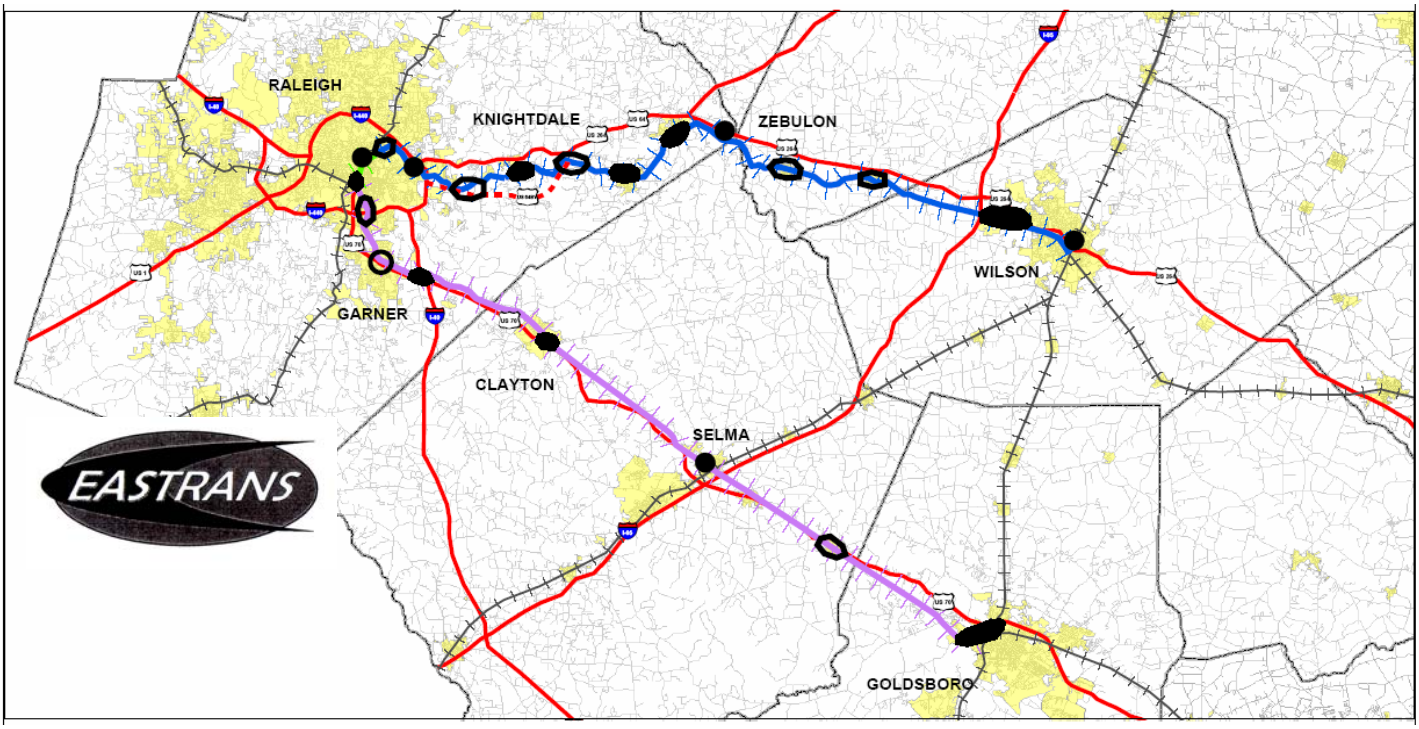
EASTRANS COMMUTER RAIL FEASIBILITY STUDY

Final Report



Submitted To:

Town of Knightdale

Submitted April 2004
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1. BACKGROUND AND INTRODUCTION

In September 2003, the Town of Knightdale contracted with Wilbur Smith Associates (WSA) to conduct the *Eastrans Commuter Rail Feasibility Study* for regarding the feasibility of instituting commuter rail service in corridors east and south of Raleigh. This report presents the findings and recommendations of that plan.

1.1 PROJECT GENESIS AND ADVOCACY ORGANIZATIONS

The idea of instituting commuter rail service east of Raleigh began as an outgrowth of several groups and issues. The issues all revolved around how to accommodate growth and maintain an economically viable region while providing an alternative means of travel. Traffic congestion levels continue to increase into the Raleigh area, overwhelming many of the smaller towns on the periphery. These increases in congestion are viewed as hurting the very quality of life that draws so many people to the region. At the same time, many of the smaller towns located away from Raleigh are seeing their traditional economic bases wither as tobacco and textiles decline.

As a proactive approach, two different groups arose that saw commuter rail service as one part of a solution to help the Raleigh region and areas to the east accommodate the growth so that all areas benefit and the strains of development do not overwhelm any one town. The efforts of these groups ultimately led to this *Eastrans Commuter Rail Feasibility Study*.

1.1.1 Eastrans Commuter Rail Alliance

The Eastrans Commuter Rail Alliance was formed by the Town of Knightdale as part of its Comprehensive Plan Update process, beginning in Summer 2001. During this process, Knightdale's Planning Department, under the leadership of Vivian Coleman and Mike Ciriello, desired to focus future development in a more compact fashion than the emerging strip development along US 64. The Norfolk Southern (NS) rail line through town was viewed as a potentially new travel corridor that could provide an alternate commute into Raleigh, and create the opportunity to focus development around station locations in town.

Realizing that a commuter rail service could not exist just to serve the Knightdale to Raleigh commute, input was solicited from Wendell, Zebulon regarding their potential interest in commuter rail services. Zebulon had recently updated its Comprehensive Transportation Plan, with assistance by WSA, which conceptually identified locations for potential commuter rail stations. Zebulon and Wendell were supportive of examining the potential for commuter rail along the NS corridor. Originally, the group was conceived to convince the Triangle Transit Authority (TTA) to extend their planned regional rail service to the east. Subsequently, TTA's next phase of work was determined to be toward the Chapel Hill area, resulting in the Knightdale group evolving their concept into a complementary but conventional commuter rail system that could connect to TTA's system.

As the commuter rail concept continued to evolve and gather publicity, the scope of the area being considered expanded beyond Knightdale, Wendell, and Zebulon. Wilson officials saw benefits in connecting their city with Raleigh, and similar benefits were seen by cities along the US 70 and North Carolina Railroad (NCRR) corridor southeast of Raleigh. This expansion coincided well with the agreement reached in 1999 by the North Carolina Railroad Company with Norfolk Southern. This agreement allowed not only regional rail service (as planned by the TTA), but also conventional commuter rail if certain conditions are met. By Spring 2002, the idea of an eastern commuter rail service included the idea of service on the two corridors centered in Raleigh.

Congestion is an everyday occurrence on the two parallel freeways – US 64/264 to the east, and US 70 to the south. While these roadways are heavily congested, many officials, staff, and the general public saw the adjacent railroad corridors as relatively underused and a potential source of a faster trip into Raleigh. One of the major objectives of this *Eastrans Commuter Rail Feasibility Study* is to verify whether these initial impressions are correct.

Commuter rail service was also viewed as more than just a travel option. Many in the communities saw it as a potential generator of a focused, transit-oriented development. According to an early presentation by the Alliance[1], the objectives of rail service are:

- Improve municipal fiscal and service efficiency by pursuing more compact pattern of development;
- Promote infill projects in areas with underutilized infrastructure to maximize efficiency;
- Help us to maintain and enhance our unique character as we compete with other places;
- Attract and retain business and light industry;
- Attract and retain a broader socio-economic range of residents;
- Provide residents with a truly multi-modal transportation network;
- Improve the personal productivity of commuters; save money on cars;
- Support the environmental health of natural areas; address proactively rising air quality standards and ensure that we don't lose federal funding in response to these;
- Build communities that will add to the overall value and attractiveness of the larger region;
- Be proactive, not reactive, about growth and economic development – *put us ahead of the pack*;
- Rail greatly enhances the accessibility of communities < 30 miles from Raleigh to commuters and businesses; and
- Preserve agricultural areas to utilize for economic development and business recruitment; the Triangle is considered among the top 6 biotechnology centers in the US – none of the others can beat the Triangle's proximity to the agricultural resources increasingly used in medical treatment.

[1] Undated presentation by the Eastrans Commuter Rail Alliance, formerly posted on the web.

Rail service was seen as more conducive to these objectives than was a bus-based system. Bus systems, even commuter and higher-speed alternatives, were not seen as encouraging the same level of land development that a rail system would. The Alliance also viewed rail transit as providing faster and more consistent travel speeds than could be achieved by bus systems operating on the roadway network. Finally, the rail system was anticipated to have lower start-up capital costs than would an equivalent busway system.

1.1.2 Eastern North Carolina Railroad Alliance

Coincidentally, about the same time as the Eastrans Commuter Rail Alliance was forming, a second group was coalescing in the Goldsboro region. The Eastern North Carolina Railroad Alliance was formed in December 2001 to promote improvements in the rail system in eastern North Carolina. According to the group's website, www.encrra.org, they have four goals:

- Improve freight railroad access to the ports;
- Improve commuter passenger rail access to Raleigh;
- Improve (intercity) passenger service; and
- Encourage historic station renovation.

This group is broader in its aim than the Eastrans group, which is primarily concerned with commuter rail service. The ENCRRA also wants to promote better freight-handling capabilities, bring additional intercity (Amtrak) services to the area (see Section 1.3.2), and redevelop the remaining historic train stations.

The group is strongly supportive of rail over the over travel modes in order to provide a choice to passengers and freight movement. They see rail as an under utilized, energy efficient, and safe mode of travel. It offers the potential to reinforce small town life by giving many commuters a way to travel to major employment areas without creating traffic problems that could destroy the quality of life.

1.2 LAND USE IMPLICATIONS

As noted in the mission of the two advocacy groups, commuter rail service is viewed as having a positive impact on land use development in the adjacent areas. Highway-based transportation is seen as promoting the development of sprawl as a greater and greater land area is required just to support the needs of automobiles.

1.2.1 Historic Development Patterns

Many of the towns along the two corridors owe their existence to the railroads. Zebulon was chartered in 1907 as a development of the Zebulon Company. This company was formed to develop land along the railroad, which opened in the prior year. Knightdale grew out of property owned by Henry Haywood Knight, who donated land to the Raleigh & Pamlico Railroad so they would extend the rail line through his area. Garner began as an outgrowth of the section house erected on the NCRR at "Garner's Station." Clayton was built up around a depot known as Stallings Station that was created to serve the North Carolina Railroad. Many other towns, while

not created as a result of the railroads, grew and thrived as a result of having a depot located in their towns.

As a result, the historic areas of these towns often have a denser, walkable development pattern that reduces the need for automobile ownership, and potentially limits the amount of parking available. This pattern provides a model for how the towns can grow in the future.

1.2.2 Inclusion in Local Plans

Several local jurisdictions have included the potential for commuter rail service in their local plans. The comprehensive transportation plans of Garner and Zebulon, both prepared with WSA assistance, have identified locations for rail stations. The recently adopted 2027 Comprehensive Plan by the Town of Knightdale include provision for three rail stations in town, primarily as a focal point for more compact development. The City of Raleigh has also included potential stations in its Southeast District Plan component of the overall Raleigh Comprehensive Plan.

TTA has included possible rail service to Zebulon and Garner in its long-term plans. While no specific proposal has been developed at this point, service to these two cities would conceptually use the same corridors being examined in this Eastrans study. The Eastrans service could be considered as a later phase of an expanded TTA system.

The cities of Wilson and Selma are even further ahead in that they already have fully functional rail stations. Both of these stations have also recently been renovated, with Wilson's 1924 Atlantic Coast Line station being renovated for $2.5 million in 2003, and Selma's 1924 Union station for the Atlantic Coast Line and Southern Railway being renovated in 2002 for $3.4 million.

1.2.3 Transit Oriented Development (TOD)

The concept of Transit Oriented Development, or TOD, is a modern application of the historic development patterns. TODs are centered on people travel, not vehicle travel. Origins and destinations are more closely clustered, with sidewalks, bike lanes, and transit service receiving equal priority with the automobile. A mix of use is provided, with different housing types in walking distance to shopping, employment, and medical destinations.

Often, TODs center on a major transit facility, typically a rail station. Numerous studies have shown that the area within one-quarter mile of a train station can support a high density of development, while the area within one-half mile is supportive of a mid-level density. Beyond one-half mile away from a station, the walking distances become too long for most individuals, and higher levels of density are less justifiable.

To encourage this effect, TTA has developed a series of Station Area Design Guidelines that aim to help local jurisdictions and developers see the potential impacts transit access can have. Several towns have begun implementing aspects of these guidelines through changes in their land use plans and zoning regulations. The City of Garner has implemented these guidelines as part of its North Garner Plan. Other cities and towns off the Eastrans corridors have also

implemented these changes, notably Cary's Town Center Area Plan (TCAP), which calls for increasing density and mix of use in the area surrounding the downtown station.

1.3 OTHER RAIL STUDIES

In reading through this *Eastrans Commuter Rail Feasibility Study*, it is important to keep in mind the distinction between this study and other passenger rail studies underway in the region. This study is examining the potential for Commuter Rail service, which is defined as a service designed for people to use going to and from work. Stations are located every 3-5 miles, and several trips are offered per day. Passenger cars are generally the same length as freight cars, but the length of the trainsets is much shorter and speeds are higher. Similar to commuter rail service is Regional Rail, with Regional Rail potentially having closer station spacing, self-propelled vehicles, and service that is more frequent.

Commuter rail service is contrasted with streetcar (also known as light-rail transit, trolley, or tram) service, which uses vehicles that are more lightweight and can run in street operation. Stops are located every one-half to one mile, and most systems are powered by overhead electric wires. On the other end of the passenger train scale are intercity services, such as the Carolinian and Piedmont provided by Amtrak (Amtrak also operates commuter rail services in some northeast cities). Intercity stations are located infrequently; for example, Amtrak's stations between New York and North Carolina are spaced between 35-40 miles apart on average. A variation of this is high-speed rail, currently under development. High-speed rail stations are located even further apart, perhaps 50+ mile spacing.

The distinctions among these types of services are important because other studies are underway that are considering these different modes. This Eastrans study, while considering some of the same rail corridors, is separate and distinct from the other studies.

1.3.1 Triangle Transit Authority Regional Rail

The TTA is currently in the Final Design phase of their Regional Rail service. TTA's route overlaps with the Eastrans corridors in the vicinity of downtown Raleigh, and offers the potential for shared or adjacent stations. TTA is scheduled to begin service in late 2007/early 2008. Trains are initially planned for a 15-minute frequency of service. For more information, refer to TTA's website at www.ridetta.org.

1.3.2 Southeastern North Carolina Passenger Rail

This study was conducted by the North Carolina Department of Transportation to examine reinstituting passenger rail (Amtrak) service to Wilmington. Two routes are under consideration for this service. One route uses this corridor between Raleigh and Selma, before turning south on the CSX Transportation (CSXT) mainline to Fayetteville, and the old Seaboard Air Line to Wilmington. The other route uses the NCRR corridor from Raleigh to Goldsboro, before turning south on the CSXT (old Atlantic Coast Line) line to Wilmington. This latter line is abandoned between Wallace and Castle Hayne.

Both options share the Eastrans section of the NCRR corridor between Raleigh and Selma, and the latter option further shares the portion between Selma and Goldsboro. Station stops would only be located at Goldsboro (in the latter option), Selma, and Raleigh. Two trains per day are envisioned for this service.

The report is on NCDOT's website at www.bytrain.org/future/southeastern.html.

1.3.3 Southeastern High Speed Rail

The Southeastern High Speed Rail (SEHSR) project is the potential extension of Amtrak's Acela service from Washington, DC to Charlotte, and potentially on to Atlanta. The study is a joint project of NCDOT and the Virginia Department of Rail and Public Transportation. The study has finished the Tier I analysis, which selected the alignments for further study in the Tier II analysis. The alignment selected in Tier I overlaps with the Eastrans corridors in downtown Raleigh, along the same alignment as the TTA corridor (on CSXT alignments). Further information on the SEHSR is available on the web at www.sehsr.org/.

1.4 STUDY PURPOSE

The purpose of the *Eastrans Commuter Rail Feasibility Study* is to focus on just the feasibility of establishing commuter rail service along the two existing, primarily freight, corridors. The principal objectives are:

- to evaluate the current track conditions and their suitability for passenger service;
- to determine the required capital improvements;
- to estimate the capital and operating costs of the commuter rail service; and
- to review the potential for federal funding of any improvements.

This study does not rise to the level of an Environmental Impact Study or Environmental Assessment as defined in the Federal Transit Administration requirements. Rather, this study is an initial assessment of the conditions of the corridors and an analysis of the level of improvements and costs that would be required to upgrade the corridors to support passenger service.

Further studies would be required to define specific capital improvements, evaluate their environmental impacts, estimate ridership, and explore the requirements of the freight line owners and operators. These studies will be undertaken after this current feasibility study following a decision by the area jurisdictions and constituents to proceed with further analyses. An alternatives analysis whereby commuter rail service is evaluated against other technologies in the same corridor will need to be performed in order to obtain Federal Transit Administration (FTA) "New Starts" funding for any improvements.

1.5 STUDY COORDINATION AND DEVELOPMENT

To ensure the goals and recommendations of the *Eastrans Commuter Rail Feasibility Study* reflect the interests and considerations of the concerned stakeholders, a broad Steering

Committee was formed. Besides members of the Steering Committee, other interested officials were kept informed during the process through regular communication.

1.5.1 Study Steering Committee

The work of the study was guided by a steering committee composed of representatives of the major groups noted above. The study would not have been possible without the input provided by these individuals.

Mike Frangos, chair	Town of Knightdale (originally Town of Zebulon)
Jeanne Bonds	Town of Knightdale (former Mayor)
David Bender/Shirley Williams	North Carolina DOT Rail Division
Tamra Shaw	North Carolina DOT Public Transit Division
Edison Johnson	Capital Area Metropolitan Planning Organization
Brad Bass	City of Garner
Martin Stankus	City of Raleigh
Katrina Simon	City of Raleigh
Todd Allen	Raleigh Capital Area Transit
Teresa Piner	Town of Wendell
Bruce Beasley	Wilson Chamber of Commerce

In addition to the above members, representatives of the railroads were included. Their knowledge and support of the study will be critical in implementing any changes since they are the owners and operators of the corridors.

Carl Wilson	Norfolk Southern East Carolina Business Unit
Scott Saylor	North Carolina Railroad
John Gibson	CSX Transportation

1.5.2 Associate Members

Besides the formal Steering Committee membership, several additional organizations were kept apprised of the study findings. These members provided useful insights during the study.

Don Carnell	Triangle Transit Authority
Joe Hugey	Triangle Transit Authority
Steve Biggs	Town of Clayton
Skip Browder	Town of Clayton
Richard Slozak	City of Goldsboro
George Chapman	City of Raleigh
Eric Lamb	City of Raleigh
Jeff White	Town of Selma
Ed Wyatt	City of Wilson

1.5.3 Small Community Contacts

The WSA Team contacted the mayors of the smaller communities along the corridors. The mayors contacted were:

- NS Corridor
  - Middlesex
  - Bailey
  - Sims
- NCRR Corridor
  - Wilson Mills
  - Pine Level
  - Princeton

The majority of the communities were interested in the study and supportive of commuter rail service. Only Sims did not have interest in commuter rail service under the belief that the majority of their residents commute to Wilson and do not have any difficulties doing so. Despite several attempts, we were unable to contact representatives from Wilson Mills or Pine Level to ascertain their interest in commuter rail service.

1.5.4 Consulting Team

The consulting team for this study was led by Wilbur Smith Associates (WSA). The following were the principal team members on this project.

Wilbur Smith Associates

Robert Bush	Project Manager
Glenn Michael	
Bob Glover	
Anuja Koirala	

1.6 REPORT ORGANIZATION

The report is organized into the following chapters. Chapter 1 provides the overview of the project and its planning environment. Chapter 2 gives an overview of the corridors being considered, both for the existing railroad infrastructure and the population characteristics. Chapter 3 is an overview of the railroad owners and operators, whose support will be critical for implementing any of the planned services. Chapter 4 describes the service alternatives that were evaluated, and Chapter 5 describes the necessary capital improvements to support these operating alternatives. Chapter 6 gives the estimated capital and operating costs for the alternatives, and presents ridership targets that indicate a productive transit service. Chapter 7 concludes the study with the findings and recommended next steps.

2. CORRIDOR PROFILES

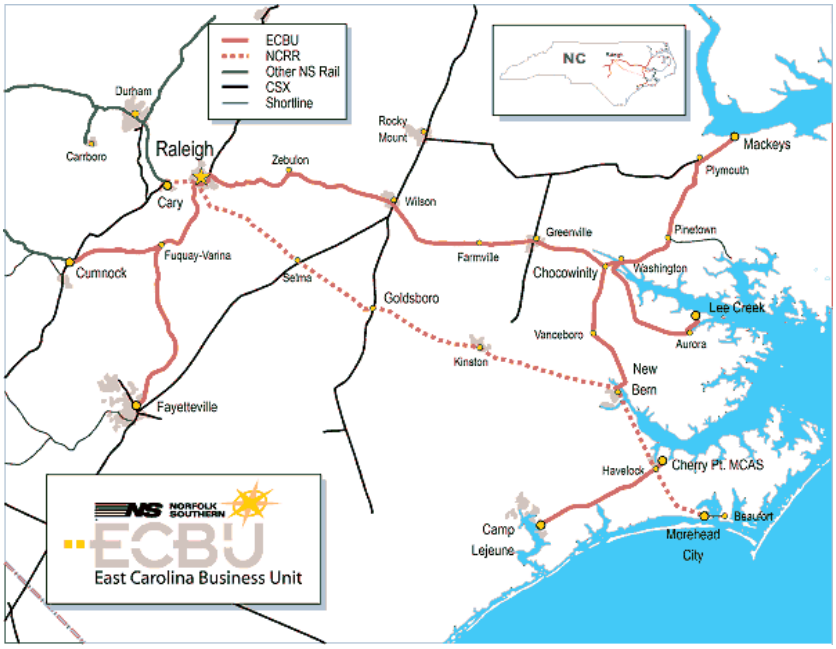
The *Eastrans Commuter Rail Feasibility Study* evaluates two separate, but connected corridors. Collectively the corridors form a "U" shape with the apex in downtown Raleigh. Service on these corridors can either operate independently, or in a consolidated fashion.

Under the original Eastrans Commuter Rail Alliance, the two corridors considered were the Norfolk Southern (NS) corridor between Raleigh and Wilson, and the North Carolina Railroad (NCRR) corridor between Raleigh and Selma. As the Alliance's efforts progressed, the City of Goldsboro was included in the evaluation of the NCRR corridor as a way to return passenger train service to the city. Upon initiation of this *Eastrans Commuter Rail Feasibility Study*, WSA identified a third corridor for further consideration – the CSXT Corridor outside downtown Raleigh. This corridor provides an alternative connection between the NS and NCRR Corridors. **Exhibit 1**, following, shows the corridor locations.

2.1 NORFOLK SOUTHERN (NS) CORRIDOR

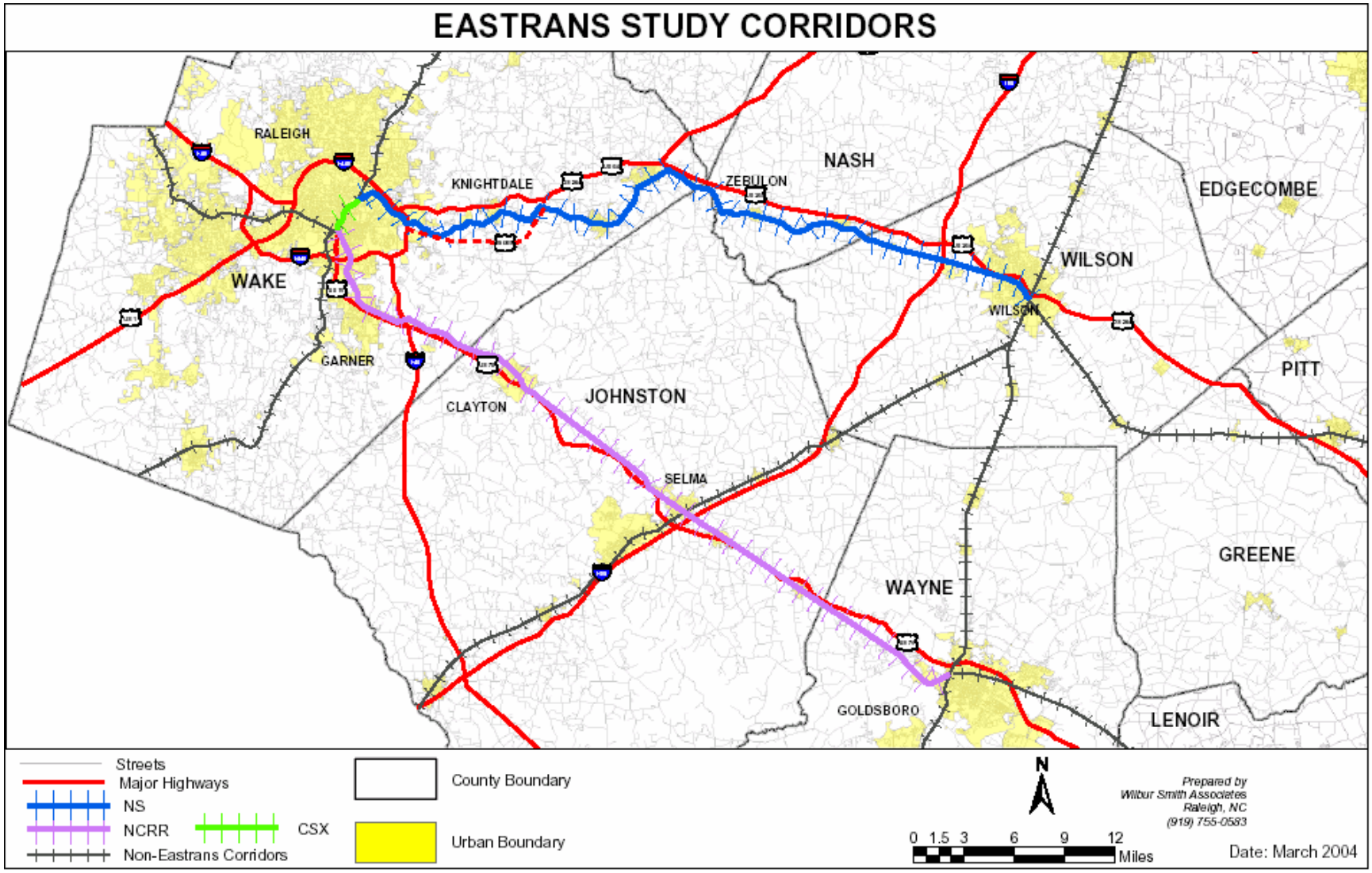
The Norfolk Southern Corridor currently stretches from Raleigh to Mackeys on the Albemarle Sound. This corridor is the newest of the three corridors being evaluated. The corridor has always been under the ownership and operating control of Norfolk Southern Corporation or its predecessor organizations (Southern Railway and Norfolk Southern Railway). The line was opened between Raleigh and Zebulon in 1906 as part of the Raleigh and Pamlico Sound Railroad. The line was extended to Chocowinity in 1910[2].

Currently, this line is part of NS's East Carolina Business Unit (ECBU), headquartered in Raleigh. The ECBU manages 485 miles of railroad track east and south of Raleigh. The map at the right shows ECBU's service area.



[2] http://users.inna.net/~jaydeet/timeline.htm

Exhibit 1
Corridor Locations



2.1.1 Corridor Facilities

The NS corridor is 50.7 miles long, stretching from milepost (MP) 182.4 at the CSXT railroad crossing in Wilson to MP 233.1 at the Boylan Wye in downtown Raleigh. For this study, an additional two miles were evaluated between the NS line and the existing Wilson station, located on the CSXT line, making the entire corridor 53 miles long. The corridor right-of-way varies along its length, but from a spot check of parcel information, the common width is 100 feet. From a hi-rail tour of the facility, the right-of-way includes much undeveloped land that is forested or wetland areas. The accompanying photo shows a typical location, in this case at MP 223 near the Raleigh/Knightdale border. The track is well buffered from most surrounding land uses.

For the majority of its length, the corridor consists of a single track. A two-mile passing siding is located at Middlesex. Current guidelines call for passing sidings to be 1.5 – 2.0 miles long in order to accommodate typical freight train lengths. A freight train with 150 cars, with an average length of 50 feet per car would be 7,500 feet long (1.4 miles). Such a freight train length is not uncommon.

The portion of the corridor from Wilson to Bailey is very straight track, and is relatively straight between Bailey and Zebulon, at Five County Stadium. From Zebulon to Raleigh, the track has more curves, including several locations where reverse curves occur in close proximity. The track is generally 132-pound, welded rail. This weight is sufficient for passenger operations. This corridor is generally considered to meet the Class 4 standards under the Federal Railroad Administration requirements.

There are 58 at-grade crossings between the CSXT track in Wilson and the Boylan Wye, or more than one crossing per mile. Not included in that number are 21 private and farm crossings, generally driveways or crossings to allow farm equipment to travel between fields on either side of the track. Approximately one-fourth to one-third of the roadway crossings are unsignalized; none of the private and farm crossings are signalized. Additionally, the line crosses CSXT's dual-track mainline at grade in Wilson and the less-used "S" line at the Edgeton Junction north of downtown Raleigh.

The above conditions combine to result in an average posted speed of 41 miles per hour along the length of the corridor, with a range of 25 mph to 49 mph. These speeds are the posted speeds for freight traffic.

Yard and shop facilities (the Glenwood Yard) are located north of downtown Raleigh, west of Capital Boulevard. This is not a major freight facility, as yard and shops go, but it is the

principal facility and headquarters for the ECBU. The yard extends from the Edgeton Junction to Fairview.

The only open Wye along the corridor is in the Glenwood Yard. A "Wye" is a section of track laid out in a "Y" pattern and is used for turning around trains. An abandoned Wye is located in Wilson, and the right-of-way is still owned by NS.

Connecting track is in place from the NS line westbound to the CSXT line southbound at the Edgeton Junction, and from the NS line to the NCRR line at Boylan. This connection allows NS trains on the NCRR line to reach the Glenwood yard & shop, and would allow the Eastrans service to interline between the two corridors.

2.1.2 Recent and Planned Improvements

The Rail Division of the North Carolina Department of Transportation (NCDOT) oversees several programs throughout the state designed to improve rail operations. Many of these programs are targeted at improving railroad/roadway crossings for safety and speed purposes. Intersections are selected for signal and signage improvement based upon several factors including train volume and speed; vehicular traffic and school bus frequency; existing warning devices and number of tracks; and the 10-year accident history.

Since 2000, NCDOT and NS have improved four crossings along this corridor. Hodge Road in Knightdale has had automatic gates installed and its signal system upgraded; Marks Creek Road in Knightdale has had crossing signals and gates installed; Pine Street in Wendell has had flashing signals and automatic gates installed; and Manning Street in Middlesex has had crossing signals and gates installed.

NCDOT also has a program to conduct Traffic Separation Studies to examine the potential of implementing grade separations or closing of some lightly used crossings. These studies are undertaken in coordination with the railroads and the affected municipalities. NCDOT considered conducting such a study in Wilson, but the department and city were unable to agree upon the scope of the analysis. No other studies along this corridor have been proposed.

2.1.3 Current Usage

There is no current passenger activity along this corridor. NS operates two long-distance trains per day along the corridor, and one to two local trains daily. Local trains are shorter and serve nearby destinations, while the long-distance trains can travel the length of the corridor and consist of 100 to 150 cars each.

Major freight switching operations for eastern North Carolina occur at the Glenwood Yard. The single track sections parallel to Glenwood Avenue are regularly used for freight car storage.

2.2 NORTH CAROLINA RAILROAD (NCRR) CORRIDOR

The North Carolina Railroad Company (NCRR) corridor stretches 317 miles from Morehead City to Charlotte. NCRR is an independent company whose controlling stock is owned by the State of North Carolina. NCRR was chartered by the State in 1849. The first rails were laid in 1853 beginning in Goldsboro, and by 1854 in Raleigh[3]. NCRR originally stretched from Goldsboro to Charlotte; the Goldsboro to Morehead City section was part of the Atlantic and North Carolina Railroad, which merged into NCRR in 1989.

NCRR contracts with Norfolk Southern for the operation of the NCRR corridor under a long-term exclusive trackage rights agreement. CSXT Transportation has a parallel track agreement for freight operations on a portion of this corridor from the Boylan Wye in downtown Raleigh to Fetner Junction in downtown Cary.

2.2.1 Corridor Facilities

The portion of the corridor studied for the Eastrans project stretches from MP 81 at the Boylan Wye to MP 130 in Goldsboro, a distance of 49 miles. The corridor right-of-way has some variation, but is generally a consistent 200-foot width. We did not conduct a hi-rail tour, but from crossing observations, much of the right-of-way is forest land. The accompanying photo is looking westbound at Wilsons Mill, MP 104.

The majority of this corridor consists of single-track sections. A 1.5-mile siding is located east of Selma. Several other short sidings are located on the corridor, but these are less than one-mile long.

This corridor is relatively straight, especially the portion between Clayton and Goldsboro. The portion between Raleigh and Clayton is relatively straight as well. The track is generally 132-pound, welded rail. This corridor is generally considered to meet the FRA Class 4 standards.

There are 68 at-grade crossings between Cabarrus Street in Raleigh and Ash Street in Goldsboro, or more than one crossing per mile. Not included in that number are 25 private and farm crossings, generally driveways or crossings to allow farm equipment to travel between fields on either side of the track. Approximately one-third of the roadway crossings are unsignalized; none of the private and farm crossings are signalized. Additionally, the line crosses CSXT's

[3] Byrd, Tom. *Around and About Cary*. Ann Arbor, MI: Edwards Brothers, 1994.

dual-track mainline at grade in Selma (the same line as in Wilson) and a less-used branch line in Goldsboro. The line is unsignalized.

The above conditions combine to result in an average posted freight speed of 46 miles per hour along the length of the corridor, with a range of 10 mph to 49 mph.

NS has yard & shop facilities located on the north side of Goldsboro. A Wye is located along Center Street at the yard & shop.

2.2.2 Freight Characteristics and Usage

Photo courtesy of NCRR

NS operates between four and eight freight trains per day along this corridor. These freight trains serve a variety of industrial and other customers. Access to freight rail service can be a major factor influencing the location of new businesses and expansion of existing businesses. Freight rail service can provide a major economic development incentive for an area. Shown in the adjacent photo is a rail spur into Goldsboro Milling, one of the most significant freight customers on the corridor.

One of the major users of the NCRR corridor (and other corridors in the state), is the US military. Heavy military equipment that is unsuitable for transport on the highway network is transported via rail lines between the bases and depots and the state's ports. The capacity provided by the rail system has been vital in preparing our troops for the recent war in Iraq.

Photo courtesy of NCRR

2.2.3 Recent and Planned Improvements

Since 2000, NCDOT and NS have improved four crossings along this corridor. NC 42 in Clayton has had improved signals and four-quadrant gates installed; Braswell-Bizzell Road in Pine Level has had crossing signals and gates installed; and Stevens Mill Road and Smithfield Road in Goldsboro have had improved signals and crossing gates installed.

Several lightly-used crossings have been closed. These crossings are located at Auburn Road in Garner; and Holt, Fitzgerald, and Church in Pine Level. NCDOT is currently conducting a Traffic Separation Studies in Clayton to determine if some lightly used crossings can be closed.

NCDOT, NCRR, and NS have jointly worked to improve track conditions between Raleigh and Selma. During 2002, new crossties were installed, the rails were resurfaced (ground), and the superelevation (banking) of several curves was increased. This $2.7 million project increased speeds by 10 miles per hour, and saved five minutes of travel time for passenger trains.

NCRR is considering further improvements along this corridor, notably upgrading and extending some sidings between Raleigh and Selma, double tracking a portion of this section, and installing Centralized Traffic Control between Garner and Goldsboro. These projects are not assured until the funding source is secured.

2.2.4 Current Passenger Usage

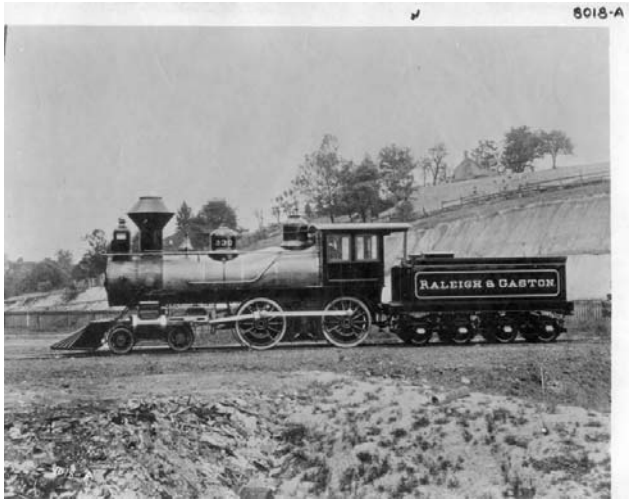
Amtrak operates four daily passenger trains between Selma and Raleigh – two trains each on the Carolinian and Silver Star lines. The Carolinian travels between Charlotte and New York City, while the Silver Star connects Miami with New York City.

2.2.5 Future Passenger Usage

This corridor is under evaluation for additional Amtrak service. As noted in Chapter 1, the NCDOT Rail Division is spearheading an evaluation of reinstituting passenger service between Raleigh and Wilmington. One of the potential routes would use the entire length of the Eastrans portion of the NCRR corridor from Raleigh to Goldsboro. Both potential routes use the NCRR corridor between Raleigh and Selma. Under the schedules being considered, two daily passenger trains would operate on this service.

2.3 CSX TRANSPORTATION (CSXT) CORRIDOR

At the outset of this study, an examination of CSXT lines was not envisioned. CSXT does not own or operate either corridor being considered. As the study progressed, however, the Team considered the desirability of using the CSXT line in Raleigh between the Edgeton Junction near the intersection of Atlantic & Wake Forest and the Boylan Wye near the Amtrak station.



Historic photo of Engine No. 230
http://imagebase.lib.vt.edu/view_record.php?URN=ns1291

This line is the oldest of the three corridors. Its history stretches back to the Raleigh and Gaston Railroad, which was one of the first two railroads incorporated in North Carolina in 1835 (the other being the Wilmington and Weldon Railroad)[4]. By 1840, the tracks were completed in Raleigh. In 1900, the Raleigh and Gaston Railroad was merged into the Seaboard Air Line Railroad, which later became the Seaboard Coast Line Railroad before becoming part of CSXT. CSXT considers this the "S" line as a result. The "S" line originally went from Raleigh to Petersburg, but the portion between Norlina and Petersburg was abandoned in 1985. CSXT's mainline is now the "A" line through Wilson and Selma.

[4] http://docsouth.unc.edu/nc/clarkw/menu.html

Exhibit 2 shows the area northwest of downtown Raleigh, where the CSXT corridor is located. Shown in the exhibit are the CSXT corridor between the Edgeton Junction and the Boylan Wye, the CSXT and NCDOT yard and shop locations, the NS corridor and its yard and shop, and the NCRR corridor and its connections with the NS and CSXT corridors.

There are several reasons to consider the usage of the "S" line between Edgeton and Boylan. This line provides access to the NCDOT yard and shops adjacent to downtown Raleigh. If an additional track is required, there are fewer grade separations along the "S" line than along NS's line. TTA's regional rail stations for downtown Raleigh are located on this line, which offers greater potential for passenger connections.

There are also disadvantages to using the "S" line compared with the NS line. This line serves two yards – NCDOT's and CSXT's. This line is the corridor that will be used by TTA for their regional rail service to north Raleigh. This line has also been identified as the future Southeast High Speed Rail service, as discussed in Chapter 1. The current right-of-way is not wide enough for all of these planned services.

Despite these disadvantages, for the *Eastrans Commuter Rail Feasibility Study*, the "S" line represents a conceivable optional route to provide the connection between the NS and NCRR corridors and to serve downtown Raleigh.

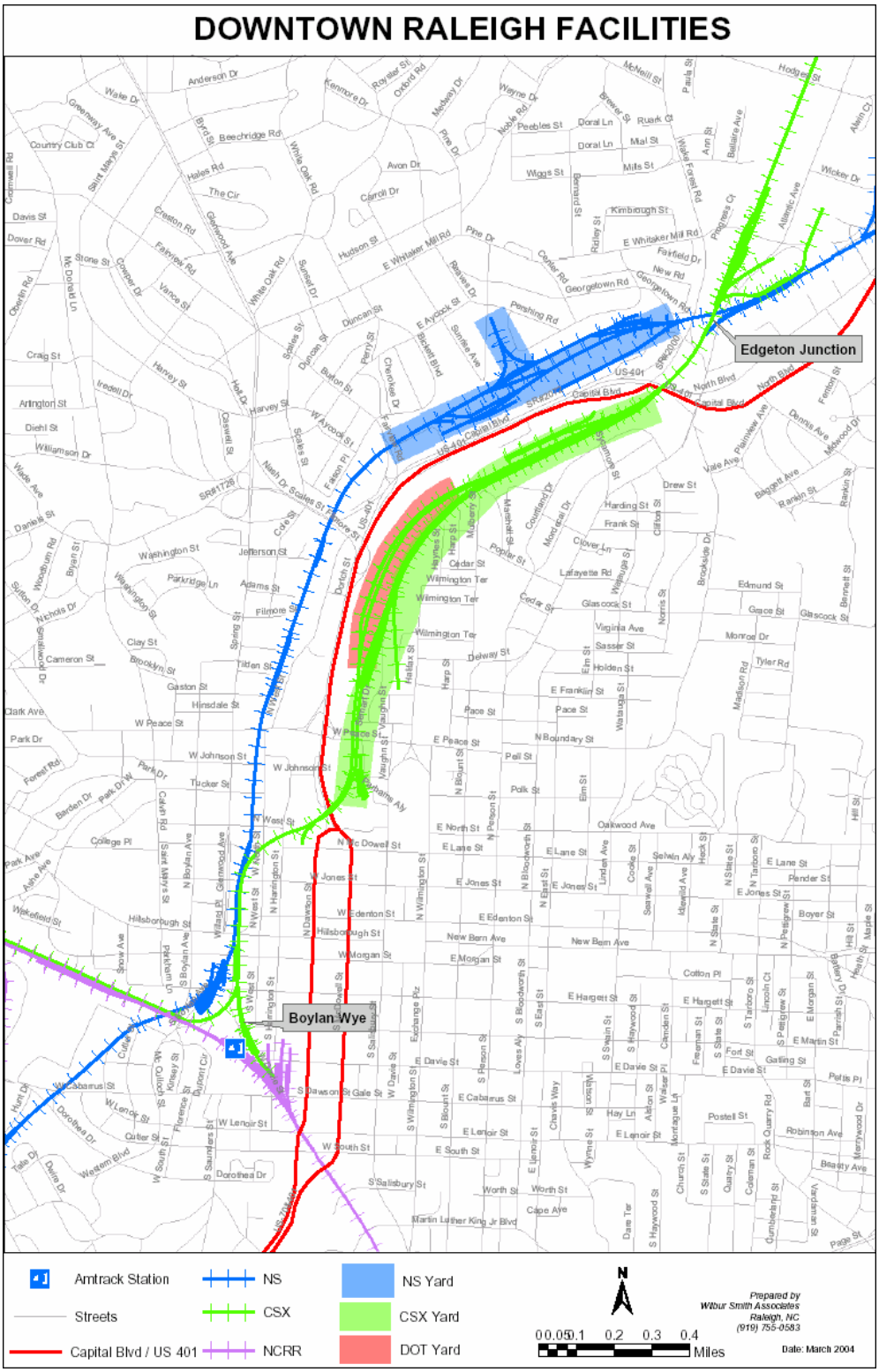
2.3.1 Corridor Facilities

Track charts were not available to the consultants for review, so our evaluation of the current facilities is limited to field observations. The portion of the "S" line being considered is approximately 3 miles long.

The track sections vary along the corridor. Starting at Edgeton Junction, the single CSXT track is joined by two connecting tracks from the NS line. These tracks merge into a single track that continues south past the CSXT yard. Connections are provided to several sidings and to the CSXT and NCDOT yards. At Jones Street, the CSXT and NS corridors have merged into adjacent rights-of-way, and a connecting track between the two lines exists between Jones and the Hillsborough Street bridge. If the NS alignment is used for the Eastrans service, the trains would use this connection to travel between the NS and NCRR corridors.

Edgeton Junction looking north; CSXT track to the left and NS connector to the right.

Exhibit 2
NS and CSXT Options



Underneath the Morgan Street bridge, the connecting track to NCRR eastbound to Goldsboro is added. Under the NS routing option, Eastrans trains would follow this connecting track. In the vicinity of Hargett Street, the CSXT line adds a second track. These two tracks curve westbound and merge into the NCRR line heading toward Cary at the Boylan Wye.

Boylan Wye looking east; CSXT dual tracks to the left, NCRR tracks to the right; Amtrak train can be seen at the station on the right.

Other than the Boylan Wye, which is under the ownership of three different railroads, the CSXT corridor does not have a Wye turnaround such as is available in the NS yard & shop. CSXT does have a turntable south of Peace Street that is large enough for one engine.

As the above description indicates, the track layout in downtown Raleigh is complex. The current level of activity causes few difficulties, but there is little excess capacity to add more trains, especially commuter trains that would be stopping at stations in the area.

The track weight ranges from 115-pound in the yard & shop area to 136-pound in other sections. There are five grade crossings in the three-mile stretch at Harrington, West, Jones, Hargett, and Martin.

2.3.2 Planned Improvements

As noted above, this corridor will be the location of the future TTA regional rail service. Final design is underway, and changes may occur, but current plans call for TTA to purchase additional right-of-way on the east side of the CSXT right-of-way, where Dillon Supply is located. TTA's tracks will be located below grade in the vicinity of the Boylan Wye. Stations will be located at Hargett Street and above Capital Boulevard.

2.4 POPULATION PROFILE

While the focus of the *Eastrans Commuter Rail Feasibility Study* is not on ridership and productivity issues, it is helpful to gain an understanding of the level of population growth, its location, and the general commuting patterns in the corridors. This information helps identify potential station locations and provides a reasonableness test for the level of ridership required to support the capital investment.

2.4.1 Population Growth

The Triangle region has shown significant population gains between the 1990 and 2000 Censuses. The rate of growth by municipality has been uneven, as shown by **Exhibit 3**.

Exhibit 3
Municipal Population Growth

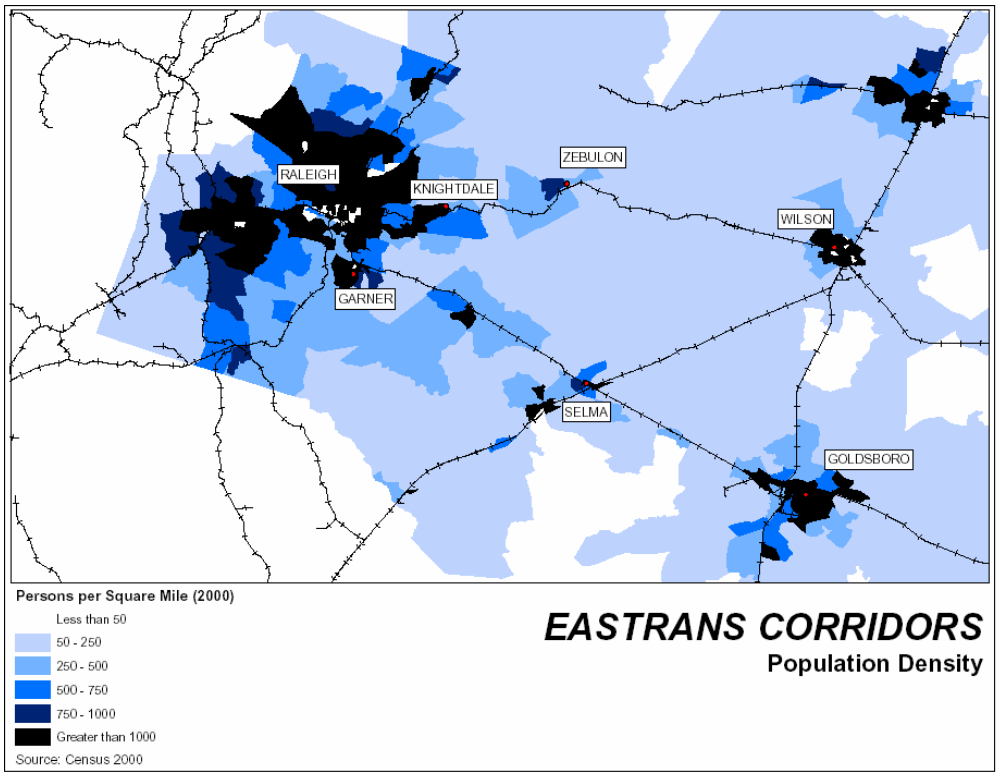
Municipality	1990 Population	2000 Population	Percent Change
Norfolk Southern Corridor			
Wilson	36,930	44,405	20.2%
Sims	124	128	3.2%
Bailey	553	670	21.2%
Middlesex	730	838	14.8%
Zebulon	3,173	4,046	27.5%
Wendell	2,822	4,247	50.5%
Knightdale	1,884	5,958	216.2%
RALEIGH	207,951	276,093	32.8%
North Carolina Railroad Corridor			
Garner	14,967	17,757	18.6%
Clayton	4,756	6,973	46.6%
Wilson Mills		1,291	
Selma	4,600	5,914	28.6%
Pine Level	1,217	1,313	7.9%
Princeton	1,181	1,066	-9.7%
Goldsboro	40,709	39,043	-4.1%

Overall, the NS corridor's population in the communities served (excluding Raleigh) grew 30.5 percent, from 46,216 to 60,292. The NCRR corridor communities grew 8.8% from 67,430 to 73,357. Excluding Wilson Mills, which was not incorporated in 1990, population in the remaining communities grew 6.9 percent.

2.4.2 Population Density

One of the principal factors influencing the use of commuter service, and its corresponding productivity, is the density of population in the area served. **Exhibit 4** shows the density by Census Tract along the corridors.

Exhibit 4
Population Density



2.4.3 Employment Levels

Changes in employment over the same period show a similar pattern, with locations closest to Raleigh and Wake County generally showing stronger growth than areas further away. The federal Bureau of Labor Statistics publishes this information on a county-level basis as shown in **Exhibit 5**.

Exhibit 5
Employment Levels by County

County	1990 Employment	2000 Employment	Percent Change
Johnston	42,771	63,724	49.0%
Nash	39,676	41,997	5.8%
Wake	247,985	360,867	45.5%
Wayne	45,786	49,516	8.1%
Wilson	32,425	35,894	10.7%

Since the end of 2000, employment levels have continued to grow in Johnston and Wake counties, but levels in Nash and Wayne Counties had fallen below the 2000 levels by the end of 2003. Wilson County has fallen below the 2000 levels in 2004. This decline in employment can

be devastating to a community. Improvements to the rail system can be one tool to reverse this trend by offering improved freight access to sites within a community, and by offering passenger service to connect the communities with the growth occurring in the greater Raleigh area.

2.4.4 Commuting Patterns

As a general indicator of ridership potential, we examined the level of commuting activity between the counties served by Eastrans. Not all commuters would use Eastrans, nor are work commuters the only users, but the county worker flows provide a general idea of the level of travel that could be served by commuter rail. **Exhibit 6** shows the worker flows by county for the 2000 Census. The origin county is shown down, and the destination county is shown across.

Exhibit 6
County Worker Flows

Destination/ Origin	Johnston	Nash	Wake	Wayne	Wilson
Johnston	26,971	307	23,628	1,142	1,051
Nash	210	26,654	2,843	23	3,216
Wake	4,050	704	272,432	198	622
Wayne	2,007	143	1,164	40,427	1,342
Wilson	749	2,457	1,143	352	26,255

The purple shading indicates the worker flows that could be served by the NCRR corridor, while the blue shading indicates the worker flows that could be served by the NS corridor. Nash County has been included in the table since the NS corridor goes through the county, but no shading has been applied since the largest city in the county (Rocky Mount) is not on the corridor, and thus would not be served.

Internal county flows have not been shaded, either, because of the multitude of destinations within each county. This lack of precision greatly affects the ability to determine the potential work commutes that would be served by the NS corridor since the majority of the municipalities along that corridor are all within Wake County, as shown in the yellow-shaded cell. A more sophisticated modeling approach, such as that afforded by the Triangle Regional Travel Demand Model, is required to develop ridership estimates.

3. JOINT FREIGHT/PASSENGER USE CONSIDERATIONS

The inherent attractiveness of the Eastrans Commuter Rail service is the potential to use an already existing asset. Railroad corridors and their associated infrastructure are already in place, providing freight service to industries along the lines. These corridors are not currently being used for commuter travel, and they offer the potential to provide an alternate route besides traffic congested roadways.

These assets, however, are not owned and operated by the government. While the State owns the controlling stock of the North Carolina Railroad (NCRR) Company, the operating rights are licensed by Norfolk Southern Corporation (NS) for freight service. NS also owns and operates the NS corridor. NS is a publicly traded corporation listed on the New York Stock Exchange (symbol: NSC). So, too, is the CSX Corporation (NYSE: CSX). These corporations are in business to make a profit and provide a return to their shareholders. They will evaluate any proposal to use their assets in the same manner as any other corporation.

As railroads, NS and CSXT are subject to federal jurisdiction that limits local or state jurisdictions from forcing them to enter into an unfavorable agreement. Any operation of passenger service on their tracks or within their right-of-way will require an agreement, the terms of which will be subject to negotiation. The capital and operating requirements for passenger service are very different from the same requirements for freight operations.

3.1 PLANNING GUIDELINES

Wilbur Smith Associates (WSA) contacted each of the railroads to discuss with them the service being considered for the Eastrans Commuter Rail project. The railroads receive many such inquiries from around the country, and they have developed a series of considerations for any entity wishing to implement commuter rail service. Letters describing the concerns of NS and CSXT are provided in the Appendix. The considerations fall into four major categories:

- **Safety** – paramount to any addition of passenger service is an issue of safety; for railroad passengers, railroad employees, and adjacent development. Any introduction of passenger service must ensure a safe operation. This concern does not preclude joint use of a corridor or the sharing of tracks, but any such sharing must be done in a prudent manner. This concern can affect not only the schedule of passenger service, but also the type of vehicles used on the corridor. Station locations will be another factor that could affect safety. Any stopping activity, especially if it's on the main track, will need to occur on a tangent, and provide plenty of visibility in both directions.
- **Liability** – along with the safety issue is the issue of liability. The freight railroad cannot be held liable for any damages caused by passenger operation. The passenger service must have adequate insurance to cover any expected liability concerns. In actual practice, this requirement has been one of the most difficult for new commuter operations to meet, and can be one of the most costly items facing a new operator.

- **Capacity** – any new operation must not negatively affect the existing freight operations in the corridor. Commuter services must be "transparent" to the freight operations, meaning that the freight operations cannot be delayed, even minimally. This concern can sometimes be addressed by either scheduling commuter service at times when freight service is not currently operating, or sufficiently increasing the capacity of the corridor to accommodate the additional trains. Along with this guideline is the likelihood that the current railroad operator (either NS or CSXT) would maintain dispatching responsibilities for passenger operation over their corridor. Capacity will be a particular issue in the vicinity of the yard and shops near downtown Raleigh. Any passenger activity must not interfere with the operations of the yard.
- **Compensation** – Any usage of the tracks or the corridor right-of-way will require "fair" compensation for their use. This compensation includes paying for the cost of any required improvements, dispatching services, maintenance of way, and a return on the value of the assets. "Fair" compensation is not the same as the current access fees paid by Amtrak, which reflects the special federal legislative arrangements related to the assumption of passenger operations from the private railroads. Each railroad will have a different way to determine the "fair" compensation. However, NCRR is likely to have a different interpretation than the two private railroads. NCRR may not have the same return requirements as the publicly-traded companies, and there are provisions in the NCRR-NS agreement that create the potential for commuter rail.

3.2 SPECIFIC CONCERNS

Two specific concerns were raised during the course of the *Eastrans Commuter Rail Feasibility Study*. These concerns are highlighted here, and will need to be addressed in more detail during later phase of refining the Eastrans project.

3.2.1 Limited CSXT Right-of-Way

As noted elsewhere in the report, there are many services being planned and designed along the CSXT "S" line adjacent to downtown Raleigh. Besides the existing CSXT freight traffic and the traffic associated with both the CSXT and NCDOT yard and shops, the Triangle Transit Authority is currently designing its regional rail lines within the same corridor. This corridor is also identified as the future Southeast High Speed Rail corridor. Even without the introduction of Eastrans service, this corridor has multiple interests that desire to use the present narrow right-of-way.

Should the Eastrans service be introduced in this corridor, several detailed studies will be required to ensure that the Eastrans operation does not interfere with the already existing and other planned train services. Such assurances are critical to obtaining the support of CSXT, which owns the corridor.

The limited right-of-way may also impact the desirability of having an Eastrans stops adjacent to the TTA Government Center station. Both TTA and NCDOT officials have raised concerns about the implications of this station on the operations in the area. The next phase of engineering

studies will need to address these implications to ensure that operations and safety are not compromised by an Eastrans station in this corridor.

3.2.2 Corridor Crossing Safety Analysis

Commuter rail service in the corridors will change the nature of train operations. Trains will now dwell at new locations to pick up passengers. As a result, trains may or will block some existing grade crossings. Although the dwell time is relatively short at one minute per stop (less than the red cycle of some traffic signals), auto traffic may be affected. Additionally, pedestrian activity will increase as passengers go to and from the trains.

NCDOT recommends that a corridor crossing safety analysis should be completed prior to implementing any passenger services. This analysis will review the potential conflicts among the three travel modes (pedestrian, auto, and train) and identify ways to minimize the conflicts and ensure everyone's safety. Such an analysis may well recommend that some existing grade crossings be closed. The local jurisdictions will need to be closely involved with this process.

3.3 INCORPORATION INTO STUDY

WSA reviewed these guidelines and considerations and incorporated them into the planning of the Eastrans Commuter Rail service. Based upon our experience with similar operations around the country, we have a good understanding of the requirements of the operating freight railroads.

Given the operating assumptions for the passenger service, the potential impacts on the freight operations were analyzed, assuming the current level of freight needs. This requirement can change over time. The analysis identified the type and level of improvements that would be required to avoid any negative impacts to the existing and planned level of freight operation (and the existing Amtrak services on the NCRR corridor).

The three railroad companies reviewed our assumptions on the level of capital improvements that would be required. Reflecting the conceptual nature of the study, the railroad review was also conducted at the conceptual level. WSA is confident that the costs shown in Chapter 6 are reasonable for the level of details known at the current conceptual level. Further study will be required to determine whether the capital improvements meet the railroads' needs as the details of the commuter rail service become known.

3.4 FUTURE IMPLICATIONS

Based upon this review, the costs presented in a later chapter can be interpreted to fairly represent the expected costs for implementing Eastrans Commuter Rail service. It is important to recall that the costs and the level of review have all been conceptual in nature. As the project moves forward into development, and a secure source of funding has been identified, the railroads will conduct a correspondingly closer examination of the assumptions.

At the final stage, the railroads will only accept operating plans, service levels, designs, and costs that have been prepared by contractors whom they have approved. The railroads will generally

require that they will be the ones to actually construct any of the improvements, even those paid for by other agencies.

As a final consideration, none of these considerations have a hard and fast set of results. The railroads will not accept any degradation of their operation, but the level of improvements required to meet that criteria will be subject to negotiation. So, too, will be the amount of liability insurance, the dispatching fees, and any other cost item. Access and dispatching fees may well be less if more capital improvements are made. Similarly, the fees may be different if NS or CSXT operates the Eastrans service instead of another company. The cost estimates provided represent the fairest appraisal possible by WSA given what is known about the operation of the service. The costs will change, however, as the project becomes more defined.

4. SERVICE ALTERNATIVES

Wilbur Smith Associates (WSA) evaluated two service alternatives for this *Eastrans Commuter Rail Feasibility Study* – a low-cost, short-term alternative and a high-cost, long-term alternative. For ease of reference, this report refers to them as the Low-cost Alternative and High-cost Alternative respectively. The purpose of evaluating two alternatives is to present a range of possible service and cost impacts. The alternatives can represent potential phases of implementation.

The evaluation considered each corridor independently, and further divided each corridor into logical operating segments. The following segments were evaluated:

- Norfolk Southern (NS) Corridor
  - Raleigh to Zebulon
  - Zebulon to Wilson
- North Carolina Railroad (NCRR) Corridor
  - Raleigh to Clayton
  - Clayton to Selma
  - Selma to Goldsboro

The segments provide potential terminal locations for service from Raleigh. The evaluation of each segment provides guidance on the incremental improvements required to extend service from Zebulon to Wilson, or to extend from Clayton to Selma, or further extension to Goldsboro.

4.1 COMMON ASSUMPTIONS

Inherent in each alternative is the assumption that existing railroad corridors are used for the services. No additional right-of-way is acquired for trackage improvements. Other alternative travel modes are not evaluated or considered, other than to provide access to the train stations. Impacts on existing transit systems in Wilson, Raleigh, and Goldsboro are assumed to be the responsibility of the local transit operator.

4.1.1 Downtown Raleigh Operations

Two options exist for the downtown Raleigh routing between the Edgeton Junction near the intersection of Atlantic and Wake Forest and the Boylan Wye near the Amtrak station. One option uses the NS track on the west side of Capital Boulevard and the other option uses the CSXT track on the east side of Capital Boulevard. These issues primarily affect the NS Corridor, but also have impacts on the NCRR Corridor, assuming trains from this corridor need to serve the northern side of downtown and will use a downtown location for yard & shop activities.

As noted in Section 2.3 CSXT Corridor, each option has advantages and disadvantages. The NS Option is further from the State Government Center and requires operation through the congested NS yard and shops. Adding track for this option will be expensive given the number of rail trestles between Glenwood Avenue and West Street. Interlining trains between the NS Corridor and the NCRR Corridor will require using CSXT trackage for a short section between Morgan Street and Davie Street. The NS Option also assumes that NS's yard is used for the Eastrans trains. The NS Option does minimize the amount of coordination required with a third railroad to start-up the Eastrans service.

The CSXT Option provides closer access to the State Government Center, and offers the potential for Eastrans and TTA transfers to occur at both the Government Center and Boylan TTA stations. This option is less expensive to add tracks since grade separations only exist at Capital Boulevard (two locations) and Peace Street. The existing bridges appear to have sufficient room for one more track. The CSXT Option opens the possibility of using the NCDOT yard & shop for Eastrans service. The two disadvantages of the CSXT Option are the need to coordinate Eastrans service with a third railroad, and the limited right-of-way in the area. This latter concern is the more critical issue and is both helped and hurt by TTA. TTA is using a portion of the right-of-way for their regional rail service, but TTA is also buying additional property in the area. The final impacts will not be known until Final Design is complete later this year. The CSXT Option does require operating over three railroads, which raises issues related to dispatching and who controls the Eastrans operation.

For this *Eastrans Commuter Rail Feasibility Study*, the CSXT Option is considered the preferred option, and its requirements are included in the operational and cost analyses. The potential problems are assumed to be solvable, and the benefits of this option are greater than the benefits of the NS Option.

Trains from both corridors are assumed to serve both the Government Center and Boylan stations. This service results in double the number of trains in operation between the two stations, that is, four trains in revenue service during each peak period in the Low-cost Alternative; more in the High-cost Alternative. As discussed in Section 5.3 Yard & Shop, trains are stored during the midday at the NCDOT yard. This arrangement requires the NS Corridor trains to deadhead, possibly in the reverse direction, up to the yard. As a result, a total of six Eastrans trains will be traveling on this section of CSXT track during each peak period for the Low-cost Alternative and more in the High-cost Alternative. An increase in the capacity of the corridor is required and has been included in the cost assumptions.

4.1.2 Station Locations

For this feasibility study, approximate station locations have been identified to provide an analysis of the running time requirements and to help the communities and stakeholders identify the potential service that they would receive. Station locations have not been determined at this stage of the analysis. A station identified as "Downtown Knightdale," for example, could be a mile either side of where the caboose is currently stored. The precise location will not affect the cost or running time of the calculations.

Stations are generally considered to be one of two types. In developed areas, such as the historic downtowns, parking is more limited and development is closer to the stations. In suburban locations, stations have more parking provided, which limits the density of development immediately adjacent to the platform. The first type of station is more appropriate in locations where the municipalities wish to increase the density of development. Since fewer people are able to drive and park to these stations, the desired passenger activity will need to be achieved by providing more development within walking distance of the station. Such Transit Oriented Development is discussed in Chapter 1.

In latter phases of studying Eastrans service, more precise station locations will be required. When ridership analyses are performed, station locations will need to be defined well enough so that the ridership model can determine the attractiveness of the location. In modeling parlance, the stations will need to be located within a specific Traffic Analysis Zone (TAZ), which could be a few square blocks in a developed area. Further refinements will need to occur as cost calculations become more precise so that specific track improvements can be determined. As this focusing process occurs, the railroads (both owners and operators) should be closely involved to ensure no safety or operational issues arise.

Several criteria have been used to locate stations for this study. The criteria call for stations to be located

- In areas of existing development (employment centers, hospitals)
- Where potential park & ride lots can be provided (easy freeway access, current parking)
- Where focused development is planned (new transit-oriented development)
- Consistent with local plans
- At existing station locations (Selma)
- To connect with other travel modes (TTA, local bus service)
- No closer than 3-4 miles apart; longer spacing for Low-cost Alternative

This station spacing is within the range of the average station spacing for commuter rail services in North America. According to a WSA evaluation of the 12 commuter rail systems in the US and Canada, including TTA's planned system, the average station spacing is 4 miles, with most systems having an average spacing in the range of 1.5 – 6.5 miles. Closer spacing, up to one mile apart, is possible in more developed areas, while the spacing is greater in suburban areas.

Anything closer than three-mile spacing greatly reduces train speeds since the train will not be able to reach its potential maximum speed before having to slow down for the next station. In downtown Raleigh, this is not a concern since the posted track speed is relatively slow.

Only basic amenities are assumed for stations. In the Low-cost Alternative, no weather protection is provided. The High-cost Alternative is more accommodating, but the amenities are still limited. No new buildings or enclosed waiting spaces are assumed, nor are staff present at the stations.

The station themselves are assumed to be located within the railroad right-of-way. Since no structures beyond overhead shelters are included, this assumption is reasonable. Station

locations are assumed to be generally compatible with freight operations, but this assumption may or may not be the case. Further study will be required to ensure stations are safely located. Any parking spaces added (discussed in the next section) are assumed to be constructed outside of the right-of-way. Gross estimates of the land acquisition costs are included in Chapter 6.

4.1.3 Parking and Access

Most commuter rail operations in the US rely heavily on park & ride, or kiss & ride patronage. Eastrans should be no exception. The walk area around stations is no greater than a one-quarter to one-half mile radius, which limits the number of residents with easy walk connections. Only Wilson, Raleigh, and Goldsboro have local bus systems to provide intermodal connections with Eastrans. Most riders are therefore anticipated to use a private automobile to reach the stations.

Parking is assumed to be provided at all stations except for the two downtown Raleigh stations. Since these are the terminal stations, and no reverse commuter trips are provided in the Low-cost Alternative, there is no demand for parking access. Even in the High-cost Alternative, no parking is provided since the anticipated low demand can be accommodated by the existing or planned parking in the area.

Parking demand for costing purposes has been estimated through an iterative process. As discussed in Section 4.2 Low-cost Alternative, the Federal Transit Administration (FTA) is assumed to be a major source of funding for any Eastrans service. One measure considered by FTA in evaluating funding requests is the cost per rider. WSA used some simplifying assumptions for the *Eastrans Commuter Rail Feasibility Study* to determine the level of ridership that would be required to support the capital costs of the service alternatives. Further discussion of the calculation of this "target" ridership level is found in Chapter 6.

The "target" ridership levels were then used to determine the number of parking spaces required for each segment. The parking spaces requirement assumed that 80 percent of the target ridership level will drive to a station. The remaining 20 percent of the target riders use other modes to reach the station, such as walking, taking a bus, or being dropped off (kiss & ride).

The "true" need for parking at each station will be an outcome of future ridership analyses. Typically, as a first step in a ridership analysis, each station location is assumed to have an unlimited supply of parking. Once the level of parking demand is determined by this method, the supply is adjusted to meet demand, provide room for growth, and fit within local circumstances. This adjusted supply is fed back into ridership calculations, along with any assumptions regarding parking charges. New parking demands result and the cycle starts again.

Since that level of analysis is beyond the scope of this current study, the consultants have estimated parking supply only based upon the target ridership levels. Feedback analyses have occurred as costs change do to changes in parking supply and train capacity. The result gives a fair estimate of the costs required to carry the target ridership levels, but is in no way a projection of demand. This analysis is also not concerned with what the supply is at any particular station, as long as the parking supply for a particular segment meets the target ridership levels in that

segment. Therefore, the only parking supply numbers reported are on a segment level, rather than a station level.

4.1.4 Running Times and Schedule

Running time is an important consideration for any commuter rail service. Speeds need to be sufficiently fast to provide an attractive alternative to the automobile, while being slow enough to provide a safe operation and give riders time to get on and off. The major factors affecting the speed of train service are:

- the condition of the track
- the signalization/control system
- the number and spacing of the stations
- the radius of the curves
- the number of grade crossings

The *Eastrans Commuter Rail Feasibility Study* has evaluated the first three factors. The capital improvements described in Chapter 5 are aimed at improving track conditions to the greatest extent possible for passenger service, including new train control signal system when required.

The Eastrans alternatives do not assume any changes in the curve radius or grade crossings. Changing the radius of a curve will usually require additional right-of-way to be purchased, and entails another level of environmental analysis to be performed. While the elimination of some of the sharper turns, such as those in Knightdale, and the rapid alternation of curves, such as along the border between Knightdale and Raleigh, would greatly increase the operating speed, the costs of doing so is prohibitive. To gain a significant benefit from any straightening of the curves, a three-mile tangent is desirable so that the train can reach the maximum posted speed. Eliminating one curve will have little effect if another curve is a half-mile down the way.

Running times for both alternatives have been calculated based upon the posted track speed, with FRA-permitted adjustments for passenger operation. The posted speed applies to freight trains, while FRA permits passenger trains to travel at faster speeds, depending upon the track class. For Class 4 track, the maximum passenger speed is 79 mph. These maximum speeds are assumed only where the posted speed is in effect for three or more miles and adequate signalization has been installed. At shorter distances, the trains will not be able to accelerate to the maximum speed.

While the posted speed, as adjusted, gives the maximum speed on each mile of track, this speed must be adjusted to account for the time required for station stops. Two adjustments are made – one for dwelling time and one for the additional time to decelerate upon arrival and accelerate on departure. Each station stop is assumed to require one minute for dwell time to allow passengers to get onboard and find their seat. To calculate the additional time required for acceleration and deceleration, WSA conducted a test using a computerized train scheduling software (the Berkley Model). Based upon this test, an additional one minute was added for each acceleration and deceleration action. Each station stop therefore adds three (3) minutes to the overall running time.

4.2 LOW-COST ALTERNATIVE

The Low-cost Alternative could also be labeled as the "low-service" alternative or "quick start" alternative. The intent of this evaluation is to develop an alternative that provides a basic level of service to begin offering an alternative travel mode. This alternative is designed to be implemented quicker than a more aggressive service level that requires more capital improvements and has higher operating costs. This alternative will not serve as many riders, but begins to test the market, and does not require as much funding from local or other sources.

The early implementation of commuter rail service as envisioned by the Low-cost Alternative enables development patterns to be influenced sooner. One of the principal objectives for commuter rail service identified by the area municipalities is this ability to shape development patterns. The *Eastrans Commuter Rail Feasibility Study* furthers this process by identifying potential station locations and highlights the passenger (and indirectly development) levels required to support the service.

One of the considerations in implementing commuter rail service is the potential funding for the project. The major contributor is expected to be the Federal Transit Administration (FTA), although this is not a requirement if adequate funding can be secured otherwise. FTA evaluates projects such as this through a process known as the New Starts Program, which takes into account transit supportive land-use policies among other factors. Under New Starts, various evaluation and calculations must be made in order to qualify for funding. When projects reach a certain threshold in funding requests, the level of analysis increases. One consideration for the Low-cost Alternative is to have a funding request under this threshold. Currently the threshold is $25 million in requested New Starts funding. Pending legislation will raise the "Small Starts" threshold to $75 million in FTA funding. As discussed in Chapter 6, some segments could be built and meet the current threshold (assuming the maximum 50 percent FTA funding) while all segments could be built within the pending cap.

4.2.1 Operating Assumptions

The minimum level of service that can be provided on a start-up commuter rail operation is two peak direction trips during each peak period. For Eastrans that means two trips into Raleigh in the morning and two trips from Raleigh in the evening. Four trains per day would then be offered on each corridor. Two peak trips provide at least some choice for riders in their arrival and departure times. The typical commuter will not perceive one trip as flexible enough to encourage the commuter to leave his/her car at home.

For this analysis, trains are assumed to arrive in Raleigh between 6:30 AM and 7:00 AM, and again between 7:30 AM and 8:00 AM. These times provide about an hour separation between trips, and serve the early arrival crowd as well as the more traditional 8-5 crowd. Return trips are assumed to be between 4:30 PM and 5:00 PM for the first trip and between 5:30 PM and 6:00 PM for the second trip. The schedule for the trips will need to be determined based upon more detailed ridership studies to determine if later (or even earlier) trips would serve more commuters. The times may also have to be adjusted depending upon the freight train schedules.

For the Low-cost Alternative, the commuter trips will need to fit within the available capacity windows in order to minimize the amount of capital improvements required. As noted in Chapter 3, a basic assumption is that there will be no interference with freight operations.

The running time is discussed more fully in Section 4.2.3 Schedule/Running Times. The travel time required does not permit any reverse commute service (e.g. Zebulon to Wilson in the morning) to be provided. The first train arriving in Raleigh will not be able to return in time to provide an outbound trip to Wilson. If this travel activity is desired in the Low-cost Alternative, it can be provided by either offering a very early morning trip out to Wilson (or Goldsboro on the NCRR corridor), and a later morning arrival into Raleigh. Since the major travel market was assumed to be commuters working from 8:00 AM to 5:00 PM in Raleigh, these alternative schedules have not been assumed in the capital or cost analyses.

A similar situation exists regarding the interlining of the two corridors. In the Low-cost Alternative, no through trips are provided from NS to NCRR. A rider will not be able to travel from Wendell to Clayton, for example. The running times do not allow an attractive trip time to be offered when only two trips are being provided. In the High-cost Alternative, this interlining is possible because more trips over a longer time span are being offered.

4.2.2 Station Amenities and Locations

The level of passenger amenities provided at the stations is low in the Low-cost Alternative. A concrete boarding platform alongside the tracks, benches, and lighting are assumed and have been included in the costs. No enclosed building is provided, with the exception of the existing station in Selma. This level of amenity is similar to that provided at the existing Amtrak station in Cary.

The Low-cost Alternative spaces stations further apart than the national average of four-mile spacing. Stations in the Low-cost Alternative are also further apart than the assumption for the High-cost Alternative. This approach provides a “low-end” cost and accessibility bracket for evaluation. A station spacing of no closer than 7-8 miles reflects the sparse population in some areas, the need to hold down costs, and the desire to provide a faster travel time. The High-cost Alternative allows for a closer station spacing to show the impacts on costs and operating speed by providing greater accessibility.

As noted in Section 4.1 Common Assumptions, specific station locations have not been assumed, and certainly have not be costed in Chapter 6. The locations noted below represent general vicinities and should not be interpreted to recommend specific locations, with a few exceptions. **Exhibit 7** lists the vicinities of the station locations. Following the exhibit is a discussion of the some of the more specific thoughts and concerns identified by the consultant and the Steering Committee.

Exhibit 7
Low-cost Alternative Station Vicinities

NS Corridor	NCRR Corridor
West Wilson	Goldsboro
Five County Stadium	Selma
Wendell	Clayton
Knightdale	Garner
Wake Med	
GOVERNMENT CENTER	BOYLAN
BOYLAN	GOVERNMENT CENTER

NS Corridor Stations

In **Wilson**, a station has been assumed on the west side of the city rather than at the existing Amtrak station in downtown. The simple reasons for this assumption are cost and the impacts to existing train operations. The downtown train station is located on the CSXT main east coast corridor. This corridor is double-tracked for most of its length and has a high number of trains per day. The station is located on one of the two main tracks. CSXT will not grant permission for a commuter rail service to use its tracks for access to the station, or for dwelling at the station. This operational constraint can be overcome by constructing a new spur track to the station, but this option will require about two miles of new track and probable real estate acquisition. Downtown Wilson has thus been deferred to the High-cost Alternative. The West Wilson station is compatible with having an additional station in downtown and, in the Low-cost Alternative, offers the potential for park & ride access.

The **Five County Stadium** has been specified as the Zebulon station because of its abundant existing parking and easy access to US 64/264. A stadium station also works well for attracting special event riders to Mudcats games or other events. A downtown Zebulon station has been included in the High-cost Alternative.

A station in downtown **Wendell** is assumed in the Low-cost Alternative. While a location near Main Street, potentially using a renovated siding, has appeal, the station could be anywhere within Wendell.

A station in downtown **Knightdale** is assumed in the Low-cost Alternative. The Knightdale Comprehensive Plan calls for three locations in town, but this alternative assumes only one location. Which of the three locations (or another location) is opened will not affect the cost or running time calculations in this study.

The **Wake Med** station is a logical location given the level of employment in the area and the number of health services and social service agencies in the immediate area. This area is the second largest employment concentration in Raleigh outside of downtown. Several practical considerations exist regarding getting rail passengers to the buildings. The track is located in a depression adjacent to the Neuse River, which is between the track and the hospital. New Bern Avenue is above the track and no current access exists for pedestrians or vehicles between the track level and the roadway level. A greater level of capital improvement will be required, as

well as shuttle operations between the station and the hospital area. For costing purposes in both alternatives, additional funds have been provided to create pedestrian access up to the roadway level. The shuttle costs have not been included under the assumption that this will be provided by others, either the hospital or through the CAT bus system.

NCRR Corridor Stations

In **Goldsboro**, there is strong local sentiment for using the historic train station for any commuter service. This station is also the desired location for any future trains to Wilmington. Unfortunately, as with Wilson, the train station is located on CSXT tracks and not on the NCRR corridor. While operational issues are not as great as in Wilson since this is not CSXT's mainline, access to the station will require new tracks since it is on a deteriorated siding. While this requirement has cost implications, a greater cost impact is the renovation costs of the station itself. In an independent assessment of the train station conducted by Partin-Hobbs & Associates, a Goldsboro architectural firm, for the City of Goldsboro, the renovation costs were estimated to be $4 million for the station and $1 million for site improvements. These costs have been deferred to the High-cost Alternative. For the Low-cost Alternative, a new station platform has been costed at the NCRR Wye at the north end of Center Street. This location is on the NCRR line, provides quicker turnaround for the trains, and is within a closer walk of downtown development. This station would not be compatible with the historic station since they are in such close proximity. If Goldsboro transitions to the historic location in the future, then the station platform on Center Street should be abandoned at that time. If the Southeastern North Carolina rail service is implemented prior to Eastrans, the track improvements contemplated at the historic station may require reconsideration of the station location plans for Eastrans.

The **Selma** station is assumed to be at the existing, and recently renovated, Union Station. This station is a landmark for the community, provides connections with Amtrak, and is easy to reach from I-95. This station is one of the few locations in the *Eastrans Commuter Rail Feasibility Study* where a specific parcel can be identified. The existing parking will meet some of the needs for the Eastrans service, and adjacent vacant parcels offer the opportunity to add more spaces.

The **Clayton** station could be located anywhere within Clayton. A downtown location provides close access to the historic part of town and creates a new development focal point, but may have limited parking. A location near NC 42 works well as a park & ride location. The tradeoffs of each should be assessed in later studies.

The **Garner** station has two potential locations. Similar to Clayton, a downtown station could provide a focal point for redevelopment activities being planned, and this location has been included in the town's Comprehensive Transportation Plan, but parking may be limited. This historic depot building is currently being renovated. A station on the east side of town at I-40 offers the potential to be a major park & ride location, and with the Timber Drive extension being designed, this location would serve a broad section of the town. For the Low-cost Alternative, one station location in Garner is assumed; the preference between the two locations will need to be determined in a later phase of analysis.

We note that because the NCRR Company owns the right-of-way and other properties, it may determine on its own the location of stations, which could serve to lower the capital costs.

Downtown Raleigh Stations

The **Government Center** and **Boylan** stations mirror those being designed by TTA. These two locations provide the opportunity to transfer between the Eastrans trains and the TTA trains to points north and west. Practical design issues exist regarding creating a convenient pedestrian access between the services. At Boylan, the TTA station will be below grade, and may be adjacent to a curved track portion of the CSXT/NCRR connecting track. These issues, while a very real concern, are beyond the scope of this study, and will need to be addressed at that time. Additional funds have been included in the cost estimate to allow for this complexity. Both of these stations will be served by trains from both corridors. The operational issues associated with this activity and the use of CSXT right-of-way, are discussed in more detail in Section 4.1 Common Assumptions.

4.2.3 Schedule/Running Times

As noted in Section 4.2.1 Operating Assumptions, a specific schedule has not been developed for this study, rather general arrival and departure windows have been identified. The arrival trips will be between 6:30 AM and 8:00 AM, and the departure times will be between 4:30 PM and 6:00 PM. Times and spacing will be confirm as part of a ridership analysis and closer review of the existing freight schedules.

WSA did conduct a general running time analysis in order to determine the anticipated travel times on each corridor, and the number of trainsets required. The general assumptions are discussed in Section 4.1 Common Assumptions, and concern the dwell time at stations, acceleration/deceleration impacts, and posted speeds.

The results of this calculation for the analysis segments are:

- NS Corridor
  - Zebulon to Raleigh (Government Center) – 46 minutes
  - West Wilson to Zebulon – 24 minutes
- Downtown Raleigh
  - Between Boylan and Government Center – 9-10 minutes
- NCRR Corridor
  - Clayton to Raleigh (Boylan) – 23 minutes
  - Selma to Clayton – 14 minutes
  - Goldsboro to Selma – 30 minutes

A rider desiring to arrive at the first Raleigh stop at 8:00 AM would need to leave Zebulon at 7:14 AM, and leave Wilson at 6:50 AM. Overall travel time on the corridor from Wilson to Boylan (the second downtown Raleigh stop) would be 80 minutes. From the NCRR corridor, the same rider would need to leave Clayton at 7:37 AM, Selma at 7:23 AM, and Goldsboro at 6:53 AM. Overall travel time on the corridor from Goldsboro to Government Center (the second downtown Raleigh stop for this corridor) would be 76 minutes.

Train speeds are based upon certain thresholds reflecting track condition, alignment, and control systems. For the Low-cost Alternative, existing track conditions are generally assumed with sufficient upgrades to support passenger service. No significant costly investments have been made to move the commuter services up to the next threshold of speed in this alternative. Additional improvements are assumed for the High-cost Alternative. Specific capital improvements are discussed in Chapter 5.

With these running times and arrival/departure times in Raleigh, Eastrans operations would be occurring between approximately 5 AM to 8 AM and 4:30 PM to 7:30 PM if all segments are operated. This is the window of time during which freight (and Amtrak on NCRR) operations need to be analyzed in later studies to ensure sufficient capital improvements have been made to avoid any scheduling inference by Eastrans.

4.3 HIGH-COST ALTERNATIVE

The High-cost, or long-term, Alternative relaxes the constraints of the Low-cost Alternative. The High-cost Alternative can be considered as a later phase of the service initially offered by the Low-cost Alternative.

Under the High-cost Alternative, more frequent train service is offered over a longer span of the day. A midday "escape" trip home is provided for riders that cannot wait for the peak trips. This midday trip has been costed as a train trip, but as this Alternative is refined, a bus trip should be analyzed if appropriate. Some reverse commute trips are possible. Additional stations are provided, increasing the accessibility to the service and enhancing the ability of the service to affect land use. Further enhancements to the corridors are made to increase the capacity and operating speeds.

4.3.1 Operating Assumptions

In this alternative, the frequency of service is increased to every 30 minutes during peak periods. With a three-hour peak period, six trips are offered on each corridor in the peak direction. One midday train is also provided on each corridor to allow riders to return home during the midday for appointments or in case of illness or other emergency.

For evaluation purposes, the peak period is considered to be arrival in downtown Raleigh between 6:00 AM and 9:00 AM. Return trips in the afternoon would be between 4:00 PM and 7:00 PM. As with the Low-cost Alternative, trip times will need to be confirmed following a ridership analysis.

This frequency of service and span of service permits some reverse commute trips to be offered by interlining the two corridors. For example, the first inbound trip on the NS Corridor can make a reverse commute trip on the NCRR Corridor. The number of possible reverse trips is dependent upon the number of segments in operation. In the previous example, if full corridor service is offered to Goldsboro, only one reverse commute trip can reach Goldsboro in time to provide another peak direction trip inbound. If the NCRR service stops at Selma, two reverse

commute trips are possible, and if service only goes as far as Clayton, three reverse commute trips are possible. The longer distance and greater travel time do not allow as many reverse commute trips on the NS Corridor, but if service stops at Zebulon, two reverse commute trips are possible. No reverse commute trips are possible if service extends all the way to Wilson.

One additional benefit of being able to recycle the trainsets to provide these trips is that fewer trainsets are required overall. In the Low-cost Alternative, one trainset was required for each trip because no return trips were possible. In the High-cost Alternative, the greatest amount of recycling could occur on the NCRR Corridor if service only went to Clayton. Under this option, three trainsets can provide six peak direction trips and three reverse trips.

4.3.2 Station Amenities and Locations

In the High-cost Alternative, additional amenities are provided at the stations. These amenities can include overhead shelters, vending machines, including those for tickets, and windbreak protection. Enclosed buildings are an additional cost that has not been included in the analysis.

Additional stations are provided for the smaller towns and areas of new planned developments along each corridor. **Exhibit 8** shows the station vicinities; unchanged stations from the Low-cost Alternative are show in a lighter shade.

Exhibit 8
High-cost Alternative Station Vicinities

NS Corridor	NCRR Corridor
Wilson CBD	Goldsboro (relocated)
West Wilson	Princeton
Bailey	Selma
Middlesex	Clayton
Five County Stadium	I-40 Garner
Zebulon CBD	Garner CBD
Wendell	S. Raleigh
E. Knightdale	
Knightdale CBD	
W. Knightdale/E. Raleigh	
Wake Med	
Peden Steel	
GOVERNMENT CENTER	BOYLAN
BOYLAN	GOVERNMENT CENTER

As with the Low-cost Alternative, station locations remain flexible and are in need of additional analyses in later studies. Based upon comments received from the Steering Committee and a review of development patterns, several stations have been added to each corridor. Seven stations have been added to the NS Corridor and three stations have been added to the NCRR Corridor. While this is a large number of stations to add, the spacing outside of downtown Raleigh on the NS Corridor is 4.2 miles between stations, and is 6.6 miles between stations on

the NCRR Corridor. These spacings are within the range of the typical US commuter rail system.

The following paragraphs describe the stations that are different from the Low-cost Alternative. Stations not discussed remain the same in each alternative, other than the provision of a higher level of passenger amenities.

NS Corridor Stations

As noted in the Low-cost Alternative discussion, a **Wilson CBD** station was not included because of the cost involved to reach the current station location. In the High-cost Alternative, this cost restriction has been relaxed and additional trackage installed to reach the station. From field observations, this Eastrans station will have to be one block south of the Amtrak station since the Amtrak trains stop on the CSXT mainline track. Eastrans trains will require a separate track to avoid interfering with CSXT's operation and there is insufficient room to do so within the existing station block.

Bailey receives a train station in this alternative. The station is assumed to be located in the general downtown area.

Middlesex receives a train station in this alternative. The station is assumed to be located in the general downtown area.

Zebulon CBD receives a train station in this alternative. The station is assumed to be located in the general downtown area.

E. Knightdale receives a train station in this alternative. The station is one of the three locations identified in the Knightdale Comprehensive Plan. It is assumed that this station was not the location of the single Knightdale station in the Low-cost Alternative.

A new station is located near the border of **W. Knightdale** and **E. Raleigh**. Both cities have identified potential locations for dense development on either side of the Neuse River. The two potential locations are approximately one mile apart, which is too close of a spacing for a typical commuter rail system. For purposes of the *Eastrans Commuter Rail Feasibility Study*, only one station is assumed somewhere in this area. The most appropriate location(s) will need to be decided at a later time. The ridership analysis can provide some further guidance on the relative merits of each location.

The **Peden Steel** site is located at the northeast corner of the Edgeton Junction. It is an identified redevelopment site that has the potential to be served by both the Eastrans service on the NS Corridor and the TTA service on the CSXT Corridor. The stop spacing is close to both the Wake Med and Government Center stations, but the overall density of development and slower operating speeds in the area indicate the station spacing is not inappropriate.

NCRR Corridor Stations

The **Goldsboro** station is assumed to be relocated to the historic depot in the High-cost Alternative. The relaxing of the cost constraints permits additional funds to be spent on

renovating the historic building and providing a new spur track. As noted in the Low-cost Alternative discussion, the Goldsboro station at the Center Street Wye is not required if the historic building is renovated.

Princeton receives a train station in this alternative. The station is assumed to be located in the general downtown area.

The **I-40** and **Garner CBD** stations represent a net addition of one station within Garner. Which station is new depends upon which one was implemented in the Low-cost Alternative.

The **S. Raleigh** station is located somewhere in the vicinity of south downtown/Shaw University to Rush Street. This station offers the potential for providing service to an underserved population and can help focus redevelopment activity in the area.

4.3.3 Schedule/Running Times

For the High-cost Alternative, travel speeds are projected to increase as the result of additional track capacity and the installation of a more sophisticated train control system, which permits passenger speeds up to 79 mph. Due to the track layout between Middlesex and Raleigh, it is not possible to raise speeds in this area, unless more expensive efforts to straighten the alignment are undertaken.

The projected travel times by segment are:

- NS Corridor
  - Zebulon to Raleigh (Government Center) – 58 minutes
  - Wilson CBD to Zebulon – 40 minutes
- NCRR Corridor
  - Clayton to Raleigh (Boylan) – 25 minutes
  - Selma to Clayton – 11 minutes
  - Goldsboro to Selma – 27minutes
- Downtown Raleigh
  - Between Boylan and Government Center – 9-10 minutes

A rider desiring to arrive at the first Raleigh stop at 8:00 AM would need to leave Zebulon at 7:02 AM, and leave Wilson CBD at 6:22 AM. Overall travel time on the corridor from Wilson to Boylan would be 108 minutes. From the NCRR corridor, the same rider would need to leave Clayton at 7:35 AM, Selma at 7:24 AM, and Goldsboro at 6:57 AM. Overall travel time on the corridor from Goldsboro to Government Center would be 72 minutes.

With these running times and arrival/departure times in Raleigh, Eastrans operations would be occurring between approximately 4:30 AM to 9:30 AM and 3:30 PM to 8:30 PM if all segments are operated. This is the window of time during which freight (and Amtrak on NCRR) operations need to be analyzed in later studies to ensure sufficient capital improvements have been made to avoid any scheduling inference by Eastrans.

4.4 ALTERNATIVE COMPARISON

For ease of comparison, the following tables provide an overview of the assumptions for the Low-cost and High-cost Alternatives. **Exhibit 9** lists the station locations for each alternative. Seven stations are added to the NS Corridor and three stations are added to the NCRR Corridor in the High-cost Alternative. The additional stations provide more opportunities for access to the rail service and focal points for development activities around the stations.

Exhibit 9
Station Locations

Low-cost Alternative	High-cost Alternative
NS Corridor	
	Wilson CBD
West Wilson	West Wilson
	Bailey
	Middlesex
Five County Stadium	Five County Stadium
	Zebulon CBD
Wendell	Wendell
	E. Knightdale
Knightdale CBD	Knightdale CBD
	W. Knightdale/E. Raleigh
Wake Med	Wake Med
	Peden Steel
Downtown Raleigh	
GOVERNMENT CENTER	GOVERNMENT CENTER
BOYLAN	BOYLAN
NCRR Corridor	
	S. Raleigh
	Garner CBD
I-40 Garner	I-40 Garner
Clayton	Clayton
Selma	Selma
	Princeton
Goldsboro (Center Wye)	Goldsboro (historic station)

Exhibit 10 on the following page shows the station vicinities for each corridor. Low-cost stations are shown as solid shapes, and the High-cost stations are shown as hollow shapes. The area covered by the shapes is the conceptual area where the station could be located.

The number of required parking spaces for each segment of the alternatives is shown in **Exhibit 11**. The additional parking is not a projection, but shows the number of parking spaces required to support the "target" ridership levels. The target levels increase in the High-cost Alternative to reflect the higher number of riders required to benefit from the additional cost under FTA general guidelines.

Exhibit 10
Conceptual Station Locations

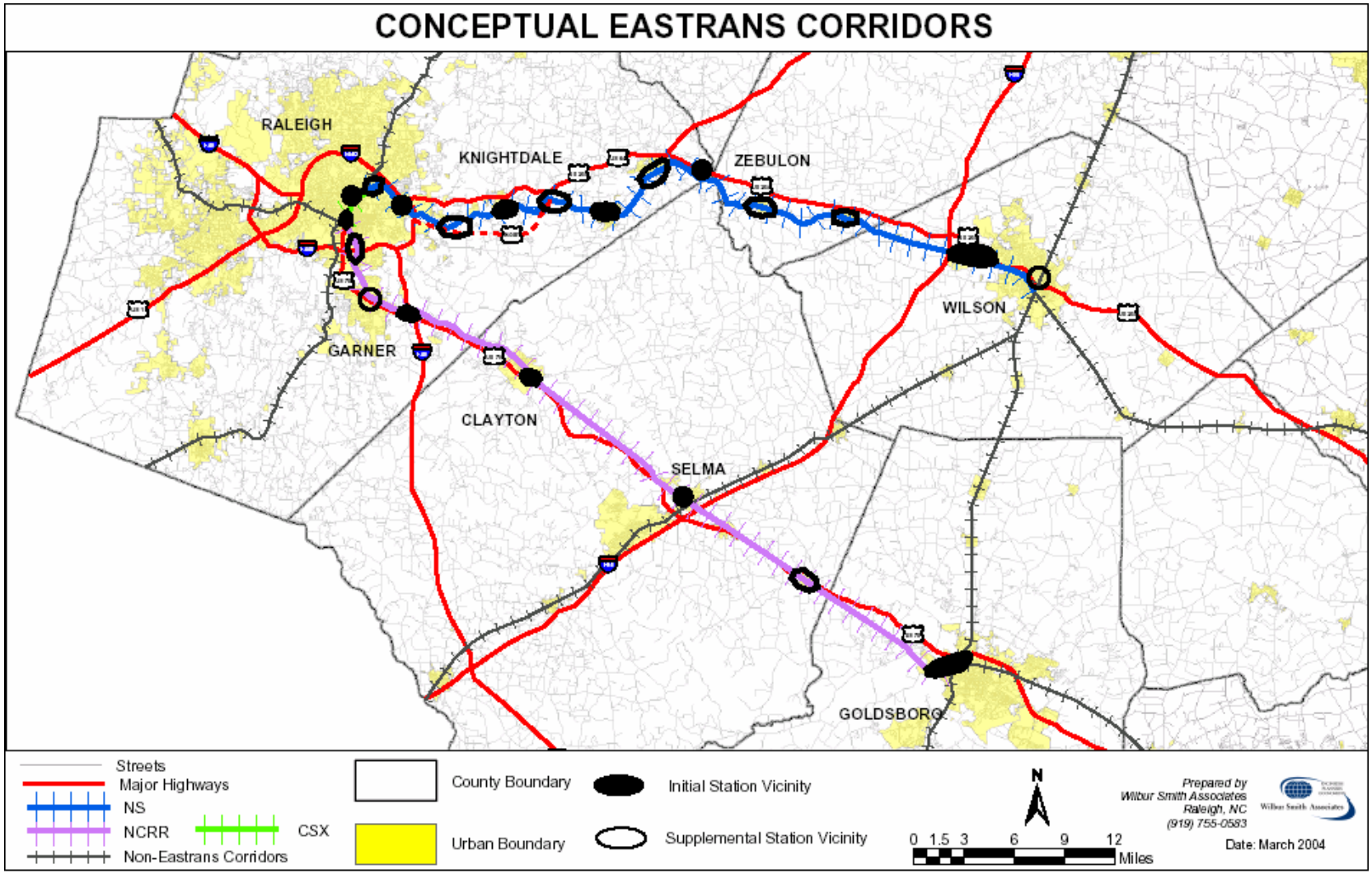


Exhibit 11
Parking Demand Summary

Low-cost Alternative		High-cost Alternative	
Segment	**Parking**	**Location**	**Parking**
Wilson - Zebulon	75	Wilson - Zebulon	630
Zebulon - Raleigh	320	Zebulon - Raleigh	820
Total NS	395	Total NS	1,450
Raleigh - Clayton	310	Raleigh - Clayton	435
Clayton - Selma	125	Clayton - Selma	125
Selma - Goldsboro	240	Selma - Goldsboro	615
Total NCRR	675	Total NCRR	1,175
TOTAL	1,075	TOTAL	2,625

Exhibit 12 shows the projected travel time for each corridor. The travel times have been affected by the number of stations in each alternative, and the upgrading of some of the track to Class 4 speeds. In some instances, the two effects offset one another. Note also that the High-cost Alternative extends the NS Corridor into downtown Wilson, resulting in a longer travel distance.

Exhibit 12
Travel Time Comparison

Segment	Low-cost Alternative	High-cost Alternative
Norfolk Southern		
Raleigh – Zebulon	46 minutes	58 minutes
Zebulon – Wilson[1]	24 minutes	40 minutes
TOTAL NS[2]	70 minutes	98 minutes
North Carolina Railroad		
Raleigh – Clayton	23 minutes	25 minutes
Clayton – Selma	14 minutes	11 minutes
Selma – Goldsboro	30 minutes	27 minutes
TOTAL NCRR[2]	67 minutes	63 minutes

[1] Travel time is to West Wilson in Low-cost and Wilson CBD in High-cost
[2] Does not include 9 minutes of travel time between Boylan and Gov't Center

5. CAPITAL REQUIREMENTS

One of the appeals of commuter rail service in the minds of the general public is that the rail lines are freely available to use with no improvements required. The belief is that all that is needed to start train service is to buy a few locomotives and passenger cars, put up a few shelters, and hire some engineers. Unfortunately, that is not the case. Despite the public perception that the rail corridors have plenty of capacity because they are not as crowded as the freeway, many rail lines do not have the capacity to safely add multiple commuter rail trips.

Wilbur Smith Associates (WSA) conducted an evaluation of the Norfolk Southern (NS) and North Carolina Railroad (NCRR) Corridors to determine the level of improvements that would be required for passenger operation. The examination included a hi-rail tour of the NS Corridor, and selected observations of the NCRR Corridor and CSXT Corridor. Track charts for the NS and NCRR Corridors were also reviewed. In keeping with the nature of a feasibility study, the evaluation was at the conceptual level and did not include any engineering analysis.

Based upon the operational requirements described in Chapter 4, a list of capital improvements was developed to ensure that the introduction of commuter rail service in the corridors would not degrade the performance and safety of the existing freight operation. The resulting list of capital improvements was reviewed by the owning and operating railroads for reasonableness and to receive their feedback on any adjustments that needed to be made on the operating plan.

The level of review conducted by the railroads was appropriate to the conceptual nature of the plan. A detailed analysis was not performed. As the Eastrans project moves forward toward implementation, and as a secure funding source is identified and put into place, their level of review will increase. Additional improvements may be identified as a result, and some improvements may be regarded as unneeded.

All required improvements have been included in the analysis, including those improvements that are already in the identified capital plans, but have not yet entered the implementation phase. Until the identified improvements have been included in the annual budget, circumstances may change and they could be delayed or eliminated. These programmed improvements may end up being funded separately from the Eastrans project, which could result in the Eastrans costs decreasing. Further discussion of this issue is in Chapter 6.

Improvements and capital expense items fall within four broad categories – improvements to the track, including work on the rails, ballast, and ties, and new track installation; signalization; trainsets including power units and passenger coaches; and yard & shop facilities. Station construction is another capital requirement, but the station implications have already been covered in Chapter 4.

5.1 TRACK IMPROVEMENTS

The conceptual track improvements have been identified under the requirement that passenger trains result in no delays to freight operations. The railroads, as owners and operators of the right-of-way, will ultimately have to coordinate the infrastructure improvements. Track improvements are based upon the condition of the existing roadbed, the planned improvements, and the existing and projected level of freight and passenger traffic.

The track improvements fall into the following categories:

- Additional sidings to allow passenger trains and freight trains to pass without delays
- New track where required to access station locations
- Upgrades for rail replacement, tie replacement, and rail resurfacing and grade changes
- Signalization to improve safety, speed, and capacity

The level of each improvement varies with the two alternatives. The Low-cost Alternative requires relatively little capacity improvement since only two morning and two evening trains are provided. These trains will require few improvements to eliminate conflicts with the freight trains. The High-cost Alternative has a much greater potential for conflicts with freight operations unless improvements have been made.

5.1.1 Low-cost Improvements

In the Low-cost Alternative, the majority of the improvements are needed along the NS Corridor. NCRR and NCDOT have been regularly upgrading the NCRR Corridor, including resurfacing the rails and superelevating the curves. NS has been maintaining their corridor in good shape, but has not made major investments in improving its condition in light of the lower freight traffic on this line.

On the NS Corridor, new sidings are included approximately every 15 miles to provide sufficient capacity for freight and passenger trains to pass one another. Additional trackage is provided into Five County Stadium's lot to provide better access to this location and its associated parking. Replacement of the rails is required in a few locations where the existing rails are worn too much to be reused, primarily in some of the sharper curves in the corridor. The remaining rails, ties, and ballast are in good shape, but we have assumed that some replacement and resurfacing will be required.

On the CSXT Corridor, between NS and NCRR, a higher level of investment is required due to the greater level of existing freight activity and planned Eastrans activity. Some upgrades are already planned by TTA as part of their adding commuter rail service in this corridor. We have assumed that these upgrades will take place. In the remaining areas, we have assumed that double tracking is required in certain areas, and that worn sections of rail and ties will be replaced. Limited right-of-way is available in this area, and detailed studies will be required to determine the potential for adding additional track within the existing right-of-way and the need to acquire additional property. Because of the unknown final property acquisition by TTA in this area, the amount of additional right-of-way is undeterminable. No right-of-way costs have been

included; they will need to be added in later phases. The principal expense for this corridor is the installation of a new train control system. Currently, limited train signalization and control exists and this system needs to be upgraded to increase capacity and speeds.

The NCRR Corridor requires additional passing sidings, rail resurfacing in some locations, and tie replacement. Little rail replacement appears to be warranted with the exception of the Wye area in Goldsboro, which also requires an additional track for storage. The NCRR Corridor will need to be signalized even though Eastrans only adds four trains per day. The existing freight and Amtrak trains are using all of the available capacity, and signalization is required to add the Eastrans service. Several of these projects are already in the NCRR program and may end up being done with or without Eastrans. At present, however, the funding is not secure.

5.1.2 High-cost Improvements

The High-cost Alternative assumes all of the Low-cost Alternative improvements are also required, with the exception of the improvements at the Goldsboro Wye. As discussed in Section 4.2.2, these improvements are not required if the historic Goldsboro station is used in the High-cost Alternative.

Additional improvements along the NS Corridor primarily consist of signalizing the corridor. Four additional trains per day are well within the existing capacity of the corridor, but 12 additional daily trains in the High-cost Alternative are above the ability of the current signalization and control system. The other high cost item is the extension of track to the Wilson CBD station. As noted previously, this station cannot be reached from the NCRR line since it is only served by the CSXT mainline and CSXT will not allow a slower moving commuter service to use its tracks. Several options for extending tracks to the station were considered including building a parallel track to CSXT, but out of their right-of-way if required. Additional tie replacements are required to upgrade the track east of Middlesex to Class 4 standard.

The CSXT Corridor requires double tracking for the entire length between Edgeton and Boylan, to the greatest extent possible given the limited right-of-way. This additional track is necessary to accommodate the trains in service, deadheading to the yard and shops, and staging in the evening at Boylan and Government Center.

The NCRR Corridor requires additional sidings to increase the capacity, and additional tie replacements. A new spur line to the historic station is required to replace the 80+ year old light-way spur and to avoid interference with the CSXT branch line.

5.2 TRAINSETS

Each alternative has its distinctive requirements for trainsets. The number of trainsets varies depending upon the alternative and the segments receiving service. Two trainsets are needed for each corridor in the Low-cost Alternative, regardless of the amount of segments operated, but the High-cost Alternative permits some efficiencies. The passenger capacity requirement of each alternative has been considered in determining the number of passenger coaches. A seat is

assumed to be required for all passengers, and no passengers are assumed to get off at intermediate stops. The passenger loads are based upon the "target" ridership levels.

Trainsets have one chief requirement – they must meet the Federal Railroad Administration's (FRA) crashworthiness standards. These standards are designed to ensure a survival compartment exists for both the train crew and passengers in case of a collision with a freight train. This requirement eliminates some of the lighter weight trainsets that are designed for use away from the general railway system. Locomotive-pulled passenger equipment, such as Amtrak, meets this requirement. A second option is the newer generation Diesel Multiple Units (DMU), which are essentially a self-propelled passenger coach. One such DMU is now certified, and other manufacturers are in the process of obtaining certification. This is the type of equipment that TTA plans on using for its regional rail service.

The number of trainsets requires includes 20 percent extra of each car type for spares. Spare vehicles allow for routine and special maintenance to occur without interruption in service. A 20 percent ratio is standard in the transit industry.

5.2.1 Low-cost Trainsets

In keeping with the intent of the Low-cost Alternative to be inexpensive and quick to implement, the use of refurbished, locomotive-pulled passenger cars has been assumed. Refurbished equipment is what is used on the Piedmont line. Both refurbished locomotives and passenger coaches are available, but the market fluctuates in cost and number of cars. NCDOT has recently announced a sale of some of their surplus cars. The adjacent photo is of a recently available double-deck passenger coach that could be suitable for the Eastrans service. DMUs are not assumed to be available in the short-term.

Each trainset will consist of a refurbished locomotive pulling between two (2) to five (5) single-level 90-passenger refurbished coaches. Two locomotives are required for each corridor, one for each trip provided. The number of passenger cars required is determined by the "target" ridership level and varies by the number of segments operated. Single-level coaches have been assumed and costed because of their generally greater availability. Bi-level coaches can be used instead if they are available. Bi-level coaches will also reduce the required platform length at the stations.

At least one passenger coaches per trainset will be a "cab" coach. A cab coach is a regular passenger coach with a separate engineer's compartment. The locomotive is the only power plant, but with a cab coach, the engineer can control the train's operation. A cab coach permits the train to operate in either direction without having to turn around. Turning around the trainset is to be avoided if at all possible due to the time required to reverse operation.

5.2.2 High-cost Trainsets

Since the High-cost Alternative is assumed to also be a longer term alternative, the use of DMUs can be assumed. DMUs are the type of vehicle that TTA will be using, and they offer certain advantages in operating expense and speed. The first DMU has entered trial revenue service in Florida, and in the long term, this vehicle should be common and easy to acquire. In the short term, supplies and choices will be limited, and the shakedown process will still be underway.

Each trainset will consist of one DMU with 90 seats. Depending upon the "target" ridership for the segments in operation, each DMU will pull between zero (0) and two (2) 185-seat double-deck coaches with cab. The double-deck option allows fewer cars to accommodate the "target" passenger load. Single-deck cars are also available, but the initial analysis indicates using the double-deck cars is more cost efficient.

5.3 YARD & SHOP

The two corridors under evaluation are each 50 miles long. This distance raises issues related to the storage of trains when not in use and the location of maintenance and servicing activities.

Based upon discussions with NCDOT's Rail Division, they are interested and willing to perform maintenance on the Eastrans trains from their downtown Raleigh location. Under the CSXT Option for the Raleigh operation, the NCDOT yard can be accessed. NCDOT indicates that they have sufficient capacity currently for the number of trains required in the Low-cost Alternative, and their identified expansion plan can accommodate the additional trains of the High-cost Alternative.

Maintenance on the trains can be accomplished during the middle of the day, between the morning and evening trips. In the morning, trains come into downtown Raleigh from the ends of the line, and proceed on to the NCDOT yard after completing their trip. NS Corridor trains first stop at Government Center and then Boylan, before returning to the NCDOT yard north of Government Center. NCRR Corridor trains first stop at Boylan, then Government Center, before heading directly to the NCDOT yard. No backward movement or turnaround is required for these trains. All trains are stored in the yard until time for the evening return trip.

With the decision to have maintenance activity take place in Raleigh during the day, the question then becomes what to do with the trains overnight? Two choices exist: bring the trains back to Raleigh, or leave them at the end of the line. Bringing the trains back into Raleigh requires deadheading the trains with no passengers, or making a revenue trip with next to no passengers. Few commuters will be traveling in the off-peak direction at the times the trains will be returning. If the trains return in the evening, additional deadhead trips are required in the morning to get the trains back into position for their peak trips. Not only would this maneuver increase the hours train crews have to be paid, it also increases the hours when Eastrans trains

could be interfering with freight traffic. Additional capacity could be required to eliminate this interference.

For these reasons, the consultants recommend "outposting" the trains at the ends of the line overnight. This outposting will require storage tracks, some small supply building, and a basic level of security at the ends of the line. The cost calculations include these provisions.

6. COST ESTIMATES

This chapter presents the costs estimates for the capital improvements and the annual operating expenses that will be required for each alternative. This chapter is not, however, an overall financial plan for the Eastrans service because it does not include an analysis of the potential funding sources. Such an examination will be required in later studies.

Capital costs have been estimated for each item identified for the service alternatives. The railroads have reviewed the cost calculations, and WSA is confident that, conceptually, the necessary improvements have been included and the unit cost estimates are generally correct. The cost estimates include a 25 percent construction contingency and a 30 percent real estate contingency. Another 15 percent is included for engineering and construction management. Detailed cost estimates are shown in the Appendix

Costs have been included for all identified items, even those already included in a capital improvement program. The only costs not included are those that are already budgeted or for which funding is secured. TTA's expenses have not been included.

6.1 CAPITAL COSTS

Capital costs have been estimated using current unit costs for each component. Costs for the yard and shop are based upon estimates prepared previously by NCDOT for expansion of their facility.

Vehicle costs are based upon recent purchases around the country for refurbished locomotives and passenger cars for the Low-cost Alternative. The DMU cost in the High-cost Alternative is based upon the published price for Colorado Railcar equipment.

Limited costs have been included for right-of-way acquisition. All stations are assumed to be located within the railroad rights-of-way and do not require any new land. The exception is for the parking associated with each station. Land requirements for parking are based upon 100 spaces per acre and a cost per acre from the (Capital Area Metropolitan Planning Organization) CAMPO Cost Model. No right-of-way is required for any track construction or improvements except for the spur track to the Wilson station.

Costs have been allocated to each segment based upon the anticipated improvements specific to that portion of the corridor. Costs associated with the CSXT Corridor have been evenly divided between the Raleigh segments of the NS and NCRR Corridors. The costs for the outer segments (beyond Raleigh) assume that the Raleigh segments have been implemented. Systemwide costs, such as for signalization, have been allocated based upon the track mileage in each segment. Yard & shop costs are allocated based upon the total cars (including spares) required for each segment.

Exhibit 13 summarizes the costs for each alternative. Each cost item represents the best possible estimate at the available level of information. All costs, however, will be subject to negotiation between the railroad and the sponsoring agency. We have estimated the amount of improvements required, but the railroads may insist more is required after they have reviewed the estimates in more detail, or they may decide that not all of our projected improvements are required. Trade-offs are also possible with improvements in one area offsetting the need for other improvements elsewhere.

Exhibit 13
Estimated Capital Costs

Segment	Low-cost Alternative	High-cost Alternative
Norfolk Southern		
Raleigh – Zebulon	$37 million	$94 million
Zebulon – Wilson	$ 9 million	$72 million
TOTAL NS	$45 million	$165 million
North Carolina Railroad		
Raleigh – Clayton	$36 million	$49 million
Clayton – Selma	$17 million	$17 million
Selma – Goldsboro	$28 million	$69 million
TOTAL NCRR	$81 million	$136 million
TOTAL SYSTEM	$126 million	$301 million

The costs represent the total cost to implement the Eastrans service, but do not necessarily represent the total cost to the municipalities served. Several sources of potential funding exist. Federal Transit Administration (FTA) funds may be available for up to 50 percent of the capital costs. As noted in Section 4.2 Low-cost Alternative, the application and approval process is less stringent for funding requests under $25 million. Under pending legislation to reauthorize the TEA-21 transportation legislation, this threshold rises to $75 million. Some of the expense included in the above calculations may be paid for by the railroads as part of their planned improvements, or by NCDOT/NCRR on the NCRR Corridor. Several items are part of their published capital program, but have not currently been funded. Other sources, such as joint development opportunities may exist.

A financial plan will need to be developed to explore the funding implications for the Eastrans system. Such a plan is beyond the cost analysis of this feasibility study, but is an integral part of the implementation steps for the program.

6.2 OPERATING AND MAINTENANCE COSTS

Costs are included for all recurring expenses associated with commuter rail operations. The components are vehicle operations and maintenance, fuel, station maintenance, dispatching, track use, and insurance. A 20 percent factor for administration expense and a 20 percent contingency have been included. All services are assumed to operate weekdays only, for 255 days per year, which excludes holidays.

Vehicle operating expense is primarily associated with the train crew and is based upon revenue hours of service. Vehicle maintenance expense is based upon the train miles. Unit costs for these expenses are based upon actual experience at similar properties, but do not necessary reflect local costs.

Fuel costs have been calculated separately at $0.90 per gallon for diesel fuel. This price is the best estimate for the unit cost, but is an approximation given the sometimes dramatic change in the price of fuel. Fuel usage is based upon estimated gallons per train mile from a calculation conducted by Colorado Railcar. This calculation included a comparison between a locomotive operation and projected costs for the DMU. Actual DMU cost information is not available given the limited amount of revenue service for these cars.

Most commuter rail systems are charged "access" fees by the owning railroad. These access fees cover a variety of expenses, including dispatching and track maintenance. Access fees are based upon actual experience with other commuter railroads in the country and are not based upon the special fees granted to Amtrak. Actual access fees will be determined in negotiation with the railroads and should take into account the amount of capital improvements made by Eastrans. The adjacent photo shows a "super gang" at work maintaining the track. Passenger tracks require greater level of maintenance than do freight only tracks.

Photo courtesy of NCRR

Publicly traded railroads such as NS and CSXT also charge a user fee, essentially a return on the capital cost of their facility. NCRR is in a different situation since they are not a publicly traded company and have as one of their charges the promotion of passenger rail service. Their position on compensation and cost recovery has not yet been determined. NCRR and NS's trackage rights agreement makes specific provision for commuter rail on the NCRR line as long as cost, liability, and capacity are addressed.

Liability insurance is a major issue for the railroads; adequate insurance must be provided by Eastrans. Costs are generally calculated as a dollar amount per annual train mile. An estimate of the costs has been included from similar systems in the US, but actual expenses are highly variable and will be dependent upon the rate Eastrans can negotiate with an insurance provider. The level of required insurance is a matter for negotiation between Eastrans and the railroad owners.

Exhibit 14 shows the results of the estimated annual operating costs.

Exhibit 14
Estimated Annual Operating Costs

Segment	Low-cost Alternative	High-cost Alternative
Norfolk Southern		
Raleigh – Zebulon	$1.5 million	$3.5 million
Zebulon – Wilson	$0.9 million	$2.8 million
TOTAL NS	$2.4 million	$6.3 million
North Carolina Railroad		
Raleigh – Clayton	$0.9 million	$1.9 million
Clayton – Selma	$0.5 million	$0.9 million
Selma – Goldsboro	$0.9 million	$1.9 million
TOTAL NCRR	$2.3 million	$4.8 million
TOTAL SYSTEM	$4.7 million	$11.1 million

Some of these costs are relatively straightforward, such as the cost per train crew. Other costs, especially those associated with track maintenance and use, are more subject to negotiation. Lower operating costs may be possible in exchange for a greater level of capital improvement in the corridor. We have estimated these costs based upon similar US experience, but local negotiations will influence any final cost amounts.

6.3 RIDERSHIP EVALUATION

As noted previously in this report, the development of ridership projections is beyond the scope of work for this study. Some ridership amounts, however, are required as feedback to the required capital and operating expenses, primarily related to providing sufficient passenger carrying capacity and parking spaces. If the Eastrans project is considered feasible, then a supplemental study to develop ridership projections is required. The ridership analysis may result in changes to station locations and parking requirements, as well as the number of passenger cars required for each trainset.

To allow for that feedback calculation, and to ensure that the level of capital investment is sufficient for the level of ridership, some development of a ridership amount was required. The FTA evaluation criteria offer one approach. FTA evaluates funding requests for "New Starts" projects such as Eastrans on several criteria. One of the older criteria that is a relatively straightforward calculation is "the incremental cost per incremental rider." In other words, how much do you spend to carry one new rider.

The methodology for calculating this indicator is to develop an annualized capital cost for the improvements. FTA has guidelines on how capital costs should be annualized based upon the expected lifespan of the improvements. From these guidelines, WSA develop the annualized capital costs. For incremental riders, we estimate that all riders are new riders, since there is no existing transit service in the corridors.

Under FTA informal guidelines, the capital cost per passenger should not exceed $25, with most newly funded systems being under $10. As a comparison, the November 2003 analysis for the Charlotte and Raleigh projects had a value of $13.23 for Charlotte and $20.31 for Raleigh. Both of these projects are recommended in the President's 2005 budget for "other federal funding commitments" a new classification just shy of the most desirable "full funding grant agreement" (FFGA). A FFGA represents a pledge by the federal government for a certain level of funds.

For this feasibility study, the "targeted" number of riders has been set at the number of riders needed to result in a capital cost of $15 per passenger. [NOTE: This dollar amount is the annualize capital cost per annual boarding; it is NOT the fare per rider.] This cost is slightly worse than Charlotte's but better than TTA's. Achieving this level of ridership should make the Eastrans project competitive for federal funds, at least in terms of that indicator. **Exhibit 15** shows the average daily riders required to achieve this desired performance level. Riders are expressed in terms of one-way trips. Individuals using the service are half of the levels shown, assuming every rider comes in in the morning and makes a second trip home in the evening.

Exhibit 15
"Targeted" Daily Ridership Levels

Low-cost Alternative		High-cost Alternative	
Segment	**Targeted One-Way Trips**	**Segment**	**Targeted One-Way Trips**
Wilson – Zebulon	200	Wilson – Zebulon	1,600
Zebulon – Raleigh	800	Zebulon – Raleigh	2,000
Raleigh – Clayton	800	Raleigh – Clayton	1,100
Clayton – Selma	400	Clayton – Selma	400
Selma – Goldsboro	600	Selma – Goldsboro	1,500
TOTAL	2,700	TOTAL	6,600

By way of comparison, if the less stringent $25 per rider target was used, only 1,600 riders are required for the Low-cost Alternative and 4,000 riders for the High-cost Alternative.

Exhibit 16 shows how these targeted levels compare with the worker flow discussed in Section 2.4.4. Boardings are expressed in terms of one-way passenger trips, while the worker flow is expressed as individuals traveling in the peak direction only. To calculate the Targeted Capture percent, the Targeted Boardings is divided by two to convert the number to individuals taking the commuter rail service. This latter number is then divided by the worker flow to estimate the Targeted Capture percent. This percent is the percentage of peak-direction workers that would need to ride the rail if all of the targeted ridership came from inter-county workers.

Exhibit 16
"Targeted" Worker Capture Rate

County	Targeted Boardings	Worker Flow	Targeted Capture
Low-cost Alternative			
Wilson	200	1,100	8.7%
Johnston	660	23,600	1.4%
Wayne	600	3,200	9.5%
High-cost Alternative			
Wilson	1,600	1,100	70.0%
Johnston	900	23,600	1.9%
Wayne	1,250	3,200	19.7%

This table is not a projection of ridership. It is based upon several simplifying assumptions including estimating the required ridership by county instead of segment, and assuming that the only riders are inter-county workers. More riders are possible for non-work trips and for work trips internal to a single county. Information on the level of these types of trips is not readily available. Despite these limitations, the above table provides a general indicator of the potential to attract the target ridership levels.

7. CONCLUSIONS AND NEXT STEPS

As indicated in Chapter 1, the purpose of the *Eastrans Commuter Rail Feasibility Study* was not to make the final recommendations on whether to proceed further with the development of commuter rail service east of Raleigh. Rather, the purpose is to analyze the potential for implementing this service and determine the level of capital improvements required for commuter rail service to operate without interfering with existing train services.

Chapter 4 presented two potential operating alternatives for each corridor, one that provided a low, introductory level, and a second that provided a higher, longer-term service level. Both of these alternatives are envisioned to be compatible with the Triangle Transit Authority's (TTA) rail system under design, and could be viewed as later phases of this service. Chapter 5 determined the capital improvements required to support these operating alternatives, and Chapter 6 estimated the capital and operating costs.

7.1 CONCLUSIONS

The results show that commuter rail service is feasible in the Eastrans corridors. The overall cost per mile, especially for the Low-cost Alternative, is very modest, with the overall system costing an average of $1.3 million per mile. **Exhibit 17** provides the segment breakdown for the two corridors. These costs include all capital expenses, including vehicles and yard & shop.

Exhibit 17
Capital Cost per Mile

Segment	Capital Cost per Mile	
	Low-cost	High-cost
Norfolk Southern Corridor		
Raleigh-Zebulon	$1.3 million	$3.2 million
Zebulon-Wilson	$0.4 million	$3.0 million
North Carolina Railroad Corridor		
Raleigh-Clayton	$1.9 million	$2.6 million
Clayton-Selma	$1.5 million	$1.6 million
Selma-Goldsboro	$1.3 million	$3.3 million
Overall	**$1.3 million**	**$2.9 million**

In comparison, the planning guideline for one mile of a rural freeway is $3 million, while one mile of an urban freeway is $16 million. In all segments of the Low-cost Alternative, providing a travel choice by train is much cheaper than increasing the capacity of the roadway system. Even in the High-cost Alternative, the expense per mile is competitive with a rural freeway, and much cheaper than constructing an urban freeway. For the entire cost of the High-cost Alternative, including the vehicles, less than 20 miles of urban freeway could be built.

The productivity of the Eastrans service can be further improved if the capital expenses can be shared with other programs. Some of the expenses related to the CSXT corridor might be shared with the planned TTA improvements, or the potential high-speed rail improvements. The NCRR is planning on continuing its upgrade program along its corridor to improve operation of the existing freight and Amtrak services. These improvements could reduce the incremental costs required for the Eastrans service. Additionally, the potential Wilmington Amtrak service could further reduce these costs, including some of the renovation expenses for the historic Goldsboro station. Should any or all of these other programs occur, Eastrans would benefit by the sharing of the costs.

While the cost per mile for the Eastrans service is very reasonable, the overall costs are still expensive since it is more than a 100-mile system. Making these improvements will require local financial commitments in addition to the potential State and Federal funding. This *Eastrans Commuter Rail Feasibility Study* provides a firm basis for the local and state jurisdictions to gauge their potential financial requirements.

The two alternatives provide the local jurisdictions and other stakeholders a "bracket" of the implications of various service assumptions. For example, several jurisdictions have expressed interest in having more station locations rather than fewer. The High-cost Alternative shows the impacts of having more stations on running times and capital expenses. More stations also require a higher ridership level to be productive under the federal criteria.

There are three significant cost differences between the Low-cost and High-cost Alternatives that require further consideration by the affected stakeholders in order to decide the "best" alternative for further development. The Norfolk Southern corridor has a significant increase in its capital costs between the two alternatives due to the need to signalize the corridor if more than two daily round trips are provided. A higher service level will be more attractive to potential riders, and the ridership levels may also significantly increase, but the capital costs to the local jurisdictions will also rise. Further study is required to determine the desirability of incurring these costs.

Wilson and Goldsboro each have unique requirements compared with the other cities and towns. The two alternatives indicate the impacts to these cities of the potential options facing them. Wilson will require a significant increase in costs to access their current station in downtown due to the need to lay parallel tracks to the station. Similarly, Goldsboro has a significant cost increase to renovate their historic train station and provide an access track. These cost increases and their implications on targeted ridership levels are shown in the documentation for the alternatives. Each jurisdiction has to evaluate these implications in relation to their desired development patterns and the provision of an alternative travel mode.

While there remain a number of unanswered questions, this study does provide a firm cost estimate for the potential commuter rail services. Based upon these findings, the corridors warrant further study to refine the alternatives, estimate the ridership, and develop a funding plan. Environmental studies will be required to identify any negative impacts from the project, and ways to mitigate these impacts.

There is a strong potential that a productive commuter rail service can be developed for both Eastrans corridors that will provide travel options to residents, help shape new development in the cities and towns, improve freight railroad operations, and perform well under federal evaluation criteria.

7.2 NEXT STEPS

Given the findings that commuter rail service is feasible in the Eastrans corridors, further studies are required to refine the operating plans, identify specific capital improvements, estimate ridership, and determine the environmental implications. Costs and funding mechanisms can then be developed for the refined services.

The first step to implement commuter rail services is to identify the organization that will assume responsibility for shepherding the project through the evaluation process. Up to this point, the Town of Knightdale has taken the lead, with valuable support provided by the ad hoc organizations of the Eastrans Commuter Rail Alliance and the Eastern North Carolina Railroad Alliance. The North Carolina Department of Transportation, the North Carolina Railroad, and the operating railroad companies have all provided support, as have the cities and towns along the alignments.

For the next phase, one group must step to the forefront to assume ownership of the project and see it through to completion. This group may be one of the participating organizations, such as the Town of Knightdale or TTA, or it may be a new, formally-organized group. Earlier in the development of the Eastrans Commuter Rail Alliance, the members discussed formally creating an organization, or establishing an interlocal agreement among the parties. If no one existing group is prepared to be the Eastrans champion, then such a formalization of the Alliance should be pursued, and staff hired or loaned to the organization to further the Eastrans project.

To move the project forward through the federal process, the commuter rail lines must be included in the local transportation plans, primarily those of the Metropolitan Planning Organizations (MPOs). Two MPOs are along the corridors – Capital Area, which covers Wake County, and the Goldsboro MPO. The MPOs have a process that must be followed to add transportation facilities to their plans, and Eastrans has to go through that process in order to secure Federal Transit Administration funding. This *Eastrans Commuter Rail Feasibility Study* should be presented to the MPOs' Technical Coordinating Committees (TCC) for review and comment. The TCC then forwards the report to the MPOs' Transportation Advisory Committee (TAC) which must then approve the inclusion of the project in the Long-range Transportation Plan (LRTP). After inclusion in the LRTPs, Eastrans will need to be included in the State transportation plans. An application can then be made through the federal process to secure funding for further studies and design.

Any major construction project that uses federal funds must also go through the process required by the National Environmental Policy Act (NEPA). NEPA requires the environmental impacts of the project be analyzed, and a determination is then formally made of the impacts at the federal level. This determination can range from a Categorical Exclusion (CE), which says a project has such negligible impacts that few detailed studies are required, to the need to prepare

an Environmental Impact Statement that examines several categories of impacts and identifies mitigating measures for each. This latter process was required for the Triangle Transit Authority's Regional Rail project.

The level of the required environmental studies will be determined as the study progresses. The federal process does take into consideration the magnitude of proposed changes in determining the level of analysis. Sound advice should be solicited to develop a Project Management Plan for moving the project into implementation.

APPENDIX

EASTRANS SUMMARY CONCEPTUAL COSTS

December 15, 2003

LOW-COST ALTERNATIVE

	NS CORRIDOR		NCRR CORRIDOR			TOTAL
Capital Cost	**Raleigh - Zebulon**	**Zebulon - Wilson**	**Raleigh - Clayton**	**Clayton - Selma**	**Selma - Goldsboro**	**SYSTEM**
R-O-W	$ 200,000	$ -	$ 100,000	$ 300,000	$ 500,000	$ 1,100,000
Sidings	$ 8,600,000	$ 4,300,000	$ 4,300,000	$ 4,300,000	$ 4,300,000	$ 25,800,000
New Track	$ 4,500,000	$ -	$ 700,000	$ -	$ 1,900,000	$ 7,100,000
Rail Replacement	$ 600,000	$ -	$ 100,000	$ -	$ 200,000	$ 900,000
Tie Replacement	$ 2,100,000	$ 1,600,000	$ 1,800,000	$ 1,100,000	$ 2,200,000	$ 8,800,000
Resurfacing	$ 500,000	$ 400,000	$ 400,000	$ 200,000	$ 500,000	$ 2,000,000
Signals, electrification	$ 2,200,000	$ -	$ 12,100,000	$ 6,500,000	$ 12,300,000	$ 33,100,000
Stations	$ 4,200,000	$ 900,000	$ 2,300,000	$ 400,000	$ 1,100,000	$ 8,900,000
Locomotives	$ 5,600,000	$ -	$ 5,600,000	$ -	$ -	$ 11,200,000
Coaches/Cab Coach	$ 7,500,000	$ 1,300,000	$ 7,500,000	$ 3,800,000	$ 5,000,000	$ 25,100,000
Yard & Shop	$ 600,000	$ 100,000	$ 600,000	$ 200,000	$ 300,000	$ 1,800,000
TOTAL CAPITAL	$ 36,600,000	$ 8,600,000	$ 35,500,000	$ 16,800,000	$ 28,300,000	$ 125,800,000
		$ 45,200,000			$ 80,600,000	
Annual Operating Cost						
Vehicle Operating	$ 130,000	$ 60,000	$ 70,000	$ 30,000	$ 70,000	$ 360,000
Vehicle Maintenance	$ 150,000	$ 110,000	$ 100,000	$ 60,000	$ 110,000	$ 530,000
Fuel	$ 60,000	$ 40,000	$ 40,000	$ 20,000	$ 50,000	$ 210,000
Station Maintenance	$ 130,000	$ 30,000	$ 80,000	$ 30,000	$ 30,000	$ 300,000
Dispatching/Track Maint/Access	$ 200,000	$ 140,000	$ 80,000	$ 40,000	$ 90,000	$ 550,000
Insurance	$ 380,000	$ 270,000	$ 260,000	$ 150,000	$ 290,000	$ 1,350,000
General Administration	$ 210,000	$ 130,000	$ 130,000	$ 70,000	$ 130,000	$ 670,000
Contingencies	$ 250,000	$ 150,000	$ 150,000	$ 80,000	$ 150,000	$ 780,000
TOTAL OPERATING	$ 1,510,000	$ 930,000	$ 910,000	$ 480,000	$ 920,000	$ 4,750,000
		$ 2,440,000			$ 2,310,000	
Indicators						
Corridor Miles	28.0	20.0	19.0	11.0	21.0	99.0
Capital Cost per Mile	$ 1,304,000	$ 428,000	$ 1,869,000	$ 1,520,000	$ 1,343,000	$ 1,268,000
Target Daily Boardings	800	200	800	400	600	2,800
Running Time (minutes)	56	24	32	14	30	

HIGH-COST ALTERNATIVE

	NS CORRIDOR		NCRR CORRIDOR			TOTAL
Capital Cost	**Raleigh - Zebulon**	**Zebulon - Wilson**	**Raleigh - Clayton**	**Clayton - Selma**	**Selma - Goldsboro**	**SYSTEM**
R-O-W	$ 600,000	$ 1,400,000	$ 200,000	$ 300,000	$ 1,100,000	$ 3,600,000
Sidings	$ 10,100,000	$ 4,300,000	$ 8,600,000	$ 4,300,000	$ 8,600,000	$ 35,900,000
New Track	$ 7,300,000	$ 4,700,000	$ 3,600,000	$ -	$ 2,200,000	$ 17,800,000
Rail Replacement	$ 600,000	$ -	$ 100,000	$ -	$ 200,000	$ 900,000
Tie Replacement	$ 2,100,000	$ 2,400,000	$ 2,300,000	$ 1,400,000	$ 2,700,000	$ 10,900,000
Resurfacing	$ 500,000	$ 500,000	$ 400,000	$ 200,000	$ 500,000	$ 2,100,000
Signals, electrification	$ 27,300,000	$ 25,200,000	$ 12,100,000	$ 6,500,000	$ 13,300,000	$ 84,400,000
Stations	$ 10,900,000	$ 5,000,000	$ 6,500,000	$ 400,000	$ 9,200,000	$ 32,000,000
DMU	$ 18,100,000	$ 7,300,000	$ 14,500,000	$ -	$ 10,900,000	$ 50,800,000
Cab Coach	$ 11,300,000	$ 22,500,000	$ -	$ 3,800,000	$ 18,800,000	$ 56,400,000
Yard & Shop	$ 1,900,000	$ 1,900,000	$ 900,000	$ 200,000	$ 1,900,000	$ 6,800,000
TOTAL CAPITAL	$ 90,700,000	$ 75,200,000	$ 49,200,000	$ 17,100,000	$ 69,400,000	$ 301,600,000
		$ 165,900,000			$ 135,700,000	
Annual Operating Cost						
Vehicle Operating	$ 540,000	$ 320,000	$ 270,000	$ 90,000	$ 220,000	$ 1,440,000
Vehicle Maintenance	$ 300,000	$ 270,000	$ 210,000	$ 120,000	$ 230,000	$ 1,130,000
Fuel	$ 80,000	$ 70,000	$ 50,000	$ 30,000	$ 60,000	$ 290,000
Station Maintenance	$ 230,000	$ 100,000	$ 130,000	$ 30,000	$ 50,000	$ 540,000
Dispatching/Track Maint/Access	$ 690,000	$ 620,000	$ 270,000	$ 150,000	$ 300,000	$ 2,030,000
Insurance	$ 620,000	$ 550,000	$ 420,000	$ 240,000	$ 470,000	$ 2,300,000
General Administration	$ 490,000	$ 390,000	$ 270,000	$ 130,000	$ 260,000	$ 1,540,000
Contingencies	$ 590,000	$ 460,000	$ 320,000	$ 160,000	$ 320,000	$ 1,850,000
TOTAL OPERATING	$ 3,540,000	$ 2,780,000	$ 1,940,000	$ 950,000	$ 1,910,000	$ 11,120,000
		$ 6,320,000			$ 4,800,000	
Indicators						
Corridor Miles	28.0	25.0	19.0	11.0	21.0	104.0
Capital Cost per Mile	$ 3,239,000	$ 3,000,000	$ 2,590,000	$ 1,555,000	$ 3,299,000	$ 2,897,000
Target Daily Boardings	2,000	1,600	1,100	400	1,500	6,600
Running Time (minutes)	68	40	34	11	27	

Annualized Capital Cost for Low-Cost and High-Cost Alternatives

Eastrans Commuter Rail

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CORRIDOR COSTS ASSUME PART OF SYSTEM; NOT INDIVIDUAL CORRIDORS

LOW-COST OPTION	Raleigh - Zebulon Corridor						Zebulon - Wilson Segment					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 190,000	$ 57,000		$ 247,000	0.07	$ 17,000	$ 10,000	$ 3,000		$ 13,000	0.07	$ 1,000
Sidings	$ 6,000,000	$ 1,500,000	$ 1,125,000	$ 8,625,000	0.081	$ 699,000	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000
New Track	$ 3,100,000	$ 775,000	$ 581,000	$ 4,456,000	0.081	$ 361,000	$ -	$ -	$ -	$ -	0.081	$ -
Rail Replacement	$ 431,000	$ 108,000	$ 81,000	$ 620,000	0.081	$ 50,000	$ -	$ -	$ -	$ -	0.081	$ -
Tie Replacement	$ 1,440,000	$ 360,000	$ 270,000	$ 2,070,000	0.081	$ 168,000	$ 1,080,000	$ 270,000	$ 203,000	$ 1,553,000	0.081	$ 126,000
Resurfacing	$ 330,000	$ 83,000	$ 62,000	$ 475,000	0.081	$ 38,000	$ 300,000	$ 75,000	$ 56,000	$ 431,000	0.081	$ 35,000
Signals, electrification	$ 1,500,000	$ 375,000	$ 281,000	$ 2,156,000	0.081	$ 175,000	$ -	$ -	$ -	$ -	0.081	$ -
Stations	$ 2,890,000	$ 723,000	$ 542,000	$ 4,155,000	0.094	$ 391,000	$ 650,000	$ 163,000	$ 122,000	$ 935,000	0.094	$ 88,000
Locomotives	$ 4,500,000	$ 1,125,000		$ 5,625,000	0.086	$ 484,000	$ -	$ -		$ -	0.086	$ -
Coaches/Cab Coach	$ 6,000,000	$ 1,500,000		$ 7,500,000	0.086	$ 645,000	$ 1,000,000	$ 250,000		$ 1,250,000	0.086	$ 108,000
Yard & Shop	$ 408,000	$ 102,000	$ 77,000	$ 587,000	0.081	$ 48,000	$ 48,000	$ 12,000	$ 9,000	$ 69,000	0.081	$ 6,000
	$ 26,789,000	$ 6,708,000	$ 3,019,000	**$ 36,516,000**		**$ 3,076,000**	$ 6,088,000	$ 1,523,000	$ 953,000	**$ 8,564,000**		**$ 713,000**
Miles / cost per corridor mile				$ 1,304,000	28					$ 428,000	20	
Annual boardings (threshold)					123,040	205,067					28,520	47,533
Daily boardings (threshold)					483	804					112	186
Peak Passenger Cars	5						1					
Passenger Fleet	6						1					
Peak Locomotives	2						0					
Total Locomotives	2.5						0					

HIGH-COST OPTION	Raleigh - Zebulon Corridor						Zebulon - Wilson Segment					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 490,000	$ 147,000		$ 637,000	0.07	$ 45,000	$ 1,052,000	$ 316,000		$ 1,368,000	0.07	$ 96,000
Sidings	$ 7,000,000	$ 1,750,000	$ 1,313,000	$ 10,063,000	0.081	$ 815,000	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000
New Track	$ 5,100,000	$ 1,275,000	$ 956,000	$ 7,331,000	0.081	$ 594,000	$ 3,300,000	$ 825,000	$ 619,000	$ 4,744,000	0.081	$ 384,000
Rail Replacement	$ 431,000	$ 108,000	$ 81,000	$ 620,000	0.081	$ 50,000	$ -	$ -	$ -	$ -	0.081	$ -
Tie Replacement	$ 1,440,000	$ 360,000	$ 270,000	$ 2,070,000	0.081	$ 168,000	$ 1,638,000	$ 410,000	$ 307,000	$ 2,355,000	0.081	$ 191,000
Resurfacing	$ 330,000	$ 83,000	$ 62,000	$ 475,000	0.081	$ 38,000	$ 345,000	$ 86,000	$ 65,000	$ 496,000	0.081	$ 40,000
Signals, electrification	$ 19,000,000	$ 4,750,000	$ 3,563,000	$ 27,313,000	0.081	$ 2,212,000	$ 17,500,000	$ 4,375,000	$ 3,281,000	$ 25,156,000	0.081	$ 2,038,000
Stations	$ 7,615,000	$ 1,904,000	$ 1,428,000	$ 10,947,000	0.094	$ 1,029,000	$ 3,450,000	$ 863,000	$ 647,000	$ 4,960,000	0.094	$ 466,000
DMU	$ 14,500,000	$ 3,625,000		$ 18,125,000	0.086	$ 1,559,000	$ 5,800,000	$ 1,450,000		$ 7,250,000	0.086	$ 624,000
Cab Coach	$ 9,000,000	$ 2,250,000		$ 11,250,000	0.086	$ 968,000	$ 18,000,000	$ 4,500,000		$ 22,500,000	0.086	$ 1,935,000
Yard & Shop	$ 1,297,000	$ 324,000	$ 243,000	$ 1,864,000	0.081	$ 151,000	$ 1,297,000	$ 324,000	$ 243,000	$ 1,864,000	0.081	$ 151,000
	$ 66,203,000	$ 16,576,000	$ 7,916,000	**$ 90,695,000**		**$ 7,629,000**	$ 55,382,000	$ 13,899,000	$ 5,725,000	**$ 75,006,000**		**$ 6,274,000**
Miles / cost per corridor mile				$ 3,239,000	28.00					$ 3,000,000	25.00	
Annual boardings (threshold)					305,160	508,600					250,960	418,267
Daily boardings (threshold)					1,197	1,995					984	1,640
Peak DMU	4						2					
DMU w/ spares	5						2					
Peak Cab Coaches	2						5					
Cab Coaches w/ spares	3						6					

Annualized Capital Cost fo
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LOW-COST OPTION	Raleigh - Clayton Corridor						Clayton - Selma Segment						Selma - Goldsboro Segment					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 40,000	$ 12,000		$ 52,000	0.07	$ 4,000	$ 209,000	$ 63,000		$ 272,000	0.07	$ 19,000	$ 401,000	$ 120,000		$ 521,000	0.07	$ 36,000
Sidings	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000
New Track	$ 500,000	$ 125,000	$ 94,000	$ 719,000	0.081	$ 58,000	$ -	$ -	$ -	$ -	0.081	$ -	$ 1,340,000	$ 335,000	$ 251,000	$ 1,926,000	0.081	$ 156,000
Rail Replacement	$ 62,000	$ 16,000	$ 12,000	$ 90,000	0.081	$ 7,000	$ -	$ -	$ -	$ -	0.081	$ -	$ 123,000	$ 31,000	$ 23,000	$ 177,000	0.081	$ 14,000
Tie Replacement	$ 1,238,000	$ 310,000	$ 232,000	$ 1,780,000	0.081	$ 144,000	$ 743,000	$ 186,000	$ 139,000	$ 1,068,000	0.081	$ 87,000	$ 1,508,000	$ 377,000	$ 283,000	$ 2,168,000	0.081	$ 176,000
Resurfacing	$ 270,000	$ 68,000	$ 51,000	$ 389,000	0.081	$ 32,000	$ 165,000	$ 41,000	$ 31,000	$ 237,000	0.081	$ 19,000	$ 315,000	$ 79,000	$ 59,000	$ 453,000	0.081	$ 37,000
Signals, electrification	$ 8,439,000	$ 2,110,000	$ 1,582,000	$ 12,131,000	0.081	$ 983,000	$ 4,490,000	$ 1,123,000	$ 842,000	$ 6,455,000	0.081	$ 523,000	$ 8,571,000	$ 2,143,000	$ 1,607,000	$ 12,321,000	0.081	$ 998,000
Stations	$ 1,620,000	$ 405,000	$ 304,000	$ 2,329,000	0.094	$ 219,000	$ 293,000	$ 73,000	$ 55,000	$ 421,000	0.094	$ 40,000	$ 730,000	$ 183,000	$ 137,000	$ 1,050,000	0.094	$ 99,000
Locomotives	$ 4,500,000	$ 1,125,000		$ 5,625,000	0.086	$ 484,000	$ -	$ -		$ -	0.086	$ -	$ -	$ -		$ -	0.086	$ -
Coaches/Cab Coach	$ 6,000,000	$ 1,500,000		$ 7,500,000	0.086	$ 645,000	$ 3,000,000	$ 750,000		$ 3,750,000	0.086	$ 323,000	$ 4,000,000	$ 1,000,000		$ 5,000,000	0.086	$ 430,000
Yard & Shop	$ 408,000	$ 102,000	$ 77,000	$ 587,000	0.081	$ 48,000	$ 144,000	$ 36,000	$ 27,000	$ 207,000	0.081	$ 17,000	$ 192,000	$ 48,000	$ 36,000	$ 276,000	0.081	$ 22,000
	$ 26,077,000	$ 6,523,000	$ 2,915,000	**$ 35,515,000**		**$ 2,973,000**	$ 12,044,000	$ 3,022,000	$ 1,657,000	**$ 16,723,000**		**$ 1,377,000**	$ 20,180,000	$ 5,066,000	$ 2,959,000	**$ 28,205,000**		**$ 2,317,000**
Miles / cost per corridor mile				$ 1,869,000	19					$ 1,520,000	11					$ 1,343,000	21	
Annual boardings (threshold)					118,920	198,200					55,080	91,800					92,680	154,467
Daily boardings (threshold)					466	777					216	360					363	606
Peak Passenger Cars	5						2						3					
Passenger Fleet	6						3						4					
Peak Locomotives	2						0						0					
Total Locomotives	2.5						0						0					

HIGH-COST OPTION	Raleigh - Clayton Corridor						Clayton - Selma Segment						Selma - Goldsboro Segment					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 118,000	$ 35,000		$ 153,000	0.07	$ 11,000	$ 209,000	$ 63,000		$ 272,000	0.07	$ 19,000	$ 873,000	$ 262,000		$ 1,135,000	0.07	$ 79,000
Sidings	$ 6,000,000	$ 1,500,000	$ 1,125,000	$ 8,625,000	0.081	$ 699,000	$ 3,000,000	$ 750,000	$ 563,000	$ 4,313,000	0.081	$ 349,000	$ 6,000,000	$ 1,500,000	$ 1,125,000	$ 8,625,000	0.081	$ 699,000
New Track	$ 2,500,000	$ 625,000	$ 469,000	$ 3,594,000	0.081	$ 291,000	$ -	$ -	$ -	$ -	0.081	$ -	$ 1,500,000	$ 375,000	$ 281,000	$ 2,156,000	0.081	$ 175,000
Rail Replacement	$ 62,000	$ 16,000	$ 12,000	$ 90,000	0.081	$ 7,000	$ -	$ -	$ -	$ -	0.081	$ -	$ 123,000	$ 31,000	$ 23,000	$ 177,000	0.081	$ 14,000
Tie Replacement	$ 1,620,000	$ 405,000	$ 304,000	$ 2,329,000	0.081	$ 189,000	$ 990,000	$ 248,000	$ 186,000	$ 1,424,000	0.081	$ 115,000	$ 1,890,000	$ 473,000	$ 354,000	$ 2,717,000	0.081	$ 220,000
Resurfacing	$ 270,000	$ 68,000	$ 51,000	$ 389,000	0.081	$ 32,000	$ 165,000	$ 41,000	$ 31,000	$ 237,000	0.081	$ 19,000	$ 315,000	$ 79,000	$ 59,000	$ 453,000	0.081	$ 37,000
Signals, electrification	$ 8,439,000	$ 2,110,000	$ 1,582,000	$ 12,131,000	0.081	$ 983,000	$ 4,490,000	$ 1,123,000	$ 842,000	$ 6,455,000	0.081	$ 523,000	$ 9,271,000	$ 2,318,000	$ 1,738,000	$ 13,327,000	0.081	$ 1,079,000
Stations	$ 4,495,000	$ 1,124,000	$ 843,000	$ 6,462,000	0.094	$ 607,000	$ 293,000	$ 73,000	$ 55,000	$ 421,000	0.094	$ 40,000	$ 6,400,000	$ 1,600,000	$ 1,200,000	$ 9,200,000	0.094	$ 865,000
DMU	$ 11,600,000	$ 2,900,000		$ 14,500,000	0.086	$ 1,247,000	$ -	$ -		$ -	0.086	$ -	$ 8,700,000	$ 2,175,000		$ 10,875,000	0.086	$ 935,000
Cab Coach	$ -	$ -		$ -	0.086	$ -	$ 3,000,000	$ 750,000		$ 3,750,000	0.086	$ 323,000	$ 15,000,000	$ 3,750,000		$ 18,750,000	0.086	$ 1,613,000
Yard & Shop	$ 648,000	$ 162,000	$ 122,000	$ 932,000	0.081	$ 75,000	$ 162,000	$ 41,000	$ 30,000	$ 233,000	0.081	$ 19,000	$ 1,297,000	$ 324,000	$ 243,000	$ 1,864,000	0.081	$ 151,000
	$ 35,752,000	$ 8,945,000	$ 4,508,000	**$ 49,205,000**		**$ 4,141,000**	$ 12,309,000	$ 3,089,000	$ 1,707,000	**$ 17,105,000**		**$ 1,407,000**	$ 51,369,000	$ 12,887,000	$ 5,023,000	**$ 69,279,000**		**$ 5,867,000**
Miles / cost per corridor mile				$ 2,590,000	19.00					$ 1,555,000	11.00					$ 3,299,000	21.00	
Annual boardings (threshold)					165,640	276,067					56,280	93,800					234,680	391,133
Daily boardings (threshold)					650	1,083					221	368					920	1,534
Peak DMU	3						0						2					
DMU w/ spares	4						0						3					
Peak Cab Coaches	0						1						4					
Cab Coaches w/ spares	0						1						5					

Annualized Capital Cost fo
Eastrans Commuter Rail

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LOW-COST OPTION	Total Low-Cost System					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 850,000	$ 255,000	$ -	$ 1,105,000	0.07	$ 77,000
Sidings	$ 18,000,000	$ 4,500,000	$ 3,377,000	$ 25,877,000	0.081	$ 2,096,000
New Track	$ 4,940,000	$ 1,235,000	$ 926,000	$ 7,101,000	0.081	$ 575,000
Rail Replacement	$ 616,000	$ 155,000	$ 116,000	$ 887,000	0.081	$ 72,000
Tie Replacement	$ 6,009,000	$ 1,503,000	$ 1,127,000	$ 8,639,000	0.081	$ 700,000
Resurfacing	$ 1,380,000	$ 346,000	$ 259,000	$ 1,985,000	0.081	$ 161,000
Signals, electrification	$ 23,000,000	$ 5,751,000	$ 4,312,000	$ 33,063,000	0.081	$ 2,678,000
Stations	$ 6,183,000	$ 1,547,000	$ 1,160,000	$ 8,890,000	0.094	$ 836,000
Locomotives	$ 9,000,000	$ 2,250,000	$ -	$ 11,250,000	0.086	$ 968,000
Coaches/Cab Coach	$ 20,000,000	$ 5,000,000	$ -	$ 25,000,000	0.086	$ 2,150,000
Yard & Shop	$ 1,200,000	$ 300,000	$ 226,000	$ 1,726,000	0.081	$ 140,000
	$ 91,178,000	$ 22,842,000	$ 11,503,000	**$ 125,523,000**		**$ 10,453,000**

Miles / cost per corridor mile				$ 1,268,000	99		
Annual boardings (threshold)						418,120	696,867
Daily boardings (threshold)						1,640	2,733
Peak Passenger Cars	16	3.2	20			@ $25 threshold	@ $15 threshold
Passenger Fleet	peak	spares	total				
Peak Locomotives	4	0.8	5				
Total Locomotives							

HIGH-COST OPTION	Total High-Cost System					
	CC	Cntgcy	Engin/CM	Total CC	AF	ACC
R-O-W	$ 2,742,000	$ 823,000	$ -	$ 3,565,000	0.07	$ 250,000
Sidings	$ 25,000,000	$ 6,250,000	$ 4,689,000	$ 35,939,000	0.081	$ 2,911,000
New Track	$ 12,400,000	$ 3,100,000	$ 2,325,000	$ 17,825,000	0.081	$ 1,444,000
Rail Replacement	$ 616,000	$ 155,000	$ 116,000	$ 887,000	0.081	$ 72,000
Tie Replacement	$ 7,578,000	$ 1,896,000	$ 1,421,000	$ 10,895,000	0.081	$ 882,000
Resurfacing	$ 1,425,000	$ 357,000	$ 268,000	$ 2,050,000	0.081	$ 166,000
Signals, electrification	$ 58,700,000	$ 14,676,000	$ 11,006,000	$ 84,382,000	0.081	$ 6,835,000
Stations	$ 22,253,000	$ 5,564,000	$ 4,173,000	$ 31,990,000	0.094	$ 3,007,000
DMU	$ 40,600,000	$ 10,150,000	$ -	$ 50,750,000	0.086	$ 4,365,000
Cab Coach	$ 45,000,000	$ 11,250,000	$ -	$ 56,250,000	0.086	$ 4,838,000
Yard & Shop	$ 4,701,000	$ 1,175,000	$ 881,000	$ 6,757,000	0.081	$ 547,000
	$ 221,015,000	$ 55,396,000	$ 24,879,000	**$ 301,290,000**		**$ 25,317,000**

Miles / cost per corridor mile				$ 2,897,000	104.00		
Annual boardings (threshold)						1,012,680	1,687,800
Daily boardings (threshold)					daily riders	3,971	6,619
Peak DMU	11	2.2	14			@ $25 threshold	@ $15 threshold
DMU w/ spares	peak	spares	total				
Peak Cab Coaches	12	2.4	15				
Cab Coaches w/ spares							

Annual Operating & Maintenance Cost for Low-Cost and High-Cost Alternatives
Eastrans Commuter Rail

Date : 12/15/03

CORRIDOR COSTS ASSUME PART OF SYSTEM

LOW-COST ALTERNATIVE		Raleigh - Zebulon			Zebulon - Wilson			Raleigh - Clayton			Clayton - Selma			Selma - Goldsboro			Systemwide
	Item	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Annual Cost
Vehicle Operating	train hours	952	$ 134.40	$ 128,000	408	$ 134.40	$ 55,000	544	$ 134.40	$ 73,000	238	$ 134.40	$ 32,000	510	$ 134.40	$ 69,000	$ 357,000
Vehicle Maintenance	train miles	28,274	$ 5.23	$ 148,000	20,074	$ 5.23	$ 105,000	19,203	$ 5.23	$ 100,000	11,067	$ 5.23	$ 58,000	21,267	$ 5.23	$ 111,000	$ 522,000
Fuel	gallons	68,424	$ 0.90	$ 62,000	48,578	$ 0.90	$ 44,000	46,472	$ 0.90	$ 42,000	26,782	$ 0.90	$ 24,000	51,466	$ 0.90	$ 46,000	$ 218,000
Station Maintenance	stations	5	$ 25,000	$ 125,000	1	$ 25,000	$ 25,000	3	$ 25,000	$ 75,000	1	$ 25,000	$ 25,000	1	$ 25,000	$ 25,000	$ 275,000
Dispatching/Track Maint/Access	train miles	28,274	$ 7.00	$ 198,000	20,074	$ 7.00	$ 141,000	19,203	$ 4.00	$ 77,000	11,067	$ 4.00	$ 44,000	21,267	$ 4.00	$ 85,000	$ 545,000
Insurance	train miles	28,274	$ 3.50	$ 382,000	20,074	$ 3.50	$ 271,000	19,203	$ 3.50	$ 259,000	11,067	$ 3.50	$ 150,000	21,267	$ 3.50	$ 287,000	$ 1,349,000
General Administration			20%	$ 209,000		20%	$ 128,000		20%	$ 125,000		20%	$ 67,000		20%	$ 125,000	$ 654,000
Contingencies			20%	$ 250,000		20%	$ 154,000		20%	$ 150,000		20%	$ 80,000		20%	$ 150,000	$ 784,000
				$ 1,502,000			**$ 923,000**			**$ 901,000**			**$ 480,000**			**$ 898,000**	**$ 4,704,000**
Per corridor mile		28.0		$ 54,000	20.0		$ 46,000	19.0		$ 47,000	11.0		$ 44,000	21.0		$ 43,000	$ 48,000

Annual hour calculation			hours/trip														
Peak	2 trips each way	4	0.93	952	4	0.40	408	4	0.53	544	4	0.23	238	4	0.50	510	
Off-peak	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	
Sat	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	
Sun	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	
				952			408			544			238			510	

HIGH-COST ALTERNATIVE		Raleigh - Zebulon			Zebulon - Wilson			Raleigh - Clayton			Clayton - Selma			Selma - Goldsboro			Systemwide
	Item	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Amount	Unit Cost	Annual Cost	Annual Cost
Vehicle Operating	train hours	4,046	$ 134.40	$ 544,000	2,380	$ 134.40	$ 320,000	2,023	$ 134.40	$ 272,000	655	$ 134.40	$ 88,000	1,607	$ 134.40	$ 216,000	$ 1,440,000
Vehicle Maintenance	train miles	99,127	$ 3.04	$ 301,000	88,298	$ 3.04	$ 268,000	67,973	$ 3.04	$ 207,000	38,026	$ 3.04	$ 116,000	74,863	$ 3.04	$ 228,000	$ 1,120,000
Fuel	gallons	85,249	$ 0.90	$ 77,000	75,936	$ 0.90	$ 68,000	58,457	$ 0.90	$ 53,000	32,703	$ 0.90	$ 29,000	64,382	$ 0.90	$ 58,000	$ 285,000
Station Maintenance	stations	9	$ 25,000	$ 225,000	4	$ 25,000	$ 100,000	5	$ 25,000	$ 125,000	1	$ 25,000	$ 25,000	2	$ 25,000	$ 50,000	$ 525,000
Dispatching/Track Maint/Access	train miles	99,127	$ 7.00	$ 694,000	88,298	$ 7.00	$ 618,000	67,973	$ 4.00	$ 272,000	38,026	$ 4.00	$ 152,000	74,863	$ 4.00	$ 299,000	$ 2,035,000
Insurance	train miles	99,127	$ 3.50	$ 616,000	88,298	$ 3.50	$ 549,000	67,973	$ 3.50	$ 422,000	38,026	$ 3.50	$ 236,000	74,863	$ 3.50	$ 465,000	$ 2,288,000
General Administration			20%	$ 491,000		20%	$ 385,000		20%	$ 270,000		20%	$ 129,000		20%	$ 263,000	$ 1,538,000
Contingencies			20%	$ 590,000		20%	$ 462,000		20%	$ 324,000		20%	$ 155,000		20%	$ 316,000	$ 1,847,000
				$ 3,538,000			**$ 2,770,000**			**$ 1,945,000**			**$ 930,000**			**$ 1,895,000**	**$ 11,078,000**
Per corridor mile		28.0		$ 126,000	25.0		$ 111,000	19.0		$ 102,000	11.0		$ 85,000	21.0		$ 90,000	$ 107,000

Annual hour calculation																	$ 4,770,000
Peak	30 minutes	12	1.13	3,468	12	0.67	2,040	12	0.57	1,734	12	0.18	561	12	0.45	1,377	
Off-peak	1 round trip	2	1.13	578	2	0.67	340	2	0.57	289	2	0.18	94	2	0.45	230	
Sat	none	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	
Sun	none	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-	
				4,046			2,380			2,023			655			1,607	

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June 1, 2003

To Planners of Passenger Train Projects:

Norfolk Southern welcomes the opportunity to work with state departments of transportation, high-speed rail advocates, and transit and commuter authorities to develop new or additional passenger rail services over our tracks. We look forward to moving your projects forward as long as they remain realistic and include our concerns.

Because of the popularity of passenger train proposals, we believe that you should be aware of some of the principles that will underlie any discussions we hold with planners. These principles are intended to protect our "factory", which is the track and right-of-way needed to produce our product – the present and future transport of freight – and to protect the interests of our owners and employees. We foresee major segments of our business – particularly the movement of truck trailers and containers – growing significantly in the coming years as highways become more congested.

These principles refer only to conventional intercity or commuter passenger services and high-speed rail projects. Additional conditions will apply to light rail and other public transit ventures. To discuss any of the following issues further, please call me at the number above.

CONVENTIONAL AND HIGH SPEED PASSENGER

We consider all passenger studies to be conceptual. Until serious money is available to construct infrastructure, we at Norfolk Southern will continue to regard passenger studies as hypothetical exercises. Their conclusions will be subject to revision if funding for a project's implementation becomes available.

We will coordinate infrastructure assessments. Studies intended to estimate how much additional capacity is needed for passenger trains (and how much it will cost) will be conducted by consultants approved by Norfolk Southern, and will be paid for by the sponsoring public agency.

All studies and surveys must acknowledge that NS owns its corridors and is entitled to fair compensation for their use. We maintain them and we pay taxes on them. Please don't assume that the use of our capacity and our asset is "free". Instead, please acknowledge in your studies and reports that we are entitled to a fair return if the corridor is to be used for passenger trains.

Passenger train operation must be "transparent" to our freight operations. We define transparency as the provision of sufficient infrastructure for passenger trains and freight trains to operate without delay to either, and to allow for the growth of both.

Delay to freight trains by passenger trains, however minimal, is unacceptable. Sufficient infrastructure must be furnished so that each type of train can operate without getting in the other's way. The common assumption that a proposed passenger train will impose “minimal interference with freight operations” is a non-starter.

We will require new passenger train services to pay higher usage fees than Amtrak pays today. Please do not use “Amtrak incremental cost” factors in estimating the operating costs of new passenger services. Amtrak was entitled to special rights in return for relieving the freight railroads of intercity passenger train operation over thirty years ago. There is no relationship between the rates Amtrak pays and a fair, commercial return for use of private assets. We will require operators of new passenger train service to negotiate market-based operating agreements with us.

Liability will be a major issue. Based on our experience with commuter authorities, the cost to the passenger carrier for indemnifying NS is substantial. We will accept no new or expanded passenger operations without adequate liability protection.

Cab signals for freight locomotives will be required if the top speed for passenger trains is above 79 mph. Be prepared to equip the NS freight locomotive fleet with additional cab signal and other safety apparatus, and to pay for and maintain any additional signal infrastructure required by speeds in excess of 79 mph.

Dispatching will remain with NS for all trains operating over NS tracks after inauguration of passenger service.

HIGH SPEED CORRIDORS

High-speed corridors require careful planning. If the federal government designates a corridor as "high speed", NS will automatically assume that mainline tracks dedicated solely to high speed trains will someday be built in the same corridor as our existing mainline tracks. Provisions must be made for separate high-speed tracks throughout the corridor, especially in urban areas. Highway or railroad overpasses/underpasses, when built with public funds, must allow space for the additional tracks.

NS will require separate tracks for passenger trains operating in excess of 90 mph. No heavy-duty rail freight line has 110-mph passenger trains operating over it today. Where freight trains do operate over 110-mph track (Northeast and Empire Corridors, for example), the penalties imposed on freight trains are substantial. In a heavy-duty freight environment (Cleveland-Chicago is one example), high-speed passenger trains must operate over tracks dedicated to their use.

Railroading is expensive. 110 mph railroading is very expensive. As most ridership analyses indicate, the greatest growth occurs with increases in frequency, not speed. This implies that four round trips a day at a top speed of 79 mph are much more cost-effective than four round trips a day at 110 mph.

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January 13, 2004

Mr. Glenn Michael
Director of Railroad and Public Transportation
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Re: Knightdale commuter rail feasibility study near Raleigh, NC

Dear Glenn,

Thanks for your November letter to Mr. John Gibson requesting CSX Transportation's (CSXT) participation in a feasibility study for commuter rail. From your letter, we understand that the city of Knightdale desires commuter rail service from Wilson to Raleigh, NC, over the Norfolk Southern freight line and also from Raleigh to Goldsboro, NC. We further understand that some portions of the proposed commuter operation would involve CSXT operating property.

In our consideration of proposals for initiating or expanding passenger rail operations on CSXT property, CSXT utilizes a fact-based analytical approach focused on the company's guiding principles of safety, capacity, compensation, and liability as outlined below.

Safety – CSXT will not participate in any proposal that moves us away from our safety objectives, regardless of the potential public transportation benefits. The risks to our employees and the public must be no greater after a passenger rail system is put in place compared to the risks prior to the project. As a result, we must object to any system that increases those risks.

Capacity – CSXT's capacity is affected by every impact to its rights-of-way and tracks. One railcar can equate to as many as four truckloads. Any relationship with passenger rail services must give CSXT the ability to effectively serve current customers and meet the demands of new and growing customers in the future. A cost-effective, reliable freight rail system is vital to local and state economies and to job creation. Passenger rail projects that diminish existing and future rail capacity can be inconsistent with the true objectives of transportation planners, which is to reduce pollution and congestion on the roadways.

Compensation – Freight railroads are publicly held companies, operating on private property acquired and maintained by private investment. Passenger authorities requesting

access to freight railroad property must bear the full cost of any new facilities required to accommodate the commuter rail service, compensate CSXT for the use or acquisition of the right-of-way at fair market value and not expect subsidy for access, maintenance, or dispatching.

Liability – CSXT cannot assume additional liability from the introduction of a new commuter rail operation on its right-of-way. CSXT expects any passenger operation to assume all liability and risks which would not have occurred but for the construction, operation, maintenance, and presence of a commuter rail system and further to provide the broadest possible contractual indemnity of CSXT, for itself, its successors, assigns, and affiliates.

In response to your specific query for CSXT participation in your committee meetings, we invite you to visit us in Jacksonville so that we may discuss your proposal in more detail. We may also be able to meet with you in Raleigh in late February or March as we work with the Triangle Transit Authority (TTA) on their light rail project.

Pending our meeting, please allow us to share our initial concern. TTA has purchased a CSXT corridor that extends from just north of Raleigh to Cary on which they will operate a self-propelled FRA-compliant DMU. There may be insufficient CSXT right-of-way remaining for another track in the Boylan Junction area

Thanks again for contacting us. We look forward to hearing from you as to how you would like to proceed. I trust that you will contact me if I can be of further assistance.

Sincerely,

Rosanne M. Kohler

Rosanne M. Kohler

cc:
Mr. J. M. Gibson - J315
Mr. J. W. Westbrook - J315

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