2: Catchment Areas Around Stations



Data used to support these exercises were derived from area census (2000) socioeconomic data; projections were based on CMCOG's and Santee Lynches' travel demand forecast data for the horizon year of 2025[8].

Land Use Assessment

Most commuter rail patrons are expected to be persons commuting to their jobs from surrounding suburban and rural areas. However, commuter rail services many times attract other patrons (albeit less frequently), such as shoppers, event-goers, students, and others. Essentially, downtown Columbia is a major destination for local residents, and commuter rail could provide a viable alternative to travel into the city's center. As the primary destination, downtown Columbia is important to the success of commuter rail; however, transit supportive land uses surrounding other stations can help build the potential ridership needed for a successful mass transit system.

Existing land uses, transit supportive land uses, and future patterns are important criteria for FTA "New Starts" evaluation for federal funding. In this study, existing land uses were evaluated by a qualitative analysis based on data derived from aerial photography for areas surrounding each proposed station. This evaluation documents existing land uses for a quarter mile radius for each proposed station site. In addition, transportation infrastructure data, and various other data sets were used for further land use identification and their classifications. The generalized land use classes are as follows:

1. Single Family Residential
2. Multi Family (including Mobile Home Parks),
3. Mixed Use
4. Commercial/Services
5. Public/Institutional
6. Industrial
7. Rural/Agriculture/Open Space
8. Undeveloped/Vacant Land
9. Other/Miscellaneous

Detailed land use definitions and descriptions are available in Appendix B. They are modified from the Anderson Land Use Classification (USGS Circular 671, 2001) and customized for the Central Midlands commuter rail study area.

Existing land uses were derived from aerial photography and classified according to the above descriptions and definitions. Future "transit supportive land uses" were extrapolated by potential opportunities to develop surrounding areas into land uses that support mass transit.

A subjective assessment of land use and accessibility was applied to each station location, using the criteria below. An independent score was assigned to each station, and comparisons between corridors were then made using the average station score for all stations in a corridor.

[8] CMCOG's data is not available for the entire commuter rail study areas; hence, some adjustments were made where every possible or the data was not analyzed, if they were not available. In regards to areas within the Kershaw County jurisdiction, data were available at a 2020 horizon year. Hence, these data were projected an additional five years, using a linear model to make all the study areas consistent to a 2025 horizon year.

To illustrate the level of potential land use support in station areas, the following scale was used:

- 5 – An optimal rating distinguishing highly supportive land uses and accessibility. These stations include a high number of persons and jobs within the catchment area, numerous trip generators / destinations, and large amounts of redevelopable and developable land.
- 4 - A highly favorable rating which suggests above average conditions for accessibility and transit-supportive land uses. A fair number of persons and jobs are located within the catchment areas, there are significant redevelopment / development opportunities, and space is available for parking.
- 3 - A good rating that indicates favorable conditions for potential ridership accessibility and transit-supportive land uses. There is some population and employment base nearby, and some developable land.
- 2 - A less than favorable rating for accessibility and transit supportive land use. These areas may include rural areas where high-density development is not desired.
- 1 - The lowest rating for accessibility and transit supportive land uses. The area is highly rural and has little opportunity for transit-supportive development.

6.3.3. Potential Cost of Implementation

An order-of-magnitude capital cost was calculated for each corridor, based on needed track improvements, station construction, train sets, and associated improvements. These costs are conceptual in nature, and would need to be refined with more detailed planning. However, the costs developed in this process enable comparisons between the corridors as well as comparisons to other existing and proposed commuter rail projects across the country.

6.3.4. Ease of Implementation

This criterion includes a subjective assessment of the potential ease of implementation for commuter rail service in each corridor. The potential ease of implementation is based on elements such as the following:

- Existing freight rail usage of corridor (the higher the freight traffic, the more difficult it will likely be to negotiate a shared-use agreement with the freight companies); and
- Ability to transition from a road-based enhanced bus service to a rail-based commuter service (alternatives in which the road-based and rail-based operations are not located adjacent to each other decreases the opportunities for transit-oriented development around bus stations that could also serve future rail stations).

6.3.5. Public Opinion

The public opinion measure is a subjective assessment based on data gathered through the following sources:

- Results of stakeholder interviews;
- Public feedback received during public forums; and
- Overall level of interest exhibited by the public.

The comments received related to individual corridors were assessed to determine the overall level of support for each of the corridors, as well as for commuter rail in general.

6.3.6. Comparison to Peer Systems

The intent of this criterion is to compare the projected productivity of the three candidate corridors to the corridors planned in peer cities. This measure is considered separately from the other five criteria, because whereas the other criteria are intended to assess the differences among the three Central Midlands corridors, this measure is intended to assess the feasibility of the Central Midlands corridors in comparison to other corridors across the country. Of the peer cities examined, two (Albuquerque and Nashville) will be initiating service in 2006, and one (Charlotte) is fairly advanced in its planning efforts. The three other cities are either early in their planning efforts, do not have commuter rail plans at this time, or no longer operate commuter rail service. Of the three cities that are advanced in their implementation process, ridership and capital cost estimates are available for two (Nashville and Charlotte).

6.4. EVALUATION RESULTS

6.4.1. Potential Ridership

Patronage estimates were developed for each of the three candidate corridors (assuming commuter rail operates in the subject corridor and Bus Rapid Transit operates on the remaining two corridors). The ridership projections developed for this study are general in nature, recognizing the sketch planning level of detail used for this analysis. Patronage estimates are shown as a range to illustrate the uncertainly associated with the analysis. The absolute forecasts provide an order-of-magnitude estimate of ridership on each line; however, the relative differences in projected ridership among the corridors are used to define which corridor ranks of the "best" in terms of potential ridership.

Exhibit 5-3 illustrates the projected commuter rail ridership in each corridor. The Camden route is projected to have the highest patronage, ranging from 1,900 to 2,300 daily boardings. The second highest potential ridership occurs in the Newberry corridor, ranging from 1,200 to 1,500 daily boardings[9]. The Batesburg-Leesville corridor is projected to have significantly lower ridership than the other two corridors.

Exhibit 6-3: Potential Commuter Rail Ridership by Corridor

Rank	Corridor	Potential Ridership (daily boardings)
1	Camden	1,900 – 2,300
2	Newberry	1,200 – 1,500
3	Batesburg-Leesville	600 - 800

In addition, ridership estimates for the BRT-only option were developed. Express bus / BRT service in all three corridors is projected to result in lower ridership as compared to commuter rail options, to a large extent because there are several stations (such as St. Andrews and Beltline / Eau Claire) that likely would not have BRT service (although local bus service would still be available). The potential BRT ridership is estimated to be in the range of 1,800 – 2,200 daily boardings (total for all three corridors).

6.4.2. Access to Stations / Land Use Support

Station "Catchment Areas"

Socioeconomic data for the "catchment areas" around stations in each of the three corridors were examined to determine how the three corridors compare in terms of the size and composition of the population base that would support potential commuter rail service. Exhibit 5-4 illustrates the key demographic and socioeconomic characteristics of each corridor.

The Batesburg-Leesville corridor has approximately 38,000 persons residing within station catchment areas. By 2025, this corridor is expected to reach over 67,000 persons, a 75.5% growth rate. In 2000, approximately 6,000 households earned over $50,000, representing approximately 42% of the corridor's households. The Batesburg-Leesville corridor is anticipated to have the highest growth of the three corridors, but even so, will remain the least populated corridor in 2025.

Nearly 99,000 persons reside in catchment areas along the Camden corridor. This corridor is anticipated to reach 131,000 persons by 2025, an increase of 35.5%. In 2000, the Camden corridor had nearly 16,000 households with an income over $50,000, totaling 42.5 percent of its households. In 2025, the corridor will continue to have the highest ridership base, with 131,000 persons living in the defined catchment areas.

The Newberry corridor has 68,000 persons living within station catchment areas. The population in these areas is expected to reach 93,000 persons by 2025, growing 37.6%. It has nearly 12,000 households with an income over $50,000, equaling 44.5 percent of the corridor's households.

[9] The range is calculated by reducing or adding approximately 10 percent for the baseline projection for both the Camden and Newberry lines. Ridership on the Batesburg-Leesville line is not projected to be as high as the other lines; hence, a more generous calculation was taken for its daily boarding ranges.

Based on this information illustrated in Exhibit 6-4, the Camden corridor fares the best with regard to access to stations.

Exhibit 6-4: Characteristics of "Catchment Areas" by Corridor

Central Midlands Council of Government: Acessibility Analyses

Alignment	Station Number	Station Location	Population Density 2000	Population			Households 2000	Households Over $50K 2000	% HH Over $50,000	Employment		
				2000	2025	% Growth				2000	2025	% Growth
Newberry	1	Downtown		-	-		-			-		-
Newberry	2	Riverbanks Zoo	2.2	1,423	1,817	27.7%	748	231	30.90%	1,565	1,967	25.7%
Newberry	3	St. Andrews	3.0	15,095	16,680	10.5%	5,930	3,036	51.20%	12,273	16,590	35.2%
Newberry	4	Irmo	1.4	13,431	22,181	65.1%	4,200	2,543	60.50%	4,110	5,759	40.1%
Newberry	5	Ballentine	0.4	6,282	10,322	64.3%	2,197	1,478	67.30%	2,102	2,743	30.5%
Newberry	6	Chapin	0.2	4,940	9,027	82.7%	1,515	732	48.30%	1,151	1,766	53.4%
Newberry	7	Little Mountain	0.1	3,769	6,139	62.9%	1,514	552	36.50%	NA	NA	NA
Newberry	8	Prosperity	0.2	10,804	12,488	15.6%	2,824	894	31.70%	NA	NA	NA
Newberry	9	Newberry	0.1	12,326	12,965	5.2%	6,007	1,457	24.30%	NA	NA	NA
Newberry Corridor Total			0.2	68,070	93,644	37.6%	24,935	10,923	43.8%	21,201	28,825	36.0%
Camden	1	Downtown		-	-		-	-		-		-
Camden	2	University	12.77	6,448	7,270	12.7%	4,829	950	19.70%	5,837	7,333	25.6%
Camden	3	Beltline	5.30	8,221	9,019	9.7%	3,017	471	15.60%	2,165	2,726	25.9%
Camden	4	Parklane	2.74	18,760	23,203	23.7%	6,630	2,457	37.10%	17,394	22,212	27.7%
Camden	5	Spring Valley	1.75	17,736	22,491	26.8%	5,943	3,844	64.70%	5,377	7,523	39.9%
Camden	6	Sandhill	0.89	14,405	21,340	48.1%	5,230	3,072	58.70%	2,619	3,947	50.7%
Camden	7	Elgin	0.24	7,573	14,339	89.3%	2,779	1,253	45.10%	1,412	869	-38.5%
Camden	8	Lugoff	0.22	8,833	10,874	23.1%	2,628	1,025	39.00%	4,381	5,341	21.9%
Camden	9	Camden	0.23	16,821	23,318	38.6%	7,195	2,532	35.20%	5,043	6,673	32.3%
Camden Corridor Total			0.55	98,797	131,854	33.5%	38,251	15,604	40.8%	44,228	56,624	28.0%
Batesburg-Leesville	1	Downtown		-	-		-	-		-		-
Batesburg-Leesville	2	West Columbia/Cay	2.23	2,730	3,059	12.1%	1272	349	27.40%	2,506	3,152	25.8%
Batesburg-Leesville	3	OakGrove	1.75	8,487	10,294	21.3%	3129	1,614	51.60%	1,627	2,424	49.0%
Batesburg-Leesville	4	Lexington	0.93	10,505	20,103	91.4%	3750	1,964	52.40%	8,856	11,784	33.1%
Batesburg-Leesville	5	Gilbert	0.19	7,339	21,148	188.2%	2779	1,122	40.40%	NA	NA	NA
Batesburg-Leesville	6	Batesburg-Leesville	0.12	9,272	12,673	36.7%	3530	1,026	29.10%	NA	NA	NA
Batesburg-Leesville Corridor Total			0.29	38,333	67,277	75.5%	14,460	6,075	42.0%	12,989	17,360	33.7%

Sources: 2000 Census and MPOs (CMCOG & SLCOG)

Land Use Assessment
Assessments of existing conditions and opportunities for future transit-oriented development are given below for each potential station site. Maps illustrating the general land uses in the vicinity of each preliminary station site are included in Appendix C.

Camden Corridor

Camden:
The proposed Camden station is located at an existing Amtrak station near downtown Camden. It is adjacent to existing CSX Transportation track and in the vicinity of Dekalb Street and Chestnut Ferry Road. Within a quarter mile from the station, there are undeveloped/vacant, public/institutional, multi family residential, single family residential, open space, and commercial/services land uses. Overall, the proposed Camden station site is favorable, because it is an existing station with potential commuter rail patrons in nearby residential areas. The undeveloped/vacant land also provides opportunities for future development. A land use score of **three** (on a 1-5 scale) was assigned to this site.

Lugoff:
The proposed Lugoff site is located on existing CSX Transportation track, with surrounding industrial land uses. The site is near the intersection of US 601 and Evans Road. Within a quarter mile of the station, there is industrial, single family residential, and undeveloped/vacant land. The Lugoff proposed site is a below average candidate for a station location. It has low residential density, and industrial land uses are not conducive to commuter rail ridership, yet the surrounding undeveloped/vacant land has potential for more transit supportive land uses. The land use score for Lugoff is **two**.

Elgin:
The proposed Elgin site is located near the town's center, off of US 1. The site takes advantage of existing CSX Transportation track. Within a quarter mile from the property, there is low-density single family residential, commercial/services, and vacant/undeveloped land. The surrounding undeveloped/vacant land has potential for more transit supportive land uses, but the current uses are not conducive to mass transit; hence, the land use score for Elgin is **two**.

Sandhill:
The proposed Sandhill station is located in the vicinity of Two Notch Road (US 1), Clemson Road, and active CSX Transportation tracks. Within a quarter mile from the station, there are undeveloped/vacant, public/institutional, other/miscellaneous, and commercial/services land uses. This area is an emerging retail area, with the large Village at Sandhill now open nearby. Generally, the vicinity of the station has much potential, since there are remaining areas of undeveloped/vacant land. However, these sites can be expected to be developed in the future. Sandhill scores a **four** on this land use evaluation.

Spring Valley:
The proposed Spring Valley station is located on active CSX Transportation railway near the vicinity of Two Notch Road and Pine Springs Road, adjacent to commercial/services

land uses. Near the same location, there are many single family residences. Sesquicentennial State Park is also located nearby, limiting development opportunities. The residential communities tend to be higher income; hence, these persons have a relatively high probability to patronize commuter rail to and from downtown Columbia. The Spring Valley station scores a **three** for the land use evaluation.

Parklane/Decker:
The proposed Parklane/Decler station is near Two Notch Road and existing active CSX Transportation tracks on undeveloped/vacant land. Within a quarter mile from the proposed station, there are primarily commercial/services and undeveloped/vacant land. Single family residences lie outside the quarter mile area. With regard to existing land use, commercial development may help to generate commuter rail ridership, since the area serves as a destination for both shopping and jobs. The large areas of undeveloped/vacant land potentially could be developed in a transit-supportive manner. The Parklane/Decker station scores a **three**, because of the development opportunities surrounding the large amount of vacant/undeveloped land.

Beltline/Eau Claire:
The proposed Beltline/Eau Claire station is generally sited on Beltline Boulevard, near the existing active Norfolk Southern tracks. Within a quarter mile from the proposed station, there are commercial/service, single family residential, multi family residential, public/institutional, and undeveloped/vacant land uses. The existing single family and multi family residential land uses are fairly dense, but consist primarily of low-income households that are unlikely to use commuter rail service. The commercial/service areas consist of automotive dealerships and other non-transit-supportive uses. The Beltline/Eau Claire station area has good existing bus service and is within close proximity to downtown Columbia, reducing the viability of this station site. This station scores a **two** in the land use evaluation.

University:
The proposed University station is in the Five Points area near the University of South Carolina campus. Within a quarter mile from the University station, there are primarily public/institutional, open space, multi family residential, single family residential, and commercial/services land uses. Multi family and single family residences are within a short distance from the proposed station. The university is a prime destination for both students and workers, since the university employs many people from Columbia and surrounding areas. The University area is built out, so the immediate area provides little opportunity for new development. The proposed University station rates a **four**.

Downtown:
Downtown Columbia is the proposed terminus for all three conceptual commuter rail alignments. Currently, the proposed downtown Columbia station is the Amtrak terminal, on Pulaski Street in the Congaree Vista. This station would be expected to become widely utilized as a commuter rail terminus, since downtown is not only a focal point for the region's employment but also is the center of many recreational, cultural, educational, and institutional activities. Major employers in the downtown area include Palmetto Health, government offices (state, county, and municipal), SCANA, and others.

Within a quarter mile from the Downtown station, there are primarily public/institutional, multi family residential, single family residential, industrial, mixed-use and commercial/services land uses. The central business district provides significant employment destinations, and the Congaree Vista area is undergoing large-scale redevelopment. The proposed Downtown station rates a **five**.

The Camden Corridor received a total of 28 points for the nine stations along the route, with an average station score of 3.1 for this land use evaluation.

Newberry Corridor

Newberry:
The proposed Newberry site is located in the center of town on existing Norfolk Southern track. The approximate location is in between Friend Street and Main Street. Within a quarter mile from the station, there are multi family residences, single family residences, commercial/service areas, open space and undeveloped/vacant land. The land use evaluation score for Newberry is **three**, because the area is generally built out. Redevelopment may encourage commercial opportunities and expand possibilities for parking.

Prosperity:
The proposed Prosperity site is located on existing CSX Transportation track, near the intersection of Main Street and Wye Street. Within a quarter mile from the station, there are single family residences, multi family residences, commercial/services parcels, rural/open space, and undeveloped/vacant land. The Prosperity proposed site is a below average candidate for a station location. It has low residential density and land uses that are not conducive to commuter rail ridership. The surrounding undeveloped/vacant areas have potential for more transit supportive land uses, but not for a number of years. The land use evaluation score for Prosperity is **two**.

Little Mountain:
The proposed Little Mountain station site is located on existing CSX Transportation railway, near the site the intersection of Main Street and Depot Street. Within a quarter mile from the station, there are commercial/services parcels, single family residences, rural/open space, and undeveloped/vacant land. The Little Mountain proposed site is a below average candidate for a commuter rail station. It has low residential density and existing land uses are not conducive to commuter rail ridership. However, the surrounding undeveloped/vacant areas have potential for more transit supportive land uses in the distant future. The land use evaluation score for Little Mountain is **two**.

Chapin:
The proposed Chapin station is located in the vicinity of Columbia Avenue and Amicks Ferry Road, on existing CSX Transportation railway. Within a quarter mile from the station, there are commercial/services, undeveloped/vacant and single family residential land uses. Chapin is experiencing tremendous population growth and has large amounts of land surrounding the proposed station for development. This station vicinity has much potential for development. There are large areas of undeveloped/vacant and, and the area has a significant proportion of higher income residents. Chapin scores a

four on this land use evaluation, because of its fast growth, higher-income households, and land for development.

Ballentine/White Rock:
The proposed Ballentine/White Rock station is located on existing CSX Transportation tracks, near the intersections of Bickley Road and US 76. Within a quarter mile from the station, there are commercial/services, single family residences, rural/open space, public/institutional, and undeveloped/vacant land uses. The proposed Ballentine/White Rock station site has much potential for development. Ballentine/White Rock scores a **three** on its transit supportive land uses evaluation.

Irmo:
The proposed Irmo station is situated in the vicinity of Royal Tower Drive and Woodrow Street on existing CSX Transportation railway. Within a quarter mile from the station, there are many single family residences, some commercial/services parcels, and some potential to develop some land. There are many potential commuters within the immediate area; however, the immediate surrounding of the Irmo station does not have much opportunity to expand. Irmo rates a **three** on its land use evaluation.

St. Andrews:
The proposed St. Andrews station is near the intersections of Saint Andrews Road and Piney Grove Road on existing CSX Transportation right-of-way. Saint Andrews is a good location for commuter rail, because there are many single family residences, commercial/services, and industrial land uses. The area is almost built out, so it does not have much opportunity for new development, although there may be opportunities for redevelopment. It scores a **three**, because there are many potential commuter rail patrons and some commercial/services that are supportive to transit services.

Riverbanks Zoo:
The proposed Riverbanks Zoo station is at the end of Greystone Boulevard at the entrance of Riverbanks Zoo, adjacent to CSX Transportation railway. Within a quarter mile from the proposed station are the zoo, major highway right-of-way, and commercial/service areas. There is little land for development, but there are multi family residences within a half-mile distance. Riverbanks Zoo is a below average candidate for a commuter rail station, because opportunities for supportive development are extremely limited. Highway I-26 also becomes a constraining barrier separating the commercial areas from proposed station location. In addition, the station site is in close proximity to the downtown terminus. The Riverbanks Zoo station scores **two**, because of its existing non-transit supportive land use, and limited opportunities for future transit-oriented development.

The Newberry Corridor scores a total of 27 points for its nine stations (including the downtown station that serves all three corridors), averaging a score of 3.0 points for this land use evaluation.

Batesburg-Leesville Corridor

Batesburg-Leesville:
The proposed Batesburg-Leesville station is located near the intersection of Railroad Avenue and Oak Street, adjacent to the Norfolk Southern railway. Within a quarter mile from the station site, there are undeveloped/vacant, public/institutional, single family residences, industrial, and commercial/services land uses. The proposed Batesburg-Leesville station site is in a central location for the town, and the undeveloped/vacant land also provides opportunities for future development. In terms of land use, Batesburg-Leesville rates as a **three**.

Gilbert:
The proposed Gilbert station is situated near the intersection of Washington Street and Main Street, on Norfolk Southern track. Within a quarter mile from the station, there are public/institutional, single family residential, industrial, commercial/services, rural / open space, and undeveloped/vacant land uses. The Gilbert station rates a **two,** which is less than average, because it is surrounded by low-density development and has a rural context that is not conducive to transit-supportive land use.

Lexington:
The proposed Lexington station is near the intersection of Railroad Avenue and Lake Drive, on existing Norfolk Southern track. Within a quarter mile of the station, there are industrial, undeveloped/vacant, open spaces, multi-family and single family residential land uses. The proposed Lexington station is a favorable location to a commuter rail investment, because there are ample areas for development (as well as space available for parking areas). Lexington rates as a **three**.

Oak Grove:
The proposed Oak Grove station is located near Oak Drive and Delree Street, on existing Norfolk Southern right-of-way. Within a quarter mile are commercial/services, public/institutional, open space, and single family residential land uses. The proposed Oak Grove station received a score of **three**, because it is located in a stable community with some opportunity for redevelopment.

West Columbia/Cayce:
The proposed West Columbia/Cayce station is near Platt Springs Road and Dreher Street, on existing Norfolk Southern railway. Within a quarter mile of the station, there are public/institutional, industrial, single residential, multi family residential, and commercial/services land uses. The West Columbia station scores a **two**, because surrounding land uses are not transit-supportive, and the area may be more suited for bus service because of its proximity to downtown Columbia.

The Batesburg-Leesville corridor received a total score of 18 points for its six stations (including the downtown station that serves all three corridors), averaging a score of 3.0 points for this land use evaluation.

Summary

The land use analysis concluded that none of the three corridors has a clear cut advantage over other candidate corridors with regard to the potential for transit-supportive development. The evaluation results indicate that all three corridors provide opportunities for development and redevelopment at the proposed station sites, although transit-supportive development would clearly be more appropriate as certain station sites. As the planning process for a commuter rail project advances, some station locations could be eliminated or relocated to realize greater benefits and higher potential ridership.

The station access component distinguishes the Camden line as having the highest potential ridership base as defined by total population and the number of high-income households. The Newberry corridor has the second-highest population base, and the Batesburg-Leesville corridor ranked third. Recognizing that there were few distinguishing features between the corridors with regard to land use, the station access component was used to define the overall ranking for the Access / Land Use criterion. Exhibit 6-5 summarizes these findings.

Exhibit 6-5: Access / Land Use Rankings by Corridor

Rank	Corridor	2000 Population (in catchment areas)	2025 Population (in catchment areas)	2000 High-Income Households [1] (in catchment areas)	Land Use Rating
1	Camden	98,797	131,854	15,633	Average
2	Newberry	68,070	93,644	11,499	Average
3	Batesburg-Leesville	38,333	67,277	6,060	Average

6.4.3. Potential Cost of Implementation

The potential cost of implementation was estimated based on existing track conditions and the level of investment needed to upgrade existing rail infrastructure to support commuter rail operations. Necessary costs were categorized as follows:

- Crossing Improvements;
- Siding Improvements;
- Signal Improvements;
- Track Improvements;
- Rolling Stock;
- Station Development;
- Maintenance Facility; and
- Contingency.

Exhibit 6-6 summarizes the costs by category for each of the three study corridors. Descriptions of the costs associated with each item are given below. Annual operating costs are discussed after the assessment of capital-related implementation costs.

Exhibit 6-6: Potential Cost of Implementation by Corridor

Item	Batesburg-Leesville	Camden	Newberry
Crossing Improvements	$8,000,000	$4,700,000	$24,000,000
Siding Improvements	$2,500,000	$2,500,000	$5,000,000
Signal Improvements	$13,400,000	$0	$11,000,000
Track Improvements	$0	$2,000,000	$0
Rolling Stock	$29,600,000	$29,600,000	$29,600,000
Station Development	$12,000,000	$18,000,000	$18,000,000
Maintenance Facility	$5,000,000	$5,000,000	$5,000,000
Contingency (30%)	$21,150,000	$18,540,000	$27,780,000
TOTAL	**$91,650,000**	**$80,340,000**	**$120,380,000**

Crossing Improvements

The number and type of grade crossings vary between the three potential rail corridors. Grade crossings with flashing lights and gates are considered to have "active" crossing protection. Those crossings with only a crossbuck have "passive" protection. Private crossings, which are sometimes provided for field access or may provide access to a single residence, may have no form of protection. Grade crossing improvements associated with adding passenger rail to the route would at a minimum require the existing passive crossings to either be closed or have active warnings added to the crossings.

Batesburg-Leesville

The crossing improvements in the Batesburg-Leesville corridor include upgrading the passive crossings to have active warnings and to upgrade active crossings that only have flashing lights. Crossing improvements in this corridor also include adding engineering, flagging and associated items resulting in a cost for improvements to the crossing signals in the $8 million range.

Camden

To increase passenger speeds from 60 mph to 80 mph in one segment on the corridor and from 50 mph to 55 mph on another segment requires upgrading 24 active grade-crossing warning systems and upgrading seven passive protection crossings to active systems. The cost to accomplish these tasks is estimated to be $4.7 million.

Newberry

To increase passenger speeds above the existing 49 mph limit and possibly up to 80 mph will require upgrading each of the 43 active grade-crossing warning systems, as well as upgrading 51 passive protection systems to active systems. The cost associated with these extensive modifications is estimated to be $24 million.

Siding Improvements

Railroads utilize passing sidings to enable trains to pass other trains moving in the opposite direction. The availability of using sidings to pass trains will be important to any passenger rail operation. To pass trains in a mixed passenger/freight operation, the freight train typically will take the passing siding while the passenger train passes on the main track. Due to the time-sensitive nature of passenger traffic, it is not efficient to have the shorter passenger trains waiting in the siding for a longer freight train to pass.

Batesburg-Leesville
Adding a grade separation structure and extending the existing siding approximately 1.25 miles is required to efficiently allow opposing trains to pass each other. The cost associated with the grade separation, extending the siding, and environmental concerns is estimated to be $2.5 million.

Camden
A minimum of one passing siding with a length of two miles will be required to efficiently allow opposing trains to pass each other. The cost associated with the addition of a two-mile passing siding and its associated signal system is estimated to be $2.5 million.

Newberry
A minimum of two passing sidings (each with a length of two miles) will be required to efficiently allow opposing trains to pass each other. The cost associated with the addition of two passing sidings and their associated signal systems is estimated to be $5 million.

Signal Improvements
Track charts and timetables were referenced to identify signalized sections of the corridors. Trains operate under dispatcher permission utilizing direct traffic control block system (DTC) or under signal indication (CTC).

Batesburg-Leesville
According to track charts, the majority of the corridor is not signalized. In this corridor there are two areas of concern: one requires updates to the existing signal system, the other requires the installation of a signal system to approximately 34 miles of track. The necessary costs are estimated to be approximately $4 million to upgrade the existing system, and around $9 million to add a signal system (for a total of about $13 million).

Camden
According to the track charts and timetables, this corridor is signalized and trains operate under CTC. The existing signal system is adequate to accommodate the commuter rail traffic at existing speeds. The costs associated with improvements to the signal are minimal.

Newberry
A short section of this corridor is currently signalized. The remaining corridor segment operates under DTC. Signalizing the route will be required to provide a safer, more efficient means of dispatching the trains and mixing the passenger and freight traffic. The cost to accomplish this task is estimated to be $11 million.

Track Improvements
The entire route in all three corridors is mainline track and is in good condition. In all corridors, only nominal improvements are needed for the existing track structure to accommodate commuter rail traffic. The only major track improvement necessary is in the Camden corridor, where construction of a new connection between CSX Transportation track and Norfolk

Southern track is required as trains enter downtown Columbia. The cost to provide this connection is estimated to be $2 million.

Rolling Stock
Rolling stock consists of the locomotives and passenger cars that comprise the train sets. For costing purposes, it is assumed that service would be provided using a locomotive and passenger cars; however, use of diesel multiple unit (DMU) technology (using self-powered rail cars) could also be considered.

It is assumed that the same level of service would be provided on all three corridors. Since the corridors are fairly similar in length, the same number of train sets would be procured for each corridor. Based on the operating plans described in Section 4, three train sets would be needed for active service in each corridor. A fourth train set would also be purchased as a spare.

The cost estimates for rolling stock include the purchase of four locomotives (three active plus one spare) at an estimated cost of $3 million each (based on estimated costs of other on-going commuter rail projects). In addition, eight passenger cars (two passenger cars for each of four train sets) would be procured at an estimated cost of $2.2 million each (based on estimated costs of other on-going commuter rail projects). Therefore, the total rolling stock costs are estimated as follows:

$12,000,000 (locomotives)
+ $17,600,000 (passenger cars)
$29,600,000 (total rolling stock; same cost for each corridor)

Station Development
The costs for station development were estimated by assuming a cost of $2 million per station, multiplied by the number of stations in each corridor (nine stations in the Camden and Newberry corridors; six stations in the Batesburg-Leesville corridor). The unit cost of $2 million per station includes capital costs associated with the platform, parking, and land acquisition, and is based on estimated costs for the Albuquerque commuter rail project. The utilization of these unit costs results in the following station development cost estimates by corridor:

Batesburg-Leesville:	$12,000,000
Camden:	$18,000,000
Newberry:	$18,000,000

Maintenance Facility
A maintenance facility will be needed for storage and maintenance of the rolling stock. For this level of analysis, it is assumed that the cost of a maintenance facility will be the same across all three corridors; more detailed analysis is needed to determine more specific costs for a maintenance facility. An estimated cost of $5 million for a maintenance facility was used (applicable to all three corridors), based on the projected cost of the maintenance facility for the Albuquerque commuter rail project.

Contingency
A contingency factor was applied to the cost estimates to account for possible cost increases in the design and construction process. The cost of rail transit projects across the country has

increased significantly in recent years, due in large part to rising steel and concrete prices. For this study, 30% of the infrastructure costs was added to the total cost estimate as a contingency factor. The amount of contingency for each corridor is as follows:

Batesburg-Leesville: $21,150,000
Camden: $18,540,000
Newberry: $27,780,000

Summary

Based on the cost elements described above, the Camden corridor has the lowest projected cost, followed by the Batesburg-Leesville corridor and the Newberry corridor. As illustrated in Exhibit 6-6, the Newberry corridor has significant costs associated with needed crossing and siding improvements, and the Batesburg-Leesville corridor requires substantial signal improvements. Conversely, in the Camden corridor, rail infrastructure costs are relatively low, because of the high quality of the existing infrastructure (which is to be expected with active Amtrak operation in the corridor). Exhibit 6-7 summarizes the total estimated cost by corridor and the relative ranking of the corridors.

Exhibit 6-7: Total Estimated Cost by Corridor

Rank	Corridor	Estimated Capital Cost
1	Camden	$80,000,000
2	Batesburg-Leesville	$92,000,000
3	Newberry	$120,000,000

Although these costs are general in nature, it is important to note that more detailed planning could result in significant differences in costs at later stages in the process. For example, the need for unique design treatments could increase costs significantly; likewise, there are opportunities to reduce costs as well. The Nashville region minimized costs for its future Music City Star commuter rail service by acquiring used rail passenger cars from the Chicago METRA system via a transfer of federal interest, and the system also purchased and rehabilitated used Amtrak locomotives. In addition, station development costs can be reduced through the donation of land, use of shared parking, provision of only limited amenities, and other practices. Cost-saving techniques such as those mentioned here should be more fully explored in future stages of planning.

Operating Costs

Annual operating costs of commuter rail did not figure into the comparative analysis of corridors, because it is assumed that the same basic operating plan would be used regardless of corridor. Since the corridors are similar in length and the same operating plan is assumed in each one, the projected operating costs do not vary by corridor at this level of analysis.

However, estimated annual operating costs are presented here for completeness. These costs were projected using similar unit costs as estimated for the planned Albuquerque and Nashville commuter rail systems, along with the operating plans as presented in Section 4. Based on these data, the annual operating cost for each corridor is estimated in the range of $8 million to $10 million. It should be noted that this cost is based on an operating plan that provides ten round trips per day, and the operating cost could be reduced significantly if the number of trips is reduced (Nashville, for example, plans to operate six round trips per day). In comparison, Albuquerque's annual operating cost is estimated at $10 million, and Nashville's operating cost (with fewer trips) is projected to be approximately $3 million.

6.4.4. Ease of Implementation

As stated earlier, the "ease of implementation" criterion is a subjective assessment of the attributes of each corridor that impact its likelihood for successful implementation of commuter rail service.

Batesburg-Leesville Corridor
This corridor has a relatively low volume of freight rail traffic, decreasing the likelihood of scheduling conflicts between freight and passenger trains. However, for much of the corridor between Batesburg-Leesville and Oak Grove, the rail corridor is far-removed from the highway corridor that potentially would be used by an interim BRT service, decreasing the ability of the commuter rail corridor to support transit-oriented development as a precursor to rail service.

Camden Corridor
Of the three corridors, the Camden corridor has the lowest volume of freight rail traffic. Two daily Amtrak trains do operate in this corridor, but they provide service in the late night hours and would not conflict with commuter rail operations. In addition, because the rail line is adjacent to US 1 (for potential BRT service) for much of the corridor, a phased implementation beginning with BRT and transitioning to commuter rail service is much more viable. Development supporting BRT service could also support future commuter rail service after it is implemented.

Newberry Corridor
The Newberry corridor has the highest volume of freight traffic of the three corridors, which could increase the difficulty in establishing shared passenger and freight operations. The rail line is adjacent to US 76 for much of the corridor (where interim BRT service could be provided), but the likelihood for transit-oriented development in the rural areas between Irmo and Newberry is limited in most areas.

Summary
Based on the above descriptions, the corridors were ranked according to Exhibit 6-8 under this criterion.

Exhibit 6-8: Ease of Implementation Ranking by Corridor

Rank	Corridor
1	Camden
2	Batesburg-Leesville
3	Newberry

6.4.5. Public Opinion

The "public opinion" criterion is a subjective assessment of the feedback and overall level of interest expressed by stakeholders and the general public regarding each corridor. A full description of the public participation component of the study is contained in Section 5.

Batesburg-Leesville Corridor
The Batesburg-Leesville corridor had a relatively low level of participation at the public forum held in Lexington, although the participants were interested in the prospect of commuter rail service. Stakeholders representing jurisdictions along the corridor had a mixed reaction concerning commuter rail, with some officials being supportive and others being apprehensive.

Camden Corridor
The Camden corridor had a medium level of participation at the public forum held in Lugoff, including attendance by several local elected officials. In discussions with area stakeholders, there was some interest in commuter rail service.

Newberry Corridor
Of the three corridors, the Newberry corridor had the highest level of participation at the public forum held in Chapin, with most of the attendees having a favorable view toward commuter rail service. Stakeholders along the corridor have indicated a mixed level of interest in the potential service.

Summary
Based on the above descriptions, the corridors were ranked according to Exhibit 6-9 under this criterion.

Exhibit 6-9: Public Opinion Ranking by Corridor

Rank	Corridor
1	Newberry
2	Camden
3	Batesburg-Leesville

6.4.6. Summary of Comparative Analysis

Based on the five criteria presented above, the Camden corridor received the highest rating, with a first-place ranking in four out of the five criteria. The Newberry corridor ranked second, and the Batesburg-Leesville corridor ranked third. As shown in the summary matrix in Exhibit 6-10, the Camden corridor has clear advantages over the other two candidate corridors.

Exhibit 6-10: Summary Matrix for Ranking by Corridor

	Camden	Newberry	Batesburg-Leesville
Ridership (25%)	1	2	3
Access / Land Use (20%)	1	2	3
Cost (25%)	1	3	2
Ease of Implementation (15%)	1	3	2
Public Opinion (15%)	2	1	3
Weighted Total (lowest is best)	1.15	2.25	2.60
Overall Rank	1	2	3

6.4.7. Comparison to Peer Systems

The order-of-magnitude cost and ridership estimates that were produced for the Central Midlands effort were used as a basis for comparison to similar settings in which commuter rail service is actively being planned. Specifically, the ridership and cost projections for the three Central Midlands corridors were compared to that of planned commuter rail lines in Albuquerque, Charlotte, and Nashville.

It should be noted that the related figures for Nashville and Charlotte vary significantly, based on the scope of each project. Nashville is taking a "bare bones" implementation approach, using basic stations and used rail cars, whereas Charlotte is providing more track improvements, new vehicles, and amenities. The current estimates for Nashville project 1,500 daily passenger boardings, with an implementation cost of approximately $40 million. Plans for Charlotte currently estimate an implementation cost of $275 million - $290 million, with 2,500 to 5,000 daily riders. Albuquerque's projected cost is between that of Nashville and Charlotte, but its corridor is significantly longer than that of Nashville or Charlotte.

A comparison of projected ridership and cost between the Central Midlands corridors and the three peer corridors is given in Exhibit 6-11. As illustrated in the table, the estimated ridership of the Camden corridor compares favorably with the projected Nashville ridership, and the Newberry corridor approaches Nashville's estimated ridership. The estimated patronage for the Batesburg-Leesville line falls far below that of the peer systems.

In terms of cost per mile, the Nashville corridor (32 miles in length) is estimated to cost approximately $40 million, resulting in a unit cost of $1.25 million per mile. On the other end of the spectrum, Charlotte's North Corridor is envisioned as a full service line, costing $290 million for a 30-mile corridor, or $9.7 million per mile. Compared to these corridors, the Camden line's costs are competitive - $80 million for 33.3 miles of service, or $2.4 million per mile. The Newberry and Batesburg-Leesville lines also have reasonable unit costs, at approximately $2.8 million per mile.

Exhibit 6-11: Comparison to Peer Cities

	Ridership (daily boardings)	Capital Cost
Camden Corridor	1,900 – 2,300	$80 million
Newberry Corridor	1,200 – 1,500	$120 million
Batesburg-Leesville Corridor	600 – 800	$92 million
Albuquerque	not available	$125 million (1)
Charlotte	2,500 – 5,000	$275 - $290 million
Nashville	1,500	$40 million

(1) Includes $50 million for purchase of right-of-way

Central Midlands Commuter Rail Feasibility Study

SECTION 7:
CONNECTIONS TO REGIONAL HIGH SPEED RAIL

7.1. PURPOSE OF ANALYSIS

The purpose of this element of the overall analysis is to examine and recommend a corridor connecting the study area to the potential regional high speed rail corridor that would pass through the Upstate of South Carolina. This connection would serve as a passenger link between the Columbia area and a terminal point in either Charlotte or Spartanburg, both of which lie along the primary corridor for the Southeast High Speed Rail service.

Originally, the primary service consideration was in the Columbia-to-Charlotte link, but upon further discussion, the Columbia-to-Spartanburg connection was opened for additional consideration primarily because of the opportunity to establish service in the Columbia-to-Newberry segment first as part of regional commuter rail service. If costs have been incurred to upgrade infrastructure to enable commuter service in the Newberry Corridor, it may be a more effective use of resources to continue this line from Newberry to Spartanburg, as compared to upgrading the line between Columbia and Charlotte for a regional connection.

This evaluation is intended to estimate the current conditions of each of these two corridors, and to determine which corridor requires a higher level of investment to enable passenger rail service. This information, along with additional, more qualitative considerations, was used to develop a recommendation for the preferred connection between the Central Midlands region and the proposed Southeast High Speed Rail corridor.

7.2. CHARACTERISTICS OF POTENTIAL CONNECTIONS TO HIGH SPEED RAIL CORRIDOR

The following points highlight the current status of the rail corridors linking Columbia to Charlotte and Spartanburg. These items are indicative of the level of effort needed to bring each corridor up to passenger rail standards.

7.2.1. Columbia - Charlotte Corridor

- Total distance from downtown Columbia to downtown Charlotte = 113.2 miles via Norfolk Southern “W”, “R”, and Mainline tracks

Track Condition
- Very good condition (fairly heavy usage)

Track Speeds
- 50 mph in most areas; restrictions to 30 mph through Winnsboro; restrictions to as low as 20 mph or less on selected curves

Track Curvature
- Track curvature generally less than 5 degrees
- 182 “visual” curves along alignment

Grade Crossings
- "Active" crossings (flashing lights and gates): 99
- "Passive" crossings (crossbuck only): 39
- "Private" crossings (to access private property): 20

Existing Freight Traffic
- Difficult to project; depends on the daily need for freight movements
- "W" Line (Downtown Columbia): Approximately 18 trains per day
- "R" Line (Columbia to Charlotte): Approximately 6-18 trains per day
- Mainline (Charlotte): Approximately 36 trains per day

Track Sidings
- Several track sidings along the corridor; most are fairly short in length

Signals
- All three sections ("W", "R", and "Mainline") are signalized; age of equipment is not known
- Changes to existing signals may require changes to the entire line

Other Considerations
- Many overhead highway bridges may have close clearance issues
- Fiber optic cables in railroad right-of-way would need to be protected for any reconfiguration
- Provisions would need to be made for car storage and servicing at each end of the trip

7.2.2. Columbia - Spartanburg Corridor (via Newberry)

- Total distance from downtown Columbia to downtown Spartanburg = 109.5 miles via CSX Transportation Columbia, CN&L, Monroe, and Spartanburg Subdivisions
- Distance from Newberry (end of proposed commuter rail) to Spartanburg = 68.2 miles

Track Condition
- Good condition (fairly heavy usage); approximately 6 miles of jointed rail north of Clinton (ride is not as smooth as continuously welded rail)

Track Speeds
- 49 mph in most areas between Columbia and Newberry (with some restrictions to 30 mph); speed varies between 25 mph and 40 mph in most areas between Newberry and Spartanburg due to numerous curves

Track Curvature
- Track curvature increases as railroad extends north to Spartanburg; many grade changes and curves in northern section
- 191 curves along alignment

Grade Crossings
- "Active" crossings (flashing lights and gates): 105
- "Passive" crossings (crossbuck only): 47

- "Private" crossings (to access private property): 82

Existing Freight Traffic
- Difficult to project; depends on the daily need for freight movements
- CN&L Subdivision (Columbia to Newberry): Approximately 16-22 trains per day
- Monroe Subdivision (Clinton): Approximately 35 trains per day (overlap between CN&L and Monroe Subdivision)
- Spartanburg Subdivision (north of Clinton to Spartanburg): Approx. 20-24 trains per day

Track Sidings
- Eleven track sidings along the corridor; most are fairly short in length

Signals
- Most of corridor is unsignalized (CN&L and Spartanburg Subdivisions)
- Signalization is necessary for passenger rail

Other Considerations
- Many overhead highway bridges may have close clearance issues
- Fiber optic cables in railroad right-of-way would need to be protected for any reconfiguration
- Provisions would need to be made for car storage and servicing at each end of the trip

7.2.3. Comparison of Existing Conditions

As noted in the above items, both corridors have challenging elements associated with improving the line to enable efficient passenger rail service. Although both corridors are in fairly good condition at the present, there are many curves and speed restrictions on both lines that hinder overall travel speed. Much of the Columbia-Spartanburg corridor north of Newberry is restricted to speeds less than 40 mph, which would severely impact travel time unless major track upgrades are made. Likewise, service in the Charlotte corridor would be restricted to 50 mph or less, which is not competitive with automobile speeds between the two cities.

There are a few more "active" and "passive" grade crossings to be addressed in the Spartanburg corridor as compared to the Charlotte corridor; in addition, there are significantly more private grade crossings to be considered in the Spartanburg corridor. Freight traffic levels (representing potential scheduling conflicts with passenger rail service) are highly variable in both corridors, but in general, the Spartanburg corridor tends to have a higher volume of freight rail movements. With regard to signalization, significant investments could be required in each of the corridors. Most of the Spartanburg corridor is currently unsignalized, whereas the Charlotte alignment is signalized (though upgrades may still be needed).

In general, the Spartanburg line requires more infrastructure upgrades; however, consideration must be given to the fact that if commuter rail service to Newberry is implemented and the Columbia to Newberry portion of the corridor has already been improved, the remaining corridor length to Spartanburg is approximately 68 miles (as compared to about 113 miles between Columbia and Charlotte).

7.3. ESTIMATED INFRASTRUCTURE COSTS

The information described above was used as the basis for estimating the costs required to upgrade each corridor for passenger rail service. Exhibit 7-1 summarizes the projected costs for the major categories of infrastructure improvements. As illustrated in the table, the projected cost associated with instituting service on the Columbia to Charlotte corridor is less than the cost of establishing service in the Columbia to Spartanburg corridor. However, if commuter rail service were already in place to Newberry, the additional cost of extending service to Spartanburg would be less than the cost of the Columbia to Charlotte corridor.

Exhibit 7-1: Estimated Infrastructure Costs for High Speed Rail Connections

Item	Columbia – Charlotte	Columbia – Spartanburg	Columbia – Spartanburg *(assuming existing commuter service to Newberry)*
Crossing Improvements	$16 million	$35 million	$11 million
Siding Improvements	$4 million	$12.5 million	$1.5 million
Signalization Improvements	$26.4 million	$27.5 million	$22.5 million
Track Improvements	$3 million	$2.5 million	$2.5 million
Miscellaneous Improvements	$12 million	$12 million	$12 million
Total Costs	**$61.4 million**	**$89.5 million**	**$49.5 million**

Crossing Improvements

The number and type of grade crossings vary between the potential rail corridors. Grade crossings with flashing lights and gates are considered to have active crossing protection. Those with only a crossbuck are considered to have passive protection. Private crossings, which are sometimes field to field access or may provide access to a single residence, may have no form of protection. Grade crossing costs associated with adding passenger rail to the route would at a minimum require the existing passive crossings to either be closed or have active warnings added to the crossings.

<u>Charlotte Corridor</u>

The crossing improvements in the Columbia – Charlotte corridor include upgrading the passive crossings to active warnings and upgrading active crossings with flashing lights to active warnings. Crossing improvements also include adding engineering, flagging and associated items requiring a cost for improvements to the crossing signals in the $16 million range.

<u>Spartanburg Corridor</u>

To increase passenger speeds above the existing speeds, upgrades for each of the 105 active grade-crossing warning systems are needed and the 129 passive protection systems (including private crossings) will have to be upgraded to active systems. The cost to accomplish this task is estimated to be $35 million.

Siding Improvements

Railroads utilize passing sidings to pass trains moving in opposing directions. The availability of using sidings to pass trains will be important to any passenger rail operation. To pass trains in a mixed passenger/freight operation, typically the freight train will take the passing siding while the passenger train passes on the main track. Due to the time sensitive nature of passenger traffic, it is not efficient to have the shorter passenger trains waiting in the siding for a longer freight train to pass.

Charlotte Corridor
A minimum of one new two-mile siding and improvements of one-mile each to at least two sidings is required to efficiently pass opposing trains. The cost associated with these improvements is estimated to be $4 million.

Spartanburg Corridor
The addition of a minimum of five, two-mile passing sidings will be required to efficiently pass opposing trains. The cost associated with the addition of five passing sidings and their associated signal systems is estimated to be $12.5 million.

Signal Improvements
Track charts and timetables were referenced to identify signalized sections of the corridors. Trains operate under dispatcher permission utilizing direct traffic control block system (DTC) or under signal indication (CTC). Signal improvements focus on the elimination of DTC operations. DTC operations are labor intensive for dispatchers; they will be required to manage freight and passenger traffic.

Charlotte Corridor
According to the track charts, each line is signalized. However, as enhancements to the siding improvements discussed above, signal projects may be required at the one new siding and two siding improvements. The improvements will also address interchange points and system adjusts to support speed increases. The cost to accomplish this task is estimated to be $26.4 million.

Spartanburg Corridor
According to track charts and timetables there are segments in the Columbia – Spartanburg corridor under DTC operation. Signalizing the route will be required to provide for a safer, more efficient means of dispatching the trains carrying passenger and freight traffic. The cost to accomplish this task is estimated to be $27.5 million.

Track Improvements
The entire route track is mainline track and is in good condition. In all corridors, nominal improvements are needed for the existing track structure to accommodate the commuter rail traffic.

Charlotte Corridor
There are two interchanges, Chester and Rock Hill, where costs could be incurred due to adding high speed passenger services to the route. At a minimum there should be $3 M added to provide better connections at these two locations; $1 M at Rock Hill and $2 M at Chester.

Spartanburg Corridor
The Columbia – Spartanburg corridor is mainline track, with one section of jointed rail. The jointed rail will need to be upgraded to continuously welded rail. The cost to accomplish this task is estimated to be $2.5 million.

Miscellaneous Improvements
Other costs such as the following may be incurred in each corridor:

- Costs associated with a small platform and parking area, along with ticketing and other services;
- Potential clearance issues with overhead bridges; and
- Potential relocations of fiber optic lines.

A placeholder value of $12 million was added to the costs associated with each corridor to account for these types of improvements.

7.4. SUMMARY OF ANALYSIS

Based on the projected infrastructure costs in each corridor, it appears that the Columbia to Charlotte corridor offers a more effective opportunity for connecting to the potential Southeast High Speed Rail line. The caveat to this statement is that if improvements were to already be made to the Spartanburg corridor enabling commuter rail service to Newberry, the additional costs of extending service to Spartanburg would be less than the costs of establishing new service to Charlotte. Furthermore, there may be additional business ties between Columbia and Charlotte that could be strengthened with a rail connection.

An important note with regard to these costs is that the levels of investment shown are necessary to provide passenger service within the existing speed limitations of the tracks. Both of these corridors restrict train speeds to 50 mph or less, and to be competitive with private automobiles (or intercity buses), extensive upgrades would be needed to straighten curves and / or add superelevation to increase the speeds of the passenger trains. It is difficult to project the costs associated with these types of improvements at this stage of analysis, but the level of investment would be much greater than the costs shown in Exhibit 7-1. Further analysis may in fact determine that the costs associated with increasing the maximum speeds along these corridors may make the establishment of passenger service cost-prohibitive.

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SECTION 8: ACTION PLAN

8.1. PROJECT FINDINGS

The results of the evaluation indicate that each of the corridors analyzed exhibit characteristics supporting the implementation of high capacity transit and that the Camden corridor should receive priority consideration. Corridor population densities, the strength of downtown Columbia as a regional destination and employment center, and the proximity of activity centers to the existing freight rail lines create a positive environment for potential rail services. Projected population and employment in each of the three corridors show that these characteristics will only improve over time and the investment in transit will become more and more cost effective.

These findings present an opportunity for the region to address mobility concerns before they reach critical mass. A number of action items are summarized in Section 8.3 that will facilitate the planning process and position the region strategically to implement future high capacity transit accordingly.

8.2. FINAL PUBLIC MEETING

During the course of the study, CMCOG held three initial public meetings, one in each corridor. These meetings are summarized in Section 5. The study culminated at a fourth public meeting held at the Richland County Public Library in Columbia on May 31, 2006. There were 21 attendees, all of whom supported the project findings and were generally excited about the prospect of new investment in transit within the region. The comments at the meeting from the public related to four primary topics.

1. Environmental justice – The primary concern was that many of the findings for the commuter rail system were directed at providing service to suburban residents into the Downtown area and did not address the need for urban and lower income populations to access jobs, some of which were in the suburbs.

   Response:
   A commuter rail service which was the focus of this study gains most of its ridership from suburban passengers traveling into the urban core of the region. There are other initiatives in the region to address traditionally underserved populations but it is not the focus of the commuter rail study. However, the operating plans for each of the corridors included reverse commute trips in the AM and PM peak periods as well as the midday in order to provide some service in the off-peak direction.

2. State Legislation – The attendee cited the need for State legislation to facilitate the investment in transit for the Region.
   Response:
   An increase in the State's financial assistance would certainly aid in the development of regional transit programs especially on the capital cost side.

3. Funding – The lack of a local funding mechanism for transit was cited.
   Response:
   This point raises one of the primary obstacles for major transit investment in Columbia. The Action Items included in Section 8.3 go into greater detail, but establishing a local

funding mechanism in the region to fund both capital and operating costs will be essential if an investment in commuter rail is to become a reality.

4. Need Distribution/"Get the word out" – The attendee felt like the study had not been publicized widely enough and recommended that we request to be interviewed on radio.
   Response:
   A total of four public meetings were held during the course of the study with very good attendance. Information about the study was published in the form of fact sheets and distributed to the municipalities, libraries and other media outlets. The Rail Committee at Central Midlands COG, will be using information from the study to present findings to chambers of commerce and other interested groups to increase awareness and support for transit in the region.

8.3. ACTION ITEMS

A series of recommendations was developed that must be implemented regionally in order to maximize the effectiveness of commuter rail or any other form of high capacity transit. They are intended as a prerequisite to beginning the development process for a specific high capacity transit project in a specific corridor. The following recommendations are offered:

- Support regional transit and secure stable local funding for transit;
- Adopt land use ordinances and policies encouraging transit-supportive development;
- Develop interim transit service in corridors;
- Establish a regional educational program on the benefits of transit;
- Allocate resources to advance the planning process, including development of a regional transit model;
- Identify and preserve potential station sites;
- Coordinate on a continual basis with freight rail operators; and
- Seek a "champion" to advocate for transit interests.

8.3.1. Support Regional Transit and Secure Stable Local Funding for Transit

Public funding for commuter rail projects can be available at the federal, state, and local levels and many projects rely on funds from a combination of all of these governmental sources. Federal funding distributed through the Federal Transit Administration (FTA)'s "New Starts" program is highly competitive. Even if a project compares favorably to other proposed projects across the country and meets the FTA's stringent requirements for funding, the federal share will be only a maximum of 50% of the total capital cost of the project. The remaining 50% of the cost must come from other sources, primarily state and local governments.

Although support for transit is on the rise in the Central Midlands region, transit service funding still faces an uphill battle. Regional stakeholders are seeking a dedicated stream of funding from county-level sources such as a vehicle registration fee increase, a property tax increase, or a dedicated sales tax for transportation projects. Potential dedicated funding sources from municipalities are also being investigated. Depending on the size of these funding streams, the necessary local funds for the advancement of commuter rail planning and implementation could also come from the designated local source.

State funding for transit in South Carolina is limited, and is provided through a set-aside of ¼ of 1 cent of the state motor fuel tax. These funds are distributed by the South Carolina Department of Transportation (SCDOT) to the state's public transit providers, and are typically used by the providers as matching monies for federal grants. This revenue stream generates approximately $6 million annually for transit in South Carolina. This amount of state funding falls well short of meeting the needs of the state's transit agencies, and it is clear that this source of revenue can not be relied upon as a meaningful contributor to the possible implementation of commuter rail. Additional state revenues would need to be identified if the state elected to assist in financing a commuter rail project.

A stable source of local funds is needed to ensure that CMRTA can continue to provide effective and efficient transit service throughout the region. Supporters of commuter rail should fully strive to ensure CMRTA remains a viable system, because commuter rail service will not be possible without a strong regional bus transit system in place. All cities with commuter rail service have an effective local / regional bus transit system to feed into the commuter rail system. Furthermore, it is difficult to justify the establishment of a commuter rail service that is oriented primarily to "choice" riders if there is no effective local / regional bus transit system in place to serve the basic needs of residents that have no other travel options.

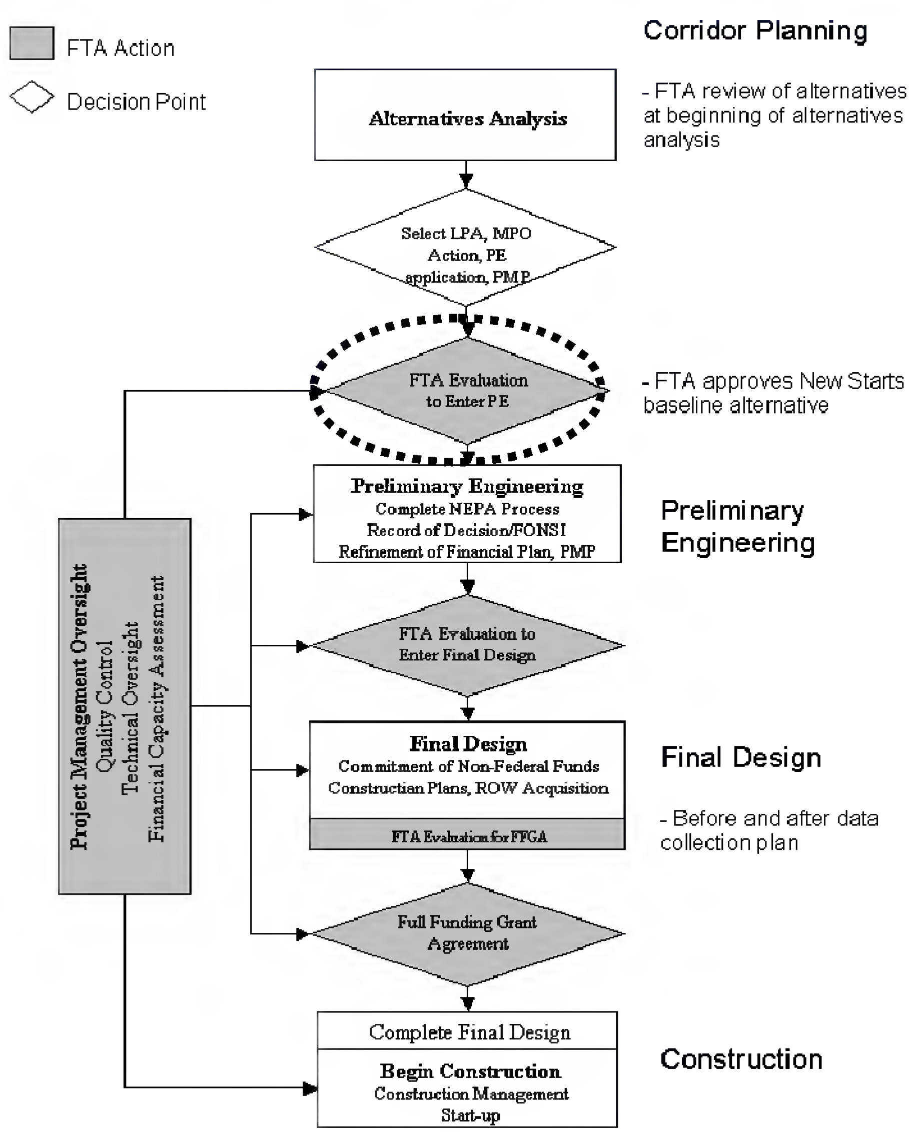
If a dedicated source of local funding is not identified soon, CMRTA will be forced to make drastic service cuts. Such cuts would represent a serious step backward for the supportive transit services vital to the success of future high capacity transit. However, if stable and significant local funds are identified, transit in general will be poised for new growth in the region. Transit could become a viable commute option for a much higher percentage of the population. Suburban participation and cooperation with the urban core on a regional funding mechanism for transit will greatly improve the region's standing with the FTA and enhance the probability for a favorable recommendation on major transit investments.

Because the local funding sources being investigated are applied at an individual county level, there is the possibility of local funds being provided in one county but not the other. Furthermore, the top two rail corridors extend into Kershaw County and Newberry County, respectively, where there are no immediate plans for dedicated transportation funding. As commuter rail planning proceeds, special attention must be paid to identifying local funds that are attributable to all of the jurisdictions that would receive service. For example, Richland County would likely be hesitant to provide the entire local match for a service that extends into Kershaw County.

Short of a new county-level tax or vehicle registration fee, there are other more targeted revenue generation methods available. Involving the business community can be a rewarding partnership. Simply designing routes to serve major employment areas can be incentive enough for businesses to support transit financially for the sole benefit of expanding its labor pool. Some regions have implemented Transportation Management Associations (TMA) in areas where there is a high concentration of employers. The TMA is a non-profit organization comprised of representatives from the employers themselves. Through the TMA, employers are able to pool their resources to assist their employers with transportation to and from work. The TMA is eligible for federal funds and has the ability to provide shuttle services to and from transit stations, fund local routes and institute bus pass programs.

Community Improvement Districts (CID) and Tax Allocation Districts (TAD) are possible methods for self-taxing mechanisms at the sub-regional level. Through legislative processes, which may or may not be available in South Carolina, these districts can be established along a commuter rail line to generate revenue for transit and other transportation improvements within the district. Bundling roadway and pedestrian improvements with transit usually makes these initiatives more palatable and they generally succeed because the proceeds always target improvements in the geographical areas from which they were generated.

Federal Transit Administration
"New Starts" Project Development Process



FTA has established a very stringent process for region's to obtain funding for major transit investments. As a project is developed, the region must obtain FTA approvals at several points in the process.

None of the corridors in Columbia have been through an alternatives analysis to determine the "locally preferred alternative". At the end of that study, a region can submit a New Starts application in order to move to preliminary engineering (circled).

Many projects do not receive this approval because their application receives a Low Cost Effectiveness Rating or Low Financial Rating.

Cost effectiveness of a transit investment is a measure of the project's benefit to all transportation system users, transit passengers and motorists, a calculation based on regional travel time savings.

The financial rating is based on the non-federal portion (at least 50%) of a project's funding program for the capital cost and the region's ability to sustain revenues to cover operational costs.

Source: FTA Website

8.3.2. Adopt Land Use Ordinances and Policies Encouraging Transit-Supportive Development

As mentioned earlier, the presence of land development patterns that are supportive of transit services will help increase the size of the ridership base for commuter rail service. Even though research suggests that high densities are not as critical for the viability of commuter rail as compared to other high-capacity transit modes, it is important for jurisdictions in the region to recognize the connection between land use decisions and transportation system impacts. Encouraging residential development around station sites would help to expand potential ridership, and additional commercial areas could serve as destinations for residents of other areas.

Furthermore, in many cases, preferred station sites would be near the centers of the jurisdictions located along the rail corridors. The designation of these station sites presents an opportunity for jurisdictions to develop larger plans that integrate a rail station into the community and include other uses as well. Communities that are undertaking planning or development studies should seek to include potential rail stations in these planning efforts.

At this stage, it is important for local jurisdictions to understand the concept and benefits of transit-oriented development. It is recognized that changes to a jurisdiction's planning approach do not occur quickly, and local officials should first learn more about this planning philosophy. Learning from the experience of peer towns would be beneficial. The towns of Huntersville, Cornelius, and Davidson in Mecklenburg County, North Carolina have adopted transit-oriented development principles associated with the planned North Corridor commuter rail line to Charlotte. CMCOG and interested jurisdictions should arrange a visit to these communities to learn from their experiences and see the results in the field.

Local stakeholders should also work to encourage additional employment development in downtown Columbia. As demonstrated by the research cited earlier, the size and density of downtown employment is a primary indicator of the potential viability of commuter rail service. Projects such as the Innovista research campus could dramatically change the face of downtown Columbia, and provide another key destination for commuter rail passengers.

8.3.3. Develop Interim Transit Service in Corridors

The Region can encourage conditions that support high capacity transit through the continued growth of suburban express bus service in the corridors. The implementation of bus services in these corridors can generate latent demand for transit service. If the service is reliable, commuters will grow accustomed to using transit. Once rail services are introduced there will already be a solid base of ridership established and the public perception of rail being more reliable should translate into even higher ridership.

As the highest rated corridor, the Camden corridor should be pursued initially through the implementation of more frequent express bus service. Current SmartRide routes should be continued as soon as sustainable funding can be established. A continual effort to improve upon the SmartRide service must be made to increase the attractiveness of the service to potential passengers. Increased frequency and hours of service, station amenities, passenger information systems, and techniques to give the transit vehicle a competitive advantage over the automobile are needed to expand the attractiveness of the service and make it operate more akin to a rail service. These improvements can happen gradually, but merely continuing the existing service is not enough to build additional support for commuter rail. The types of improvements mentioned here are needed to help create a more supportive environment for transit in the Midlands. As residents see and experience transit improvements and learn to rely on the system, they will be more supportive of further enhancements (and large investments like commuter rail).

The operating plans described in Section 4 include suggestions for SmartRide service modifications to serve the primary corridors. As the top-rated corridor, the immediate focus should be on improving the SmartRide service in the Camden corridor. Short-term suggestions include establishing interim park-and-ride lots in northeast Richland County, exploring Intelligent Transportation Systems technologies such as signal preemption to allow buses to decrease their travel time, and working closely with downtown employers to inform employees about the service.

CMCOG should also work closely with CMRTA to maintain a pulse on the need and desire for transit circulator service in the downtown area. An effective downtown circulator system must be provided in association with commuter rail service, because commuter rail will only have one central stop in the downtown area. Circulation services are not as vital if express buses are used, because the buses themselves can perform the circulation function (like the current SmartRide operations). As downtown continues to grow, there may be a renewed impetus for circulation services using CMRTA's trolleys.

8.3.4. Establish a Regional Educational Program on the Benefits of Transit

Traffic congestion, air quality and rising fuel costs will worsen over time and the ability to increase capacity on the roadways will grow more difficult. In addition, many citizens are not completely aware of the benefits of transit or are not willing to sacrifice the convenience of an automobile to use transit. Therefore, an education program on the benefits of transit may be beneficial to increase the willingness in the region to explore transit investment in the future; change the mindset of the motorist; and reduce the dependence on automobiles.

The educational program could be offered in the school system, to inform people at an early age that transit investment should be considered as one of many tools to ensure mobility and reduce congestion. A transit program, coordinated with better land use policies, enhancements to other alternative modes, as well as strategic roadway improvements, will help the region accommodate future growth. In addition to enhanced mobility and reduced congestion, transit investment has other benefits which could be covered in an education program:

- Station sites (especially for rail facilities) can become targeted areas for development and economic growth;
- Once a transit investment is implemented, capacity can be increased with additional vehicles and no additional right of way. (Roads require new land area with widening or bypasses); and
- Rail transit generally elicits 40% more ridership when replacing comparable bus service. (National Average – American Public Transit Association).

8.3.5. Allocate Resources to Advance the Planning Process, Including Development of a Regional Transit Model

One of the difficulties in evaluation for this study was that each of the corridors extended beyond the current regional travel demand model geography. To estimate ridership, planners were required to piece together trip patterns across three different demand models. A sketch-planning level impedance spreadsheet model was then employed to generate ridership estimates (See Section 6). This methodology, though appropriate for this level of analysis, does not meet FTA guidelines for alternatives analyses associated with the New Starts Program. A full-scale travel demand model with a transit network will be required to advance any major transit investments in the region.

CMCOG has already begun the process of expanding the existing model using TransCAD software, which is compatible with FTA's Summit program. Summit manipulates model outputs and measures the Transportation System User Benefit of a transportation project, a measure used to compare projects nationally. CMCOG's updated regional travel demand model should cover adequate geography and will need to eventually include a transit network for more detailed commuter rail planning. The development of this model will be critical as the region plans for future transportation demand. In the coming years, CMCOG should allocate sufficient funding resources to enable the development of an expanded and updated regional model.

8.3.6. Identify and Preserve Potential Station Sites

The station sites for the three candidate corridors were developed primarily from potential sites listed as a part of the 2000 Commuter Rail Feasibility Study. These sites are reasonably located for the purposes of this study; however, they should be reexamined as a part of future analyses. Key considerations for station sites include their proximity to other stations, potential for supportive development, and efficient access to interstate facilities for interim bus services.

Because of its capability to transition from bus services to rail services using the same station areas, station sites along the Camden corridor should have top priority. Formalizing the parking facilities served by both existing and future bus services will be critical to the development of a ridership base and will also help preserve station sites for future commuter rail.

The station sites on the Camden line need to be formally reexamined once the new travel demand model is developed. The station spacing between the Elgin, Lugoff, and Camden station sites is fairly close. Ridership estimates from the sketch planning model indicated very few boardings at the Lugoff station, primarily because a large percentage of its catchment area extends beyond the Camden station. Based on the analysis in this study, the elimination of the Lugoff station would not significantly reduce ridership for the corridor, but would reduce the overall cost of the commuter rail line. It is not recommended to eliminate the station at this stage of project development, but station productivity should be explored in future planning phases.

8.3.7. Coordinate on a Continual Basis with Freight Rail Operators

An important aspect of commuter rail development is the early and continuing coordination with CSX Transportation and Norfolk Southern or other private entities who own the right-of-way.

The railroads deal with commuter rail planning and implementation in many regions throughout the United States. Freight operators are receptive to discussions, and there are numerous examples of successful shared use agreements allowing passenger service to operate on tracks owned by a freight operator. Naturally, freight companies are most concerned with avoiding any impacts to freight operations, and the case must be made to them regarding why it is a good business decision for them to allow passenger rail operations on their tracks. For example, if the passenger rail operation can minimize impacts to freight operations and offer capital improvements at grade crossings and curves that benefit both passenger and freight traffic, the freight operators may be willing to negotiate an agreement.

CSX and Norfolk Southern representatives have been made aware of this initial feasibility assessment. Once one of the corridors is advanced into more detailed phases of analysis, CMCOG should engage the railroads into that process. It is important to clarify and maintain expectations on both sides. A possible advantage for the Camden corridor (as the top-ranked corridor) is the fact that freight traffic in the corridor is relatively light, reducing the potential for scheduling conflicts.

8.3.8. Seek a “Champion” to Advocate for Transit Interests

The foundation for commuter rail in the Midlands is the need for a “champion”. In all of the peer cities where commuter rail is gaining momentum, there is a Governor, Mayor, community or business leader, or some other stakeholder that has led the advocacy for transit at the local level. This advocate must be a highly-regarded local resident who has the knowledge, charisma, and determination to rally local citizens to support transit and commuter rail.

Cities remain dominated by the automobile, especially in the Southeast. As traffic congestion worsens, transit can be a cost effective method for providing the commuting public an alternative. Once the initial investment is in place, which is always the toughest to implement, future expansion becomes more and more cost effective. The Central Midlands region is already showing some of the characteristics that support commuter rail and other high capacity transit technologies. To build upon this momentum and spur the region to action, a champion is needed.

Central Midlands Commuter Rail Feasibility Study

APPENDIX A:
EXISTING TRACK CONDITIONS IN CORRIDORS

COLUMBIA TO BATESBURG-LEESVILLE

Information on the rail line from Columbia, SC to Batesburg-Leesville, SC was gathered from various available track charts, the FRA web site, and other sources. The area of interest was assumed to be from the AMTRAK station in Columbia, SC, located on the Norfolk Southern W-Line, to the R-141 milepost on the south side of Batesburg-Leesville. This should take into account any areas in the Batesburg-Leesville area that would be acceptable for a commuter rail station. This route will also serve the old Union Station adjacent to Assembly St. in Columbia, with the northern-most milepost being assumed as R-108.3. Using the railroad mileposts, the total distance from the farthest point in Batesburg to the old Union Station is 32.7 miles. If the existing Amtrak station is to be served, then the commuter train would likely have to leave the NS tracks at milepost R-109.0, and use the CSXT track from there to the existing Amtrak station approximately 0.6 miles on CSXT. It should be noted that not all railroad milepost miles are exactly 1 mile apart, but vary in length.

Additional information has revealed there is a possible station for the university shown on the R-Line near the Blossom St. area on the USC campus. This station would be track north of the old Union Station site at approximately milepost R-107.5. The portion of the line from the old Union Station site to the proposed site off Blossom St. will be discussed as a separate portion, after discussion of the portion from Batesburg to Columbia (old Union Station).

Batesburg to Old Union Station and Existing Amtrak Station

TRACK CONDITION:

All the route trackage is mainline track with moderate tonnage traffic, and is in good condition. The only area of track that might not be as well maintained is the section of the R-Line at the old Union Station. This section is lighter weight rail, and is little used since most rail traffic moves north-south on the R-Line by way of Andrews Yard and the Norfolk Southern SC-Line. General limits of this section are R-108.0 to R-108.4.

The existing track in the area west of the Congaree River bridge is generally shown as having a freight speed limit of 49 mph. Based on the track chart freight speed of 49 mph, and using the FRA track speeds shown in 49CFR213, this track is maintained to FRA Class 4 standards. The maximum freight speed for Class 4 track is 60 mph, and the maximum passenger speed is 80 mph.

TRACK CURVATURE:

In general, the track curvature west of the Congaree River shows no curves greater than 3 degrees. In three cases, the track charts indicate there are compound curves, so what may look like one curve in the field are actually multiple curves tied together. By line section, the number of curves is shown for both conditions:

W-Line	4 individual curves	4 "visual" curves
R-Line	33 individual curves	30 "visual" curves

TRACK SPEEDS:

The track speeds on the short portion of the W-Line are generally 20 mph. This should not be a problem, since this is mainly a switching move to the existing Amtrak station.

The R-Line track charts show freight track speeds of 49 mph in most areas; except in the area of the bridge over the Congaree River, where there is a speed restriction to as slow as 20 mph. This area of slow track speeds should not hamper commuter rail transit times, since it would likely be considered within the terminal. The various connections and routings east of the river would slow traffic anyway.

The existing track in the area west of the Congaree River bridge is generally shown as having a freight speed limit of 49 mph. Based on the track chart freight speed of 49 mph, and using the FRA track speeds shown 49CFR213; this track is maintained to FRA Class 4 standards. The maximum freight speed for Class 4 track is 60 mph, and the maximum passenger speed is 80 mph. On the track west of the river, there are six speed restricted curves that slow the maximum freight speed from 49 to 45 mph. Five of these restricted curves are from milepost R-129.7 to R-133.2. In the vicinity of Gilbert, SC the allowable passenger speed from the Norfolk Southern table would be 50 mph. If a station is placed in Gilbert, the effects of this speed restriction would be minor, since it would be in the acceleration/deceleration areas for the stop. The current Norfolk Southern table for superelevation of curves indicates that in each case the restricted speed curves would NOT be restricted for passenger trains, since they would be good for a 50 mph maximum passenger train speed.

In each case, there are very short sections of track that have speed restrictions placed due to a high degree of curvature; that could be removed with track realignment to decrease the degree of curve at each location. The approximate total length of all six curves that are speed restricted west of the Congaree River is 1.5 miles in total. The longest of these curves is approximately 0.5 miles long. Using the Norfolk Southern tables, it appears that the next restriction for curves would be at 55 mph on an additional 10 curves. Removing this restriction would require more extensive track realignments.

In summary, 50 mph is attainable for passenger trains west of the Congaree River with no change in the track alignment, 55 mph would be attainable with the realignment of about 1.5 miles of track, and depending on the extent of the realignment of the 10 next restrictive curves, the track speed could be raised to as high as 70 mph.

The cost to realign the worst curves could be estimated at $1.25 million per mile, or just under $2 million to increase the speed to 55 mph. To increase the speed to the next level would require not only additional work on the worst curves, but work on the additional 10 curves (3.2 miles), as well. Assuming $1.5 million per mile for these improvements due to the possibility of having to move portions off the right-of-way and more extensive modifications to drainage, etc., the total would amount to (1.5 miles + 3.2 mile)($1.5 million per mile) = $7.2 million for curve improvements to 70 mph.

While it might be possible to raise the speed by simply raising the superelevation on some curves rather than realigning them, Norfolk Southern does not typically want to provide excessive amounts of superelevation in curves if the train speeds for freight traffic is considerably slower than that for passenger operations.

GRADE CROSSINGS:

There are several types of grade crossings shown for this corridor. Grade crossings with flashing lights and gates are considered to have active crossing protection. Those with only a crossbuck are considered to have passive protection. Private crossings, which are sometimes field to field access or may provide access to a single residence, may have no form of protection. A summary of these crossings from the track charts indicates:

Line Section	Active	Passive	Other
W-Line	1	1	0
R-Line (Batesburg to Old Union Sta.)	47	16	1
R-Line (Old Union Sta. to Blossom St.)	2	0	1
Total Crossings	50	17	2

The grade crossing costs associated with adding passenger rail to the route would at a minimum require the existing passive crossings to either be closed or have active warning added to the crossings. In a worst case, there would be no crossing closure (some closures would certainly be requested by Norfolk Southern) and at $150,000 per active crossing the minimum costs would be 18 crossings x $150,000 = $2.7 million. Should Norfolk Southern require that any active warning with flashing lights only be upgraded, the probability is high that the entire system at such a location would need to be replaced rather than just adding gates, due to the age and condition of the equipment. While there might be some salvage value or possibility to reuse the equipment, the same $150,000 should be used on the additional 16 active crossings that only have flashing lights; this would add 16 crossings x $150,000 = 2.4 million.

If we assume that the remaining 32 active crossings are in good condition, the costs for grade crossing protection would be $5.1 million. It would be prudent to assume Norfolk Southern would require very old equipment at the remaining 32 active crossings to be replaced. Assuming that 10% are in this condition, an additional 4 crossings could be added. Assuming they are more complicated crossing locations and are not in other programmed replacements, this could add $1 million to the crossing costs. Also adding engineering, flagging and associated items a very probable cost for the improvements to the crossing signals could be in the $6 million to $8 million range.

EXISTING FREIGHT TRAFFIC:

There are two ways to look at freight traffic from the information available: from the tonnage that is moved over the line, and by the number of trains moving over the line. Typically the more tonnage, the more trains. The tonnages for these lines are found from the 2004 track charts and some are broken down into subsections. In general the W-Line carries 6.8 Million Gross Tons (MGT); the R-Line a maximum of 9 MGT.

There is little further breakdown on this line but the general pattern is that the further from Columbia that lower the traffic tonnage. That reduction is slight heading to Batesburg and it shows traffic has dropped to 8.5 MGT at that location.

The number of trains on each line is more difficult to ascertain. With no published schedule, the number of trains can vary with the need to move freight. The FRA inventory of grade crossings has a section that contains data showing the train counts for through trains, switching movements, and the number of trains in day operation. The only problem is that the information is often outdated and only as good as the input at the time any crossing update was made. Checking adjacent crossings can sometimes show differences in the data. Using the latest crossing update information is only a reasonable assumption of the number of trains.

Section	**Total Trains**	**Switching**	**Day, Thru**
W-Line at Devine St.	18	8	8
R-Line Cayce area	16	6	6
R-Line Cayce to Gilbert	11	1	6
R-Line Gilbert to Leesville	11	3	6
R-Line Batesburg area	11	0	7

TRACK SIDINGS:

The availability of using an existing track siding to pass trains will be important to any passenger rail operation. The W-Line section is somewhat limited in that the Norfolk Southern line is on the away side of the existing AMTRAK station, with the CSXT mainline between the station and Norfolk Southern. Track modifications between the Norfolk Southern track and the CSXT track might have to be made to access the station easier. This could include the placing of a part of the future third track in the shared corridor along with enough turnouts to make it operationally complete. Likewise, the connection could be made via trackage rights from the CSXT connection at R-109.0.

There currently are several short sidings on the R-Line section between Columbia and Batesburg that are used to serve local industries. There appears to be only one true passing siding at Milepost R-132.9 to R-134.5. This siding does have one grade crossing near the southern end at approximately R-134.3. For most trains on this line, it would be sufficient to pass a commuter train but it is far from the Columbia area. Another siding would be best positioned outside Cayce to account for the added traffic in that area. To add a siding in the Cayce area could mean extending an existing siding shown within the Cayce Yard Limits, in which case it would mean a possible closure of 12th St. or adding a grade separation structure and extending the existing siding approximately 1.25 miles. This would be the most restricted and expensive spot near Columbia to build a siding but would be the best for estimating the costs from a conceptual standpoint. It can be assumed that this location would be more expensive than at other places, and even though it extends the existing siding it would still be more than the $1 million per mile track construction costs. Due to the urban setting, an estimated $2.5 million for this siding should be used. That could include the costs for the environmental concerns and possible grade separations.

Leesville has one short siding in the downtown area that might be used as a destination station track if the line did not extend to Batesburg. Located at milepost R-138.3 the track does have several crossings that might be able to be consolidated or closed in an effort to use this siding for commuter service. Depending on the location of commuter equipment placement for beginning of the day service, there would probably need to be some sort of lay over facility with cleaning and security for at least one or two train sets. There is a possibility that the short siding or the stub out track in Batesburg could be modified or extended for this and possibly tied into any passenger platform or loading facility. It is estimated that if this is used for a lay over and servicing area the cost would be in the $500,000-$750,000 range, depending on the amount of track, servicing areas, and security features that are required.

SIGNALS:

According to the track charts each line is not signalized except at local restriction points, but the age of the equipment is not known. Signalization of the line from Columbia to Batesburg would be recommended.

The AMTRAK station on the W-Line is near the yard limits for Columbia, so signals in the area of Blossom Street Yard and the CSXT track might have to be reconfigured depending on track changes to get to the station from the Norfolk Southern line.

The R-Line track charts show that there are a variety of other equipment along this section, such as dragging equipment/hot box detectors, AEI scanners, and communications equipment, in addition to the limited signal system.

The line would need to be signaled the entire length, as there are limited signals on the line at present. There are two distinct areas of concern: the area east of the Congaree River that includes the various Norfolk Southern and CSXT tracks, and the line west of the Congaree River that is basically a single-track line. For that area to the east, there will be very complicated signals required, some of which are already in place. This area should be considered a special case and studied while looking at all the possibilities. At a minimum, the interlocking(s) will cost $2 - $4 million, depending on how much of the existing system will be salvageable. There is also the possibility this would be able to function as is, but that is not possible to guarantee at this stage without detailed operational plans.

For the single track west of the Congaree River, the addition of a signal system at $275,000 per track mile should be possible. The affected section would be longer than the actual operating portion to allow for approaches and equipment but would conservatively be from milepost R-109 to R-143, approximately 34 miles. The signaling cost would then be approximately 34 miles x $275,000/mile = $9.35 million.

Old Union Station to the proposed University Station at Blossom St.

TRACK CONDITION:

The trackage picking up from the old Union Station milepost R-108.3 to the proposed University Station near Blossom Street near milepost R-107.5 is part of the R-Line that is seldom used (R-108.0 to R-107.9), and partly that portion that picks up traffic from the Norfolk Southern SC line that leads to Andrews Yard. For the seldom used portion, the rail section is lighter. That portion north of the connection with the SC line at milepost 107.9 has more traffic than the line to Batesburg. This short portion carries about 2 MGT more traffic than the Old Union Station to Batesburg portion, a 20% increase, which may make some operating differences for the short portion of the line from milepost R-107.5 to R-107.9. The operating speed for freight trains from the track charts for this portion are between 20 and 50 mph but are curve limited to 20 mph in the worst case.

TRACK CURVATURE:

There are two major curves and one reversed curve on this portion. The reversed curve portion is made up of a 0.1-degree curve reversed to a 0.1-degree curve, both of which are superelevated one inch. This appears to be in the area of the old Union station at Main St., and could possibly be smoothed, or it could be an anomaly in the track chart. The other curves are a 6-degree curve near Pickens St. that is also at the connection point to the SC line. This curve will be harder to modify due to the connection turnout. This is the speed restriction limiting the track segment to 20 mph. Just south of the proposed station site is a curve of 4.5-degrees that ends at the bridge over a small waterway. While this curve has only a slightly slower speed shown for freights the fact that it is a fairly sharp curve near a proposed station site must be taken into account. The station should not be located on this curve; this pushes it north of not only the curve but also the small structure. From the track chart, there is only approximately 0.04 mile (211 feet) between the waterway bridge and the Blossom St. bridge. Depending on the point that the location was made, there could be little area for a station at this location without locating it in a curve. Due to the connection to the SC-Line and coming into the station it is anticipated the track speeds for commuter trains will be slower as they come into the proposed station near Blossom St.

TRACK SPEEDS:

The track charts show the freight operating speeds on this portion are between 20 and 50 mph but curve limited to 20 mph in the worst case. Speeds over the section from the old Union Station area should not be affected whether there is a stop at the old Union Station or not.

GRADE CROSSINGS:

There are several types of grade crossings shown for this corridor. Grade crossings with flashing lights and gates are considered to have active crossing protection. Those with only a crossbuck are considered to have passive protection. Private crossings, which are sometimes field to field access or may provide access to a single residence, may have no form of protection. A summary of these crossings from the track charts indicates:

Line Section	Active	Passive	Other
R-Line (Old Union Sta. To Blossom St.)	2	0	1

The grade crossing costs associated with adding passenger rail to the route would, at a minimum, require the existing active crossings be capable of handling the added traffic. It is anticipated there could be upgrades required if the station is located near enough to the Wheat St. crossing to require modification for the station stop. Should Norfolk Southern require that any active warning with flashing lights only be upgraded, the probability is high that the entire system at such a location would need to be replaced rather than just adding gates, due to the age and condition of the equipment. While there might be some salvage value or possibility to reuse the equipment, $150,000 should be used on the one active crossing that has only flashing lights. This would be $150,000 for crossing signals. Due to the location on the USC campus, there is one pedestrian crossing shown that will probably need to be upgraded too at $150,000 for a total crossing signal cost for this section of $300,000.

EXISTING FREIGHT TRAFFIC:

There are two ways to look at freight traffic from the information available: from the tonnage that is moved over the line, and by the number of trains moving over the line. Typically the more tonnage, the more trains. The tonnages for these lines are found, from the 2004 track charts and some are broken down into subsections. In general, the R-Line in this area is unique in that the trains from Batesburg travel into Andrews Yard after leaving the R-Line at milepost R-108.2, proceed into the yard and then continue north from Andrews Yard after being reclassified or left intact. This means that a train headed north will probably divert into Andrews Yard, and continue after setting out and picking up cars; therefore, it may be several hours between the time a train passes off the R-line and then back to the R-line. Trains that have Andrews Yard as a destination would not pass through each site but the traffic may move through on another train; this is the reason the traffic on the R-line increases north of the connection with the SC-line, and is also an added constraint when figuring the track availability for this section. It will not necessarily correspond to the traffic that flows off the R-line at R-108.5.

The number of trains on each line is more difficult to ascertain. With no published schedule the number of trains can vary with the need to move freight. The FRA inventory of grade crossings has a section that contains data showing the train counts for through trains, switching movements, and the number of trains in day operation. The only problem is that the information is often outdated and only as good as the input at the time any crossing update was made. Checking the two crossings within this section and adjacent crossings gives a reasonable assumption of the number of trains.

Section	Total Trains	Switching	Day, Thru
R-Line Blossom St. Sta. area	6	0	4

TRACK SIDINGS:

There are currently no sidings in this area. Due to the road crossings, pedestrian crossing, railroad bridge and connection to the Norfolk Southern SC-Line, the possibilities for added a siding are limited in this area. One possibility would be to construct a new portion of the R-line adjacent to the existing beginning track south of the connection to the SC-Line, thereby keeping freight and passenger traffic separated and removing a potential conflict with the freight traffic. This would also save on interlocking signal reconfiguration and affect the total cost of the project positively. If this is not possible, then trains would probably have to return to the area near the old Union Station and wait on sidings constructed there to pass trains or leave them parked for later use.

If an additional track is added parallel to the existing R-Line, the cost should be estimated at $1 million, due to the urban setting and possible changes required to the existing grade crossings, roadways, and drainage. This track would be approximately ½ mile in length, but would provide traffic separation from the freight traffic. If the trains return to the area near the old Union Station, the cost should be less- in the $0.5 million range due to shorter tracks - but more signal and special track equipment will be required. If servicing areas and facilities are needed along with security and security fencing, then these costs could escalate, depending on what needs to be provided for operating the line.

SIGNALS:

According to the track charts each line is not signalized until it reaches the point where the SC-line connects with the R-line. From that point north the line is signalized, but with the added commuter traffic there may be issues that have to be addressed. If the track is used as is, there is potential for a new signal interlocking to be requested that due to traffic flow could cost $250,000. If a parallel commuter track is built, this cost should be lower. For purposes of an order of magnitude estimate, the cost should include at least $250,000 for upgrades to the signals and crossings, so that there is some money in the budget for these items.

OTHER CONSIDERATIONS:

STATION LOCATIONS

From the information provided, there are line stations shown at Columbia near Blossom St., West Columbia/Cayce, Oak Grove, Lexington, Gilbert, and Batesburg-Leesville. While no detailed information was included it is assumed these would be near the city center or adjacent to parking facilities and easy access points. Two locations, not shown on the information provided, are the existing Amtrak facility off the W-line and the old Union Station. Both were used in the above narrative, since they are existing facilities and therefore are possible alternate station locations.

University, Columbia near Blossom Street – In the track portion of the write up, it is shown that this urban location is located on the USC campus and near local transportation. The difficulty with placing a station at this location would be from the standpoint of being able to physically build the tracks that would be needed to make this a terminus point for commuters. The fact that there are variable train schedules for the R-line may make it hard to schedule operations without adding a dedicated commuter track north of the SC line connection from Andrews Yard. Without such a track, trains would have to leave the station area so Norfolk Southern trains could use that portion of the track. The various bridges and buildings may make this more difficult and expensive to use as a station area.

West Columbia/Cayce – The station location appears to be just off Platt Springs Rd. and located between there and Dreher Rd. Both these crossings are active, with Platt Springs having flashing lights and gates and just flashing lights at Dreher Rd. This would be near a possible location for a passing track, since there is a short siding just 1.5 miles north. A siding could be added to access the station only, and therefore be much shorter than typical passing sidings, but might make discussions with Norfolk Southern more difficult. At a minimum, the two road crossings that have active warning would have to be replaced due to additional tracks, and could present some signaling problems. There would need to be a track change to be able to move the existing track lubricator at R-112.2 that would fall within the general station area. There is a very short siding shown on the east side of the track at milepost R-111.7 that appears to be long enough to be used for the commuter service, but may serve as a local switching point. The siding is mainly in a tangent section of track and adjacent to a 1-degree curve.

Oak Grove – This location appears to be near St. Davids Church Road at milepost R-116.3. There is no nearby siding that could be extended, so either this will be an on-line station stop with no siding or will need to have at least a short siding added, depending on traffic patterns. There is a dragging equipment/hot box detector at this location that might require relocation depending on the final location of the station.

Lexington – The station location is shown at the S. Lake Road crossing, milepost R-120.8. This crossing is an active crossing with flashing lights and gates. To the track south (west) side of the crossing there is a short stub end track. The stub track could be extended for a short commuter siding or set out track, or could be an on-line station. The proximity of the S. Lake Rd. crossing may affect the signal and crossing protection, since the proposed station could be very close to the crossing.

Gilbert - The station location is shown at the Main St. crossing, milepost R-131.1. This crossing is an active crossing with flashing lights and gates. To the track north (east) side of the crossing there is a short stub end track. The stub track could be extended for a short commuter siding or set out track or could be an on line station. The track south of the siding is a crossing for Peach Tree St that is only protected by crossbucks. Any station improvements in this area should include evaluating the possibility of closing this crossing or improving the protection. The proximity of the Main St., Water Ferry Rd., and Peach Tree St. crossings may affect the signal and crossing protection, since the proposed station could be very close to these crossings.

Batesburg-Leesville – The station location just off Lee St. is in the Norfolk Southern Leesville area at milepost R-138.4. There is an existing double-ended siding at this location, but with the various grade crossings on either side of Lee St., there could be some difficulty in locating the station here without closing or modifying one or more streets and pedestrian crossings. (For the corridor study the track and other information is based on a corridor ending at milepost R-141.0 should this station site need to be moved towards Batesburg.)

MISCELLANEOUS ITEMS

The area of the R-Line just east of the Congaree River bridge should be considered a difficult area for commuter operations, since there are several rail lines using this area and there are several areas where tracks cross on a first-come, first-serve basis. While there are signals in this area, the movements are also controlled via a dispatcher and priorities would have to be established to give the commuter trains access within their scheduled arrival times.

Along this route there are several overhead highway bridges that may have close clearance issues for passenger service or where track sidings need to be added. There are also several railroad bridges that carry the track over highways or streams that would need to be evaluated if track sidings were added in the area of these structures. Any added or extended track siding would have to take into account the existing drainage structures and railroad utilities. If we considered that at least two locations would require new straightforward overhead structures, then at $500,000 per overhead bridge, another $1 million would be added.

A major unknown is the condition and accessibility for passenger rail use of the bridge over the Congaree River and the unnamed waterway just east of the river. Additional traffic added to this area may warrant upgrades to this structure. The structure is an open deck with a small emergency walkway that may not be compatible with future passenger operations. While replacing the bridge would be very costly and outside the scope of this discussion, modifications may need to be made that should be included at this stage rather than ignored. There should be $500,000 placed in the budget for modifications to this structure that could be removed once a more detailed study is done.

The R-Line also has a variety of fiber optic cables placed by others on the railroad right-of-way and attached to various facilities. Relocation and protection of these would be the responsibility of the party proposing any improvement. There may be fiber optic lines in the W-Line corridor, on the CSXT side, that would need to be considered before any track reconfiguration occurred in the area of the AMTRAK station. The installation of the signal system and other right-of-way improvements could make for several relocations that would increase the cost of the project. There are also possibilities that any open conduit in the duct bank could be used to install the proposed signal system. At a minimum, money should be included to relocate fiber optic lines at several locations. $1 million should be used as a figure for these relocations.

The proposed grade separation at Assembly St. should be considered, since the proposed structure and associated road changes could effectively cut the R-Line at Assembly St. How would the track need to be configured to cross on the proposed underpass with the tracks from the Norfolk Southern SC-Line and CSXT?

Provisions will have to be made for car storage and servicing at each end of the trip and while there might be a future facility area in Columbia, there are other freight and future passenger traffic issues that would have to be accounted for in the future design and build out of this system. In Columbia, there is no existing nearby facility near the proposed terminus point at either the existing Amtrak or old Union Station locations. The closest yards are the Norfolk Southern Andrews Yard south of town or the CSXT Cayce yard across the river. Both of these would probably need some sort of modification to be able to service passenger cars. One possibility would be to build a service area in the old Blossom Street Yard if there are tracks available and not typically used. This modification should be included in the overall project and not in this particular line section. If a service facility is placed at the proposed Blossom St. station location, costs could escalate due to the location being on the USC campus.

The Blossom St. Station site is on the ruling grade for the line headed north from Columbia, and this could affect the ability to tie up cars and trains in the station area without protection from equipment being able to roll out of the station. The smaller waterway bridge at milepost R-107.5 might be an obstacle to constructing a new facility here without replacing this bridge.

COLUMBIA TO CAMDEN

Information on the rail line from Columbia, SC to Camden, SC was gathered from various available track charts, timetables, the FRA web site, and other sources. The area of interest was assumed to be from the AMTRAK station in Camden, SC, located at MP S327.1 on the CSXT Hamlet Subdivision, to the proposed commuter station in Columbia, SC, located at approximately MP R-107.4 on the Norfolk Southern R-Line. Using the railroad mileposts the total distance from station to station is 31.7 miles. Please be aware that not all railroad milepost miles are exactly 1-mile apart, but vary in length. Also the construction of a connection between CSXT and NS will be required at Fairwold (CSXT MP S354.5 = NS MP R-103.1).

Beginning at the Camden AMTRAK station and proceeding to the proposed commuter station, the following key mileposts for connections from one line segment to the next are:

Milepost	*Connection Point*
S 327.1	Camden AMTRAK Station
S 354.5	Proposed connection to the Norfolk Southern, MP R-103.1
R-107.4	Proposed commuter station

TRACK CONDITION:

All the route trackage is mainline track with fairly low tonnage traffic and has daily AMTRAK traffic. As such it is in good condition. It is assumed that little improvement would have to be made to the existing track structure to accommodate the commuter rail traffic. Construction of the new connection between CSXT and NS will be approximately $2 million, plus additional agreements between CSXT and NS for the installation, maintenance, and operating control of the connection. These agreements are usually require lengthy negotiations and compromises to finalize.

TRACK SPEEDS:

The existing FRA Class 3 track speed on the Hamlet Subdivision is 40 mph for freight trains and varies between 40 to 60 mph for passenger trains. Existing conditions result in predominantly 60 mph passenger operations with three permanent speed restrictions due to curvature reducing speeds to either 50 or 55 mph. With some required track improvements, track speeds could be raised to FRA Class 4, 60 mph for freight and 80 mph for passenger, allowing for reduced transit times between Columbia and Camden. The required improvements would consist of increasing superelevation in curves, reducing curvature through lengthening curves, and upgrading/adding grade-crossing warning systems. These improvements could lead to an 80 mph passenger operation with approximately ten curves having operating speeds less than 70 mph.

The existing track speed on the R-Line is FRA Class 4 due to existing 50 mph freight speeds. Passenger trains can operate over the R-Line at either the existing 50 mph speed or can be increased to 55 mph by upgrading the existing grade crossing warning systems.

TRACK CURVATURE and GRADES:

In general, the track curvature is consistent along the length of the route. The number of curves, typical curvature range, and maximum curvature are shown:

Subdivision	Number of Curves	Typ. Curvature Range	Maximum Curvature
Hamlet	32	1° – 2°-30'	4°-23'
R-Line	12	2° – 3°	4°-12'

The terrain along this route is rolling in nature and leads to many grade changes along the route. Though steeper grades do not impact passenger service as much as freight service, there are numerous grades between 0.4% an 1.09%, the maximum along the route. At this point, the cost of improvements due to changes in superelevation or curvature have not been calculated.

GRADE CROSSINGS:

There are several types of grade crossings shown for this corridor. Grade crossings with flashing lights and gates are considered to have active crossing protection. Those with only a crossbuck, signs, or no signs are considered to have passive protection. Private crossings, which are sometimes field to field access or may provide access to a single residence, are also counted in the passive protection column. A summary of these crossings from the track charts indicates:

Subdivision	Active	Passive	Private
Hamlet	16	7	4
R-Line	8	0	0

To increase passenger speeds from 60 mph to 80 mph on the Hamlet Subdivision will require upgrading each of the 16 active grade-crossing warning systems and the assumption that the seven passive protection systems will have to be upgraded to active systems. The cost to accomplish this task is estimated to be $3.5 million.

To increase passenger speeds from 50 mph to 55 mph on the R-Line will require upgrading the eight active grade-crossing warning systems. The cost to accomplish this task is estimated to be $1.2 million.

EXISTING FREIGHT TRAFFIC:

Actual freight traffic data is not available from CSXT for the Columbia to Camden Corridor. The FRA Grade Crossing Inventory contains train traffic data and this has been used as the source of the following data. The FRA inventory of grade crossings has a section that contains data showing the train counts for through trains, switching movements, and the number of trains in a day's operation. The only problem is that the information is often outdated and only as good as the input at the time any crossing update was made. Checking adjacent crossings can sometimes show differences in the data. Using the latest crossing update information is only a reasonable assumption of the number of trains.

Location	Total Trains	Switching	Day, Thru	Effective Date
S 328.7, E I Dupont	7	1	3	2006
S 329.98, Lachotte Road	7	3	2	2006
S 338.97, Church Street	7	2	2	2006
S 349.39, Alpine Road	5	0	2	2006
S 352.16, Arcadia Lakes Drive	5	0	2	2006
R-Line Columbia north	6	0	4	

SIGNALS:

According to the track charts and timetables, the Hamlet Subdivision and the R-Line is signalized and trains operate under signal indication (CTC). The existing signal system is adequate to accommodate the commuter rail traffic at existing speeds. At this point, the cost of improvements to the signal system due to increased speeds has not been calculated. Additional signaling will be required for the connection at Fairwold with these cost included in the estimate for the connection.

TRACK SIDINGS:

The CSXT railroad from Columbia to Camden is a single track railroad that utilizes passing sidings to pass trains moving in opposing directions. The availability of using sidings to pass trains will be important to any passenger rail operation. Though there are two existing sidings along the route, these are short, controlled sidings capable of holding approximately 25-car trains and are limited to 10 mph speeds. The following shows the location and length of each controlled siding.

Location	Milepost	Length
Lugoff Siding	S 330.0	2,945'
Weddell Siding	S 343.9	3,070'

To pass trains in a mixed passenger/freight operation, typically the freight train will take the passing siding while the passenger train passes on the main track. Due to the time sensitive nature of passenger traffic, it is not efficient to have the shorter passenger trains waiting in the siding for a longer freight train to pass. A minimum of one, two-mile passing siding will be required to efficiently pass opposing trains. The cost associated with the addition of a two-mile passing siding and its associated signal system is estimated to be $2.5 million.

OTHER CONSIDERATIONS:

Along this route there are several overhead highway bridges that may have close clearance issues for passenger service or if track sidings need to be extended. There are also several railroad bridges that carry the track over highways or streams that would need to be evaluated if track sidings were added in the area of these structures. Any added or extended track siding would have to take into account the existing drainage structures and railroad utilities.

Though the information is not readily available, the proposed route may also have a variety of fiber optic cables placed by others on the railroad right-of-way. Relocation and protection of these would be the responsibility of the party proposing any improvement.

Provisions will have to be made for car storage and servicing at each end of the trip. There is not a CSXT facility at Camden where this function can be performed. In Columbia there is no nearby facility with the closest yards being either the Norfolk Southern Andrews Yard south of town or the CSXT Cayce yard across the river. Both of these would probably have to have some sort of modification to be able to service passenger cars. One possibility would be to build a service area in the old Blossom Street Yard if there are tracks available and are not typically used.

COST CONSIDERATIONS:

The total cost associated with upgrading the Camden to Columbia Corridor is a minimum of $4.5 million if the track speeds are kept at the existing FRA Class 3 track speeds of 60 mph passenger/40 mph freight. This cost would rise to a minimum of $8 million if the track speeds were raised to FRA Class 4 track speeds of 80 mph passenger/60 mph freight on the Hamlet Subdivision. If the track speeds are increased on the R-Line, the cost would rise to a minimum of $9.2 million.

COLUMBIA TO NEWBERRY

Information on the rail line from Columbia, SC to Newberry, SC was gathered from various available track charts, timetables, the FRA web site, and other sources. The area of interest was assumed to be from the AMTRAK station in Columbia, SC, located on the CSXT Columbia Subdivision, to Downtown Newberry, SC, located on the CSXT CN&L Subdivision, via the CSXT Columbia and CN&L Subdivisions. Using the railroad mileposts the total distance from station to station is 43.4 miles. Please be aware that not all railroad milepost miles are exactly 1-mile apart, but vary in length.

Beginning at the Columbia AMTRAK station and proceeding to Downtown Newberry, the key mileposts for connections from one line segment to the next are as follows:

Milepost	*Connection Point*
S 360.4	Columbia AMTRAK Station
S 360.1	Connection to the CN&L Subdivision, MP S 360.1 = MP C 0.0
C 43.1	Downtown Newberry @ proposed commuter station

TRACK CONDITION:

All the route trackage is mainline track with fairly heavy tonnage traffic. As such it is in good condition. It is not anticipated that there will be any needed track improvements to accommodate the commuter traffic.

TRACK SPEEDS:

The track speed on the short portion of the Columbia Subdivision is 40 mph.

The CN&L Subdivision shows track speeds from 30 to 49 mph between MP C 0.0 and MP C 43.1, with the vast majority being 49 mph. Due to the difference in the passenger and freight train equipment and their respective operations, passenger trains may have a higher track speed than freight trains, especially through curves. This track is currently FRA Class 4 track allowing passenger speeds up to 80 mph and freight speeds up to 60 mph.

For the passenger traffic to run faster than the existing 49 mph, there may be some required improvements consisting of increasing superelevation in curves, reducing curvature through lengthening curves, and upgrading/adding grade-crossing warning systems.

TRACK CURVATURE and GRADES:

In general, the track curvature is less on the southern end of the route and increases as the railroad proceeds north to Newberry. By subdivision, the number of curves, typical curvature range, and maximum curvature are shown:

Subdivision	Number of Curves	Typ. Curvature Range	Maximum Curvature
Columbia	5	1° – 2°	1°-56'
CN&L	58	1° – 3°	4°-15'

The terrain along this route is rolling in nature and leads to many grade changes along the route. Though steeper grades do not impact passenger service as much as freight service, there are numerous grades between 0.8% an 1.22%, the maximum along the route. This will have to be a consideration in powering the passenger trains to pull the grades and maintain track speed. At this point, the cost of improvements due to changes in superelevation or curvature have not been calculated.

GRADE CROSSINGS:

There are several types of grade crossings shown for this corridor. Grade crossings with flashing lights and gates are considered to have active crossing protection. Those with only a crossbuck, signs, or no signs are considered to have passive protection. Private crossings, which are sometimes field to field access or may provide access to a single residence, are also counted in the passive protection column. A summary of these crossings from the track charts indicates:

Subdivision	Active	Passive	Private
Columbia	1	0	0
CN&L	42	51	31

To increase passenger speeds above the existing 49 mph and possibly up to 80 mph will require upgrading each of the 43 active grade-crossing warning systems and the assumption that the 51 passive protection systems will have to be upgraded to active systems. The cost to accomplish this task is estimated to be $24 million. Crossing closures would offset part of this cost along with decreasing the number of interfaces between trains and the motoring public.

EXISTING FREIGHT TRAFFIC:

Actual freight traffic data is not available from CSXT for the Columbia to Newberry Corridor. The FRA Grade Crossing Inventory contains train traffic data and this has been used as the source of the following data. The FRA inventory of grade crossings has a section that contains data showing the train counts for through trains, switching movements, and the number of trains in a day's operation. The only problem is that the information is often outdated and only as good as the input at the time any crossing update was made. Checking adjacent crossings can sometimes show differences in the data. Using the latest crossing update information is only a reasonable assumption of the number of trains.

Location	Total Trains	Switching	Day, Thru	Effective Date
CN&L @ C 10.28, Woodrow Street	22	11	5	2004
CN&L @ C 42.8, Glenn Street	18	6	5	2006

With this amount of existing freight traffic present on the line, there will definitely be issues with mixing the passenger traffic with the freight traffic. The addition of passing sidings will be required to accomplish this task, sidings will be discussed later.

SIGNALS:

According to the track charts and timetables, the short section of the Columbia Subdivision is signalized. The entire CN&L Subdivision is direct traffic control block system (DTC), also known as dark territory. This means the trains operate under dispatcher permission utilizing DTC blocks instead of operating under signal indication (CTC).

With the use of DTC for train control, a time sensitive operation such as commuter rail would be an extreme burden on a dispatcher who is already handling a full load of freight traffic. Signalizing the route will be required to provide for a safer, more efficient means of dispatching the trains and mixing the passenger and freight traffic. The cost to accomplish this task is estimated to be $11 million.

TRACK SIDINGS:

The CSXT railroad from Columbia to Newberry is a single track railroad that utilizes passing sidings to pass trains moving in opposing directions. The availability of using an existing track siding to pass trains will be important to any passenger rail operation. Though there are four sidings along the route, the use of DTC blocks for train movements result in the switches into these sidings being hand-throw switches. Newberry Siding does have spring switches on the north and south ends. These spring switches are self-restoring for the mainline movement after a train in the siding trails through the switch when moving on to the mainline.

To pass trains in a mixed passenger/freight operation, typically the freight train will take the passing siding while the passenger train passes on the main track. With the short lengths of the sidings shown below, most will not hold the longer freight trains allowing a passenger train to pass on the main. Due to the time sensitive nature of passenger traffic, it is not efficient to have the shorter passenger trains waiting in the siding for a longer freight train to pass.

These sidings are used for low-speed train movements for passing trains, serving industries, or running the locomotives to the other end of the train for a local switcher. The condition of these sidings is unknown and may require significant track upgrades including replacing existing turnouts with longer turnouts. The following shows the location and length of each passing siding.

Location	Milepost	Length
Saluda Storage	C 8.9	3,131’
Slighs Siding	C 29.8	5,550’
Georgia Pacific Run-around	C 33.3	1,000’
Newberry Siding	C 38.8	15,000’+

The addition of a minimum of two, two-mile passing siding will be required to efficiently pass opposing trains. The cost associated with the addition of two passing sidings and their associated signal system is estimated to be $5 million.

OTHER CONSIDERATIONS:

Along this route there are many overhead highway bridges that may have close clearance issues for passenger service or if track sidings need to be extended. There are also several railroad bridges that carry the track over highways or streams that would need to be evaluated if track sidings were added in the area of these structures. Any added or extended track siding would have to take into account the existing drainage structures and railroad utilities.

Though the information is not readily available, the proposed route may also have a variety of fiber optic cables placed by others on the railroad right-of-way. Relocation and protection of these would be the responsibility of the party proposing any improvement.

Provisions will have to be made for car storage and servicing at each end of the trip. There is not a CSXT facility at Newberry where this function can be performed. In Columbia there is no nearby facility with the closest yards being either the Norfolk Southern Andrews Yard south of town or the CSXT Cayce yard across the river. Both of these would probably have to have some sort of modification to be able to service passenger cars. One possibility would be to build a service area in the old Blossom Street Yard if there are tracks available and are not typically used.

COST CONSIDERATIONS:

The total cost associated with upgrading the Columbia to Newberry Corridor is a minimum of $40 million. A major variable is the number of passive grade crossings that will require active grade-crossing warning systems and the number of crossings that may be closed.

APPENDIX B:
LAND USE DEFINITIONS

1. SINGLE FAMILY RESIDENTIAL

Single family residential areas are comprised of detached dwellings, located in urban, suburban, and rural settings. Single family residences usually have all utilities, paved streets, and access to all public facilities such as schools, libraries, parks, police, and fire stations.

Single family residential neighborhoods are normally large contiguous areas of residential lots. Some areas have subdivisions or tracts of homes with similar size or architectural design. High or low density residential is determined by the size of the lot on which the residence is located, but is not distinguished in these analyses.

2. MULTI-FAMILY RESIDENTIAL (INCLUDING MOBILE HOME PARKS)

Multi-family units are attached residences, apartments, condominiums, townhouses, and senior apartments. These land uses include off-campus University owned housing, as well as off-campus fraternity/sorority houses. Multi-family residences have all utilities, paved streets, and access to all urban facilities such as schools, libraries, parks, police, and fire stations.

Mobile homes, trailers and pre-fabricated housing (that are either stationary or mobile) are included in this category. Vacant and occupied spaces, and associated storage facilities for the “park” are included in this land use category. Mobile homes and trailer parks are generally have all utilities, paved streets, and access to all urban facilities, such as schools, parks, police, and fire stations. These homes are generally long, narrow, and rectangular in shape.

3. MIXED USE

Mixed land uses include areas where there is a combination of single family detached and multi-family dwellings of any type occurring together, along with some commercial areas. Typically, these are located in older neighborhoods, where duplexes, triplexes, and apartment buildings occur among single family houses. However, there is a current trend to constructing these residential areas adjacent to or as part of the commercial areas, primarily retail. Transit oriented development incorporates mixed use principles.

4. COMMERCIAL/SERVICES

Commercial and services land use includes areas used predominantly for business or the sale of products and their associated services. These are general office use, retail stores, and commercial services. General office uses are usually office buildings for financial, personal, business, medical, and other professional services. Retail and commercial services include retail stores, restaurants, malls, strip malls, hotel/motels, and commercial recreation areas.

5. PUBLIC/INSTITUTIONAL

Public and institutional land uses include government offices and other public service facilities, such as major health care facilities, religious facilities, and public and private educational facilities. Government facilities include federal, state, county, and municipal government offices, as well as police, fire, and other public safety and health agencies. Religious, correctional, special care, military installations (and associated infrastructure) and educational institutions[1] are included in this land use category.

[1] Pre-schools, elementary schools, junior high schools, high schools, trade schools, and colleges and universities are defined as educational institutions.

6. INDUSTRIAL

Industrial land uses (both light and heavy industrial) are areas where manufacturing, assembly, processing, packaging, or storage of products takes place. Light industrial activities entail design, assembly, finishing, packaging, and storage of products or materials which are processed at least once. Light industrial activities are characterized as "clean", because they produce a relatively small amount of smoke or other effluents, noise, and dust. On the other hand, heavy industrial and manufacturing facilities require a magnitude processing of raw materials. Generally, these activities are considered "dirty", because of the smoke, slag, dust, liquid effluent, and noise that are generated in the production process.

7. OPEN SPACE/RURAL/AGRICULTURE

Developed open areas within urban settings, and urban and non-urban open areas developed for recreational activities. Open spaces include golf courses, local and regional parks, sport fields, cemeteries, botanical gardens, wildlife preserves, other recreational areas, and their associated facilities. Agricultural land use includes activities primarily for the production of food, fiber, and livestock. These operations include cropland, pasture land, orchards, vineyards, nurseries, dairies, poultry, and livestock.

8. UNDEVELOPED LAND/ VACANT

Undeveloped areas consist of land uses that have not been developed with man-made structures, and do not contain agriculture or water bodies. These areas are open, containing natural and/or disturbed natural vegetation. Vacant areas usually do not contain structures; but vacant lots, with abandon structures and former agricultural areas are also included in this land use category.

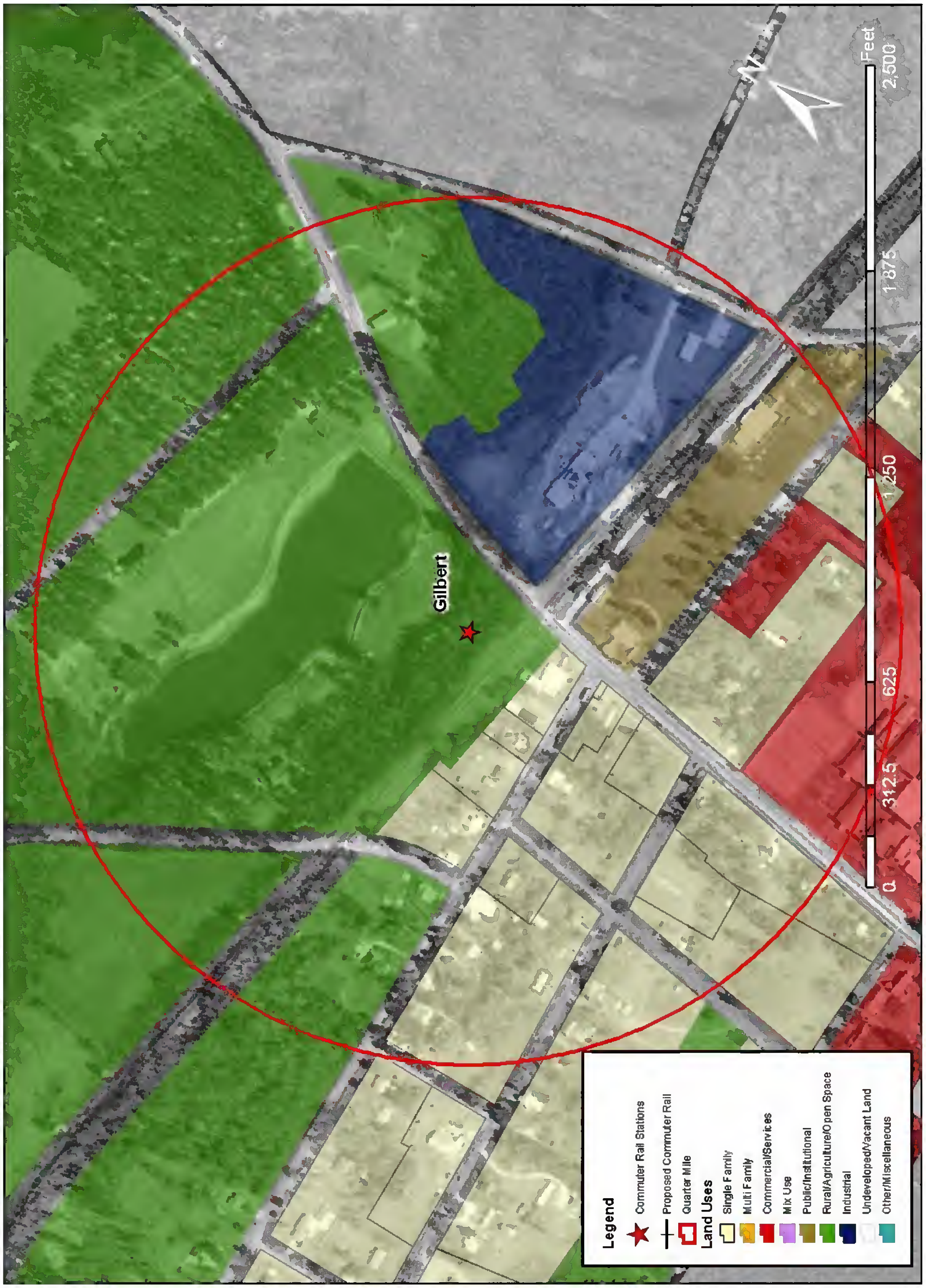
9. OTHER/MISCELLANEOUS

The miscellaneous and other category is an all-encompassing category to identify all other land uses not incorporated in the previous eight categories. It includes major structures and facilities associated with forms of transportation, communication, utilities, and mineral extraction. In terms of transportation, these areas are dedicated to major transportation, such as airports, freeways, roads, railways, and harbor facilities. Utilities land uses involve the use, production and transmission of electricity, and the treatment or transportation of water, sewage, and fuels. In terms of mineral extraction, these land uses involve the extraction of mineral and rock products, including associated mining areas, facility structures, and parking areas. Finally, the other and miscellaneous category incorporates water bodies not included under the open space classification.

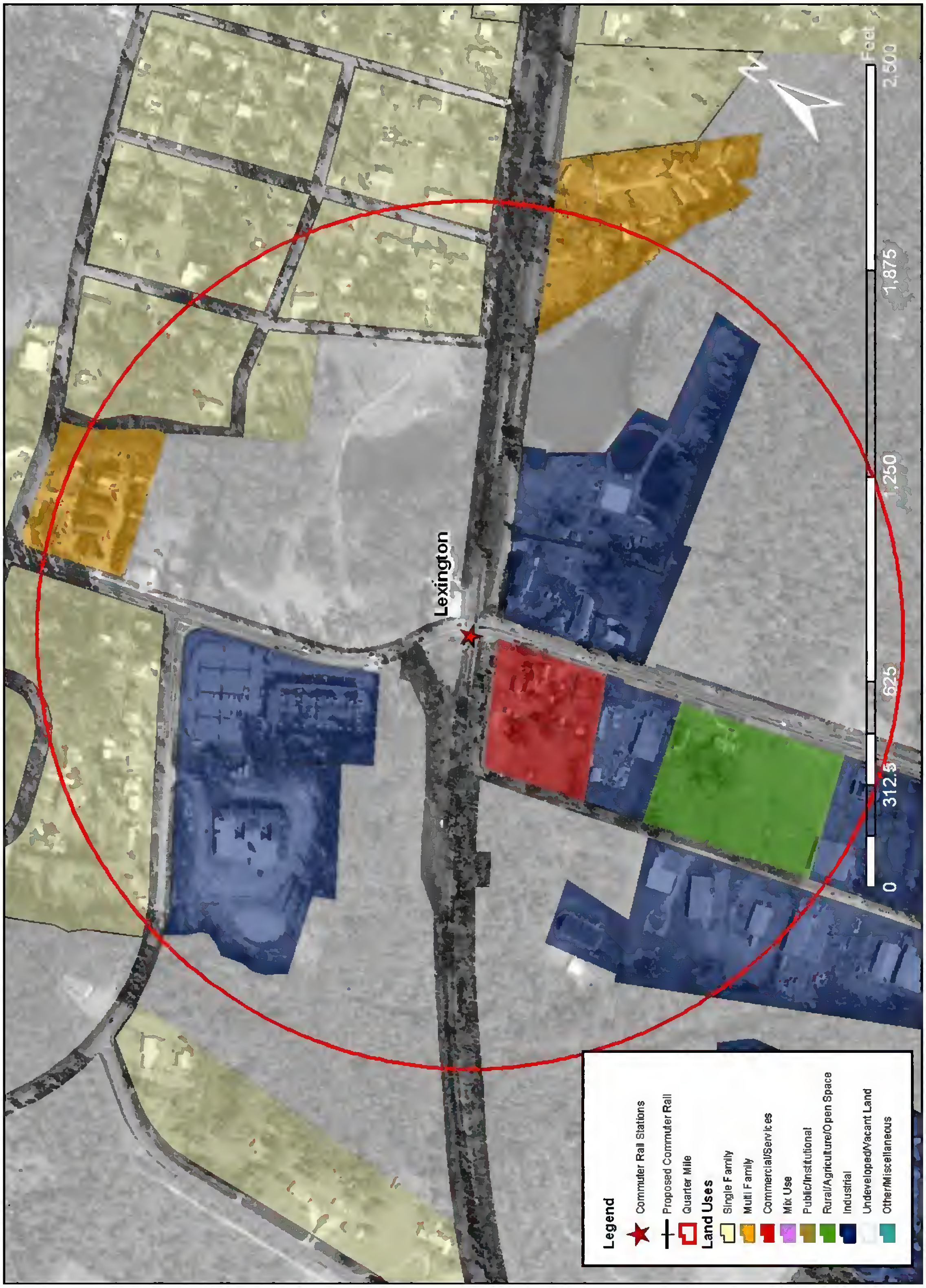
APPENDIX C:
STATION AREA LAND USE MAPS

Batesburg-Leesville Corridor (Batesburg-Leesville Station)

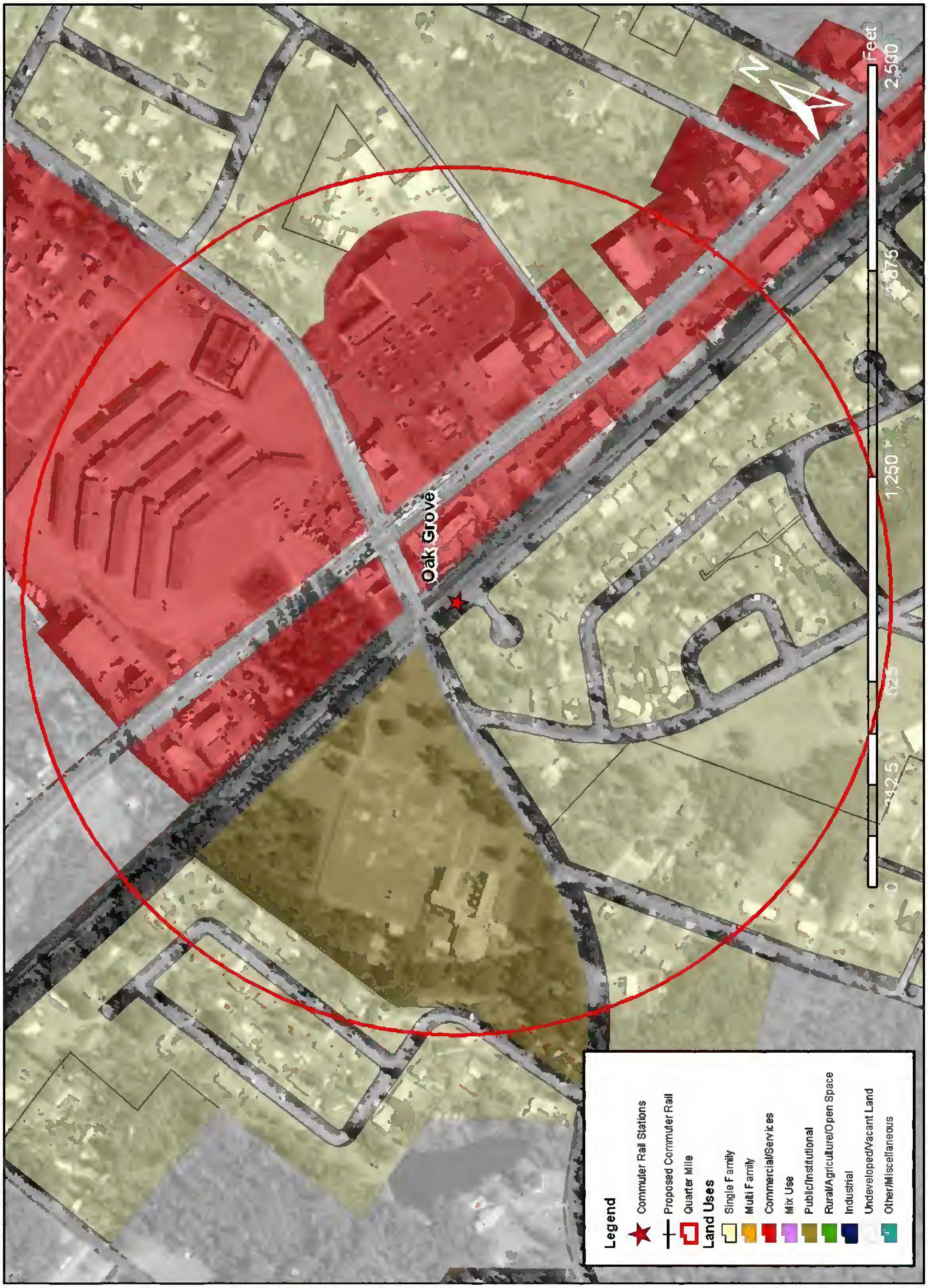
Batesburg-Leesville Corridor (Gilbert Station)



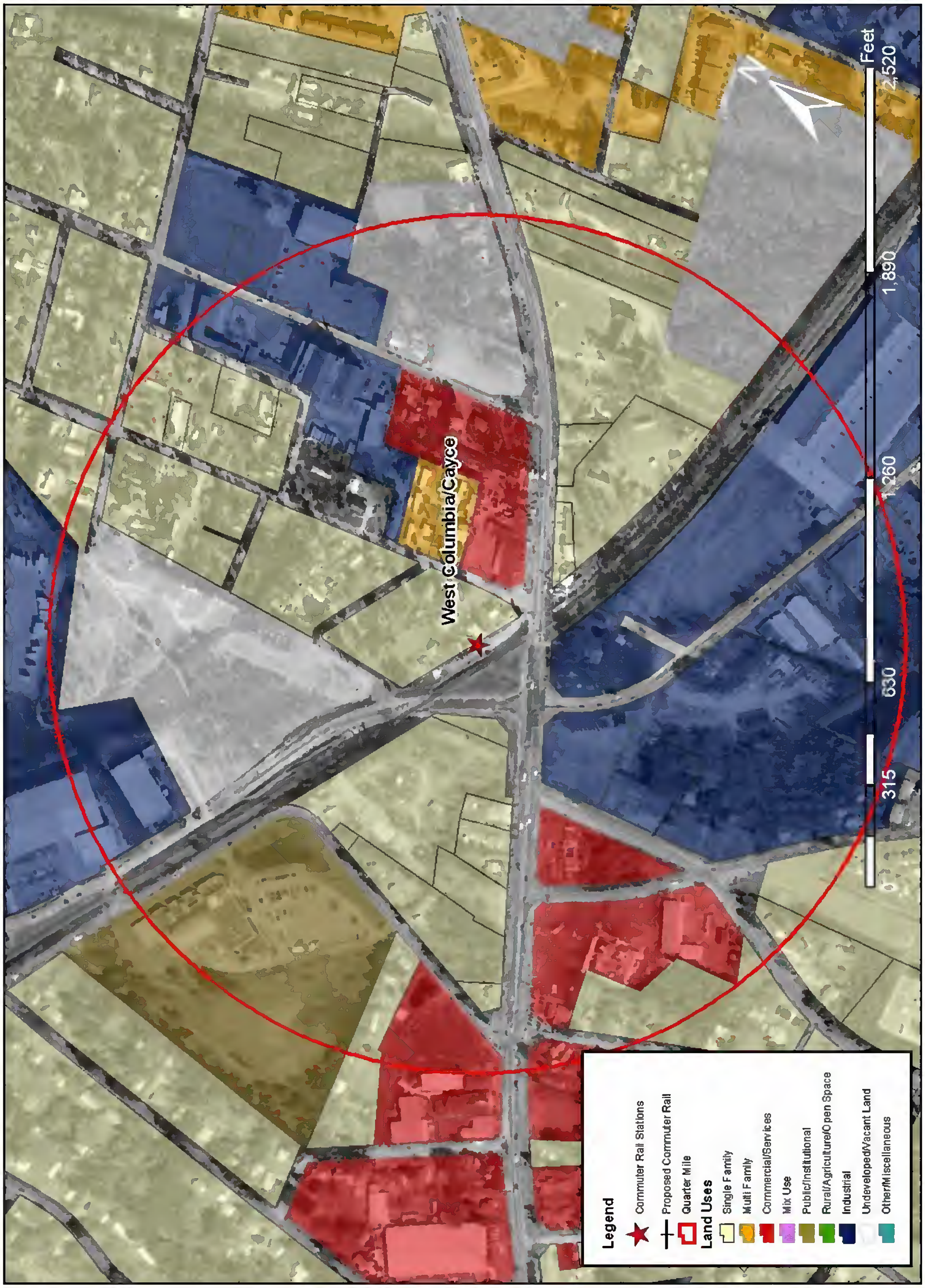
Batesburg-Leesville Corridor (Lexington Station)



Batesburg-Leesville Corridor (Oak Grove Station)



Batesburg-Leesville Corridor (West Columbia / Cayce Station)



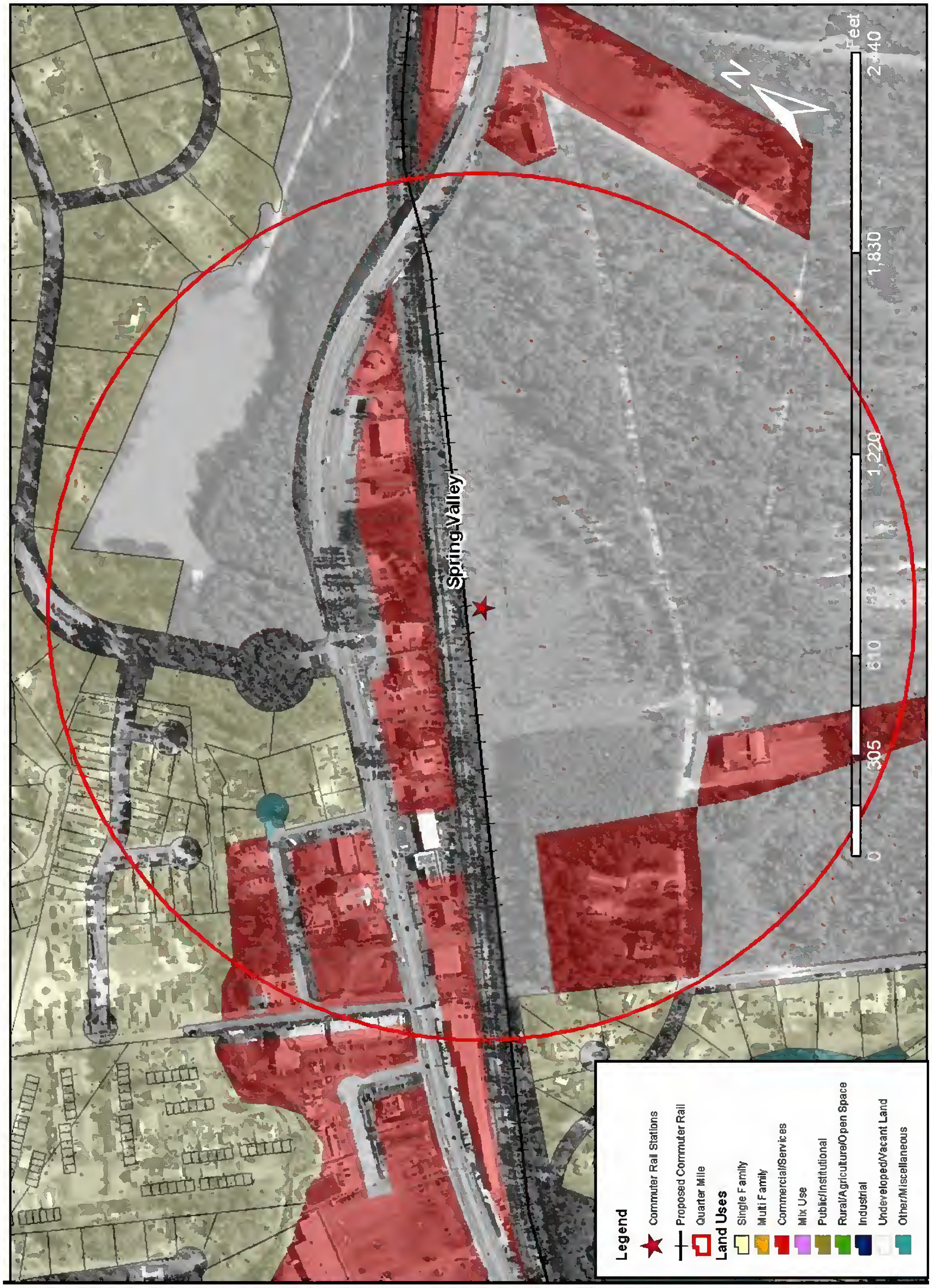
Camden Corridor (Camden Station)

Camden Corridor (Lugoff Station)

Camden Corridor (Elgin Station)

Camden Corridor (Sandhill Station)

Camden Corridor (Spring Valley Station)



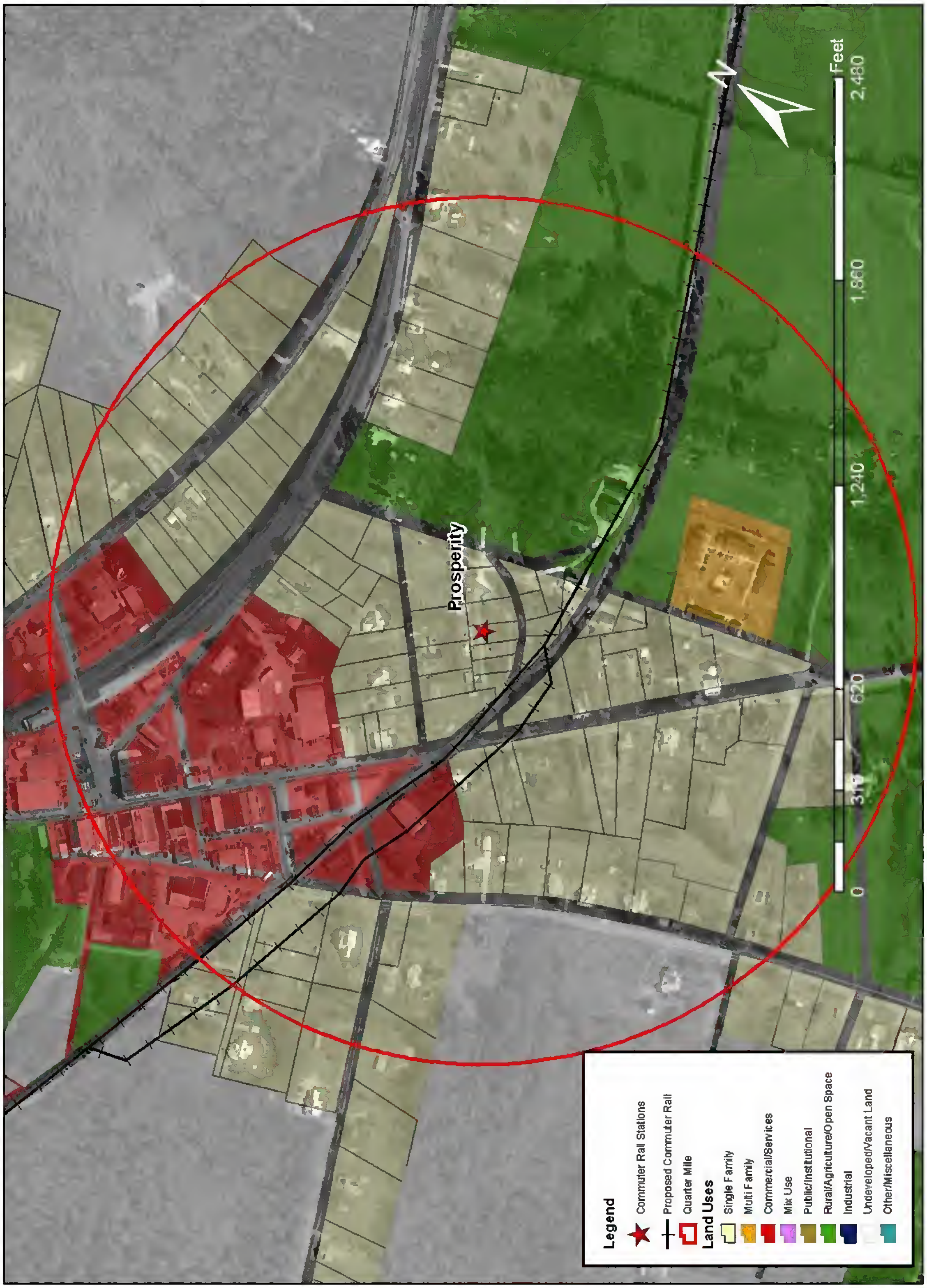
Camden Corridor (Decker / Parklane Station)

Camden Corridor (Beltline / Eau Claire Station)

Camden Corridor (University Station)

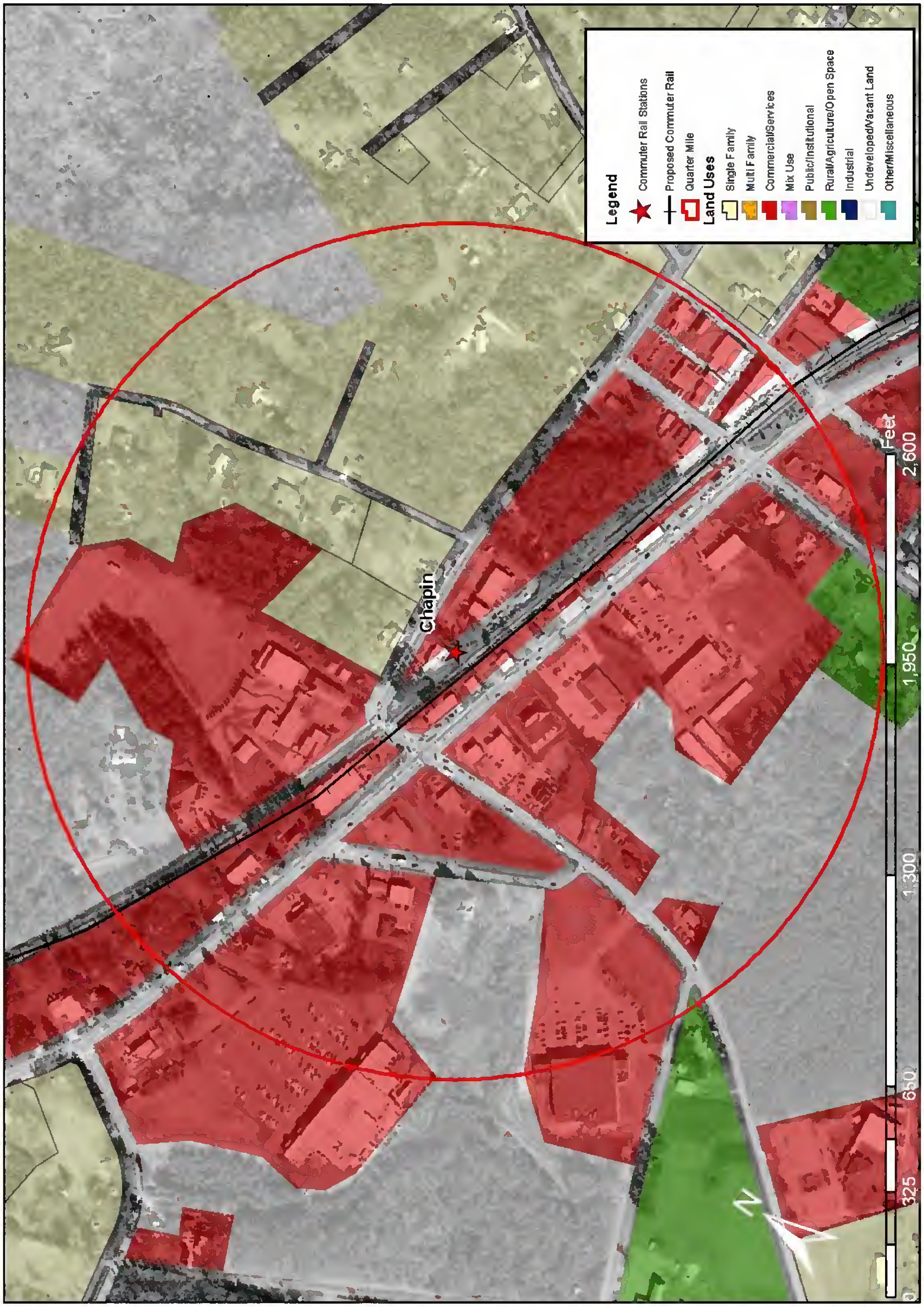
Newberry Corridor (Newberry Station)

Newberry Corridor (Prosperity Station)

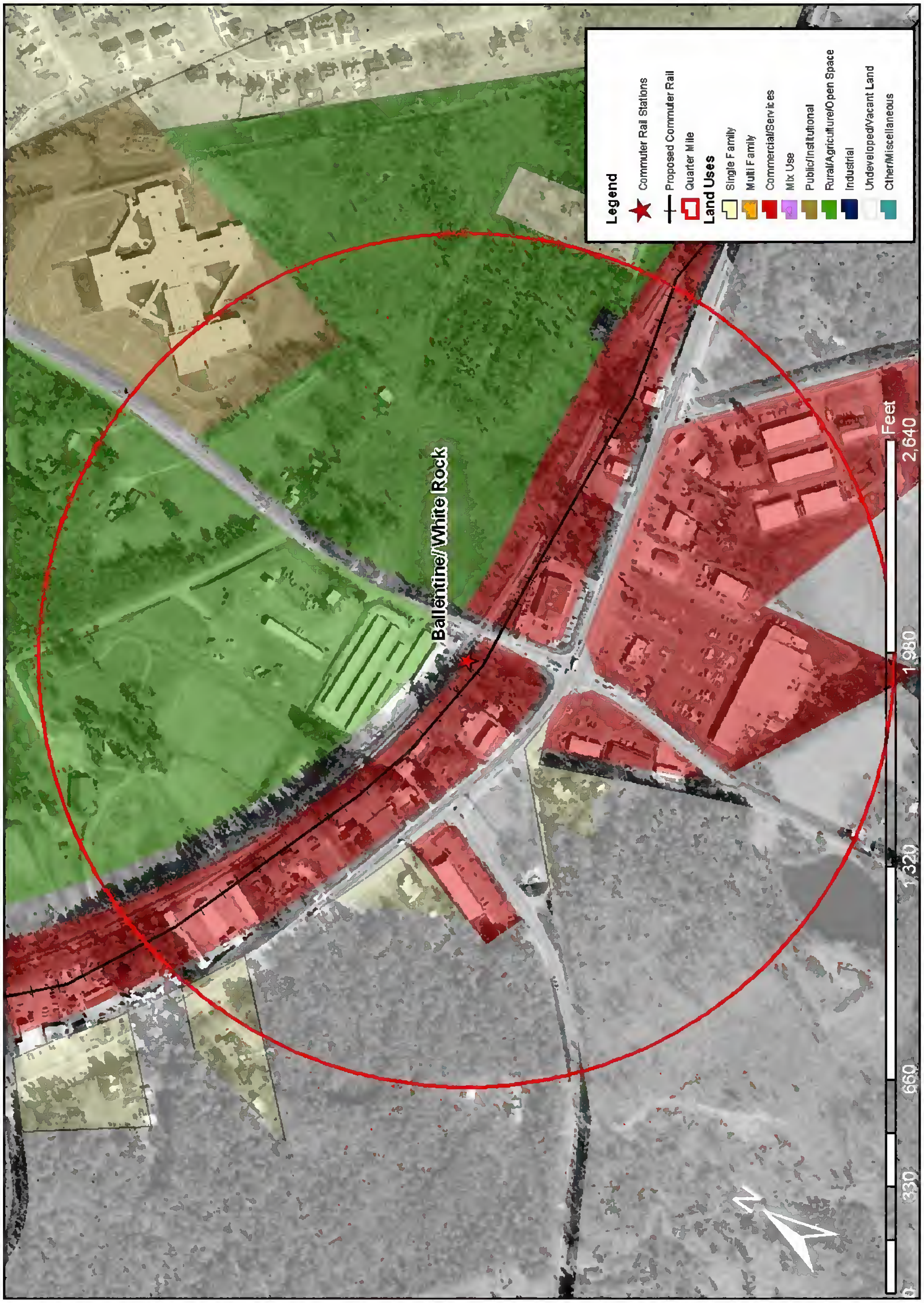


Newberry Corridor (Little Mountain Station)

Newberry Corridor (Chapin Station)



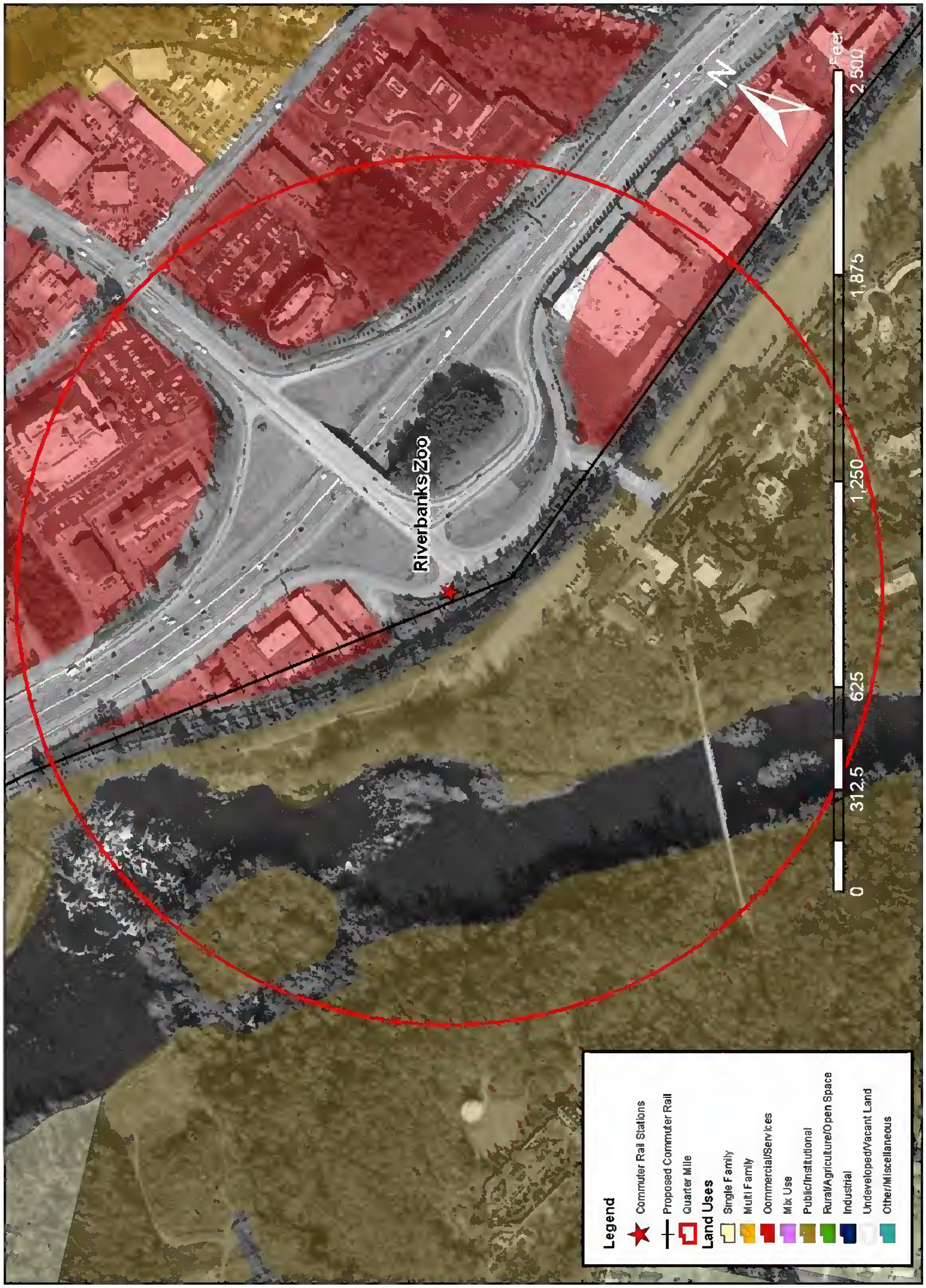
Newberry Corridor (Ballentine / White Rock Station)



Newberry Corridor (Irmo Station)

Newberry Corridor (St. Andrews Station)

Newberry Corridor (Riverbanks Zoo Station)



All Corridors (Downtown Station)