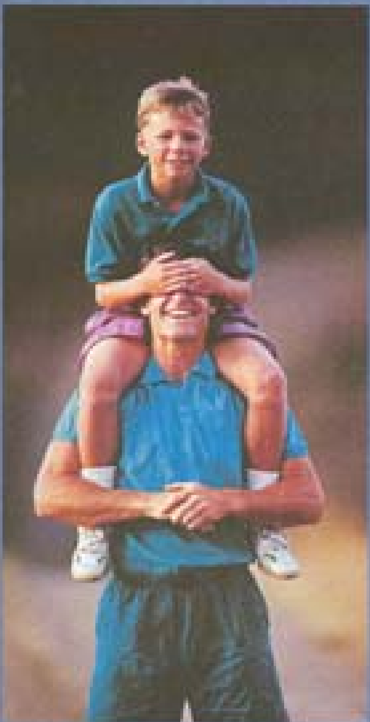

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA

MAKE THE CONNECTION

HIGH SPEED TRAINS
NASHVILLE-CHATTANOOGA-ATLANTA

FEDERAL RAILROAD ADMINISTRATION
APPLICATION FOR HIGH SPEED RAIL
CORRIDOR DESIGNATION

NOVEMBER 2003

TDOT
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ARCADIS

STV

MAKE THE CONNECTION

PHIL BREDESEN
THE GOVERNOR OF TENNESSEE

30 October 2003

The Honorable Norman Y. Mineta
U.S. Transportation Secretary
U.S. Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

Dear Secretary Mineta:

We are pleased to submit our application for the Chattanooga-Nashville extension of the Southeast High Speed Rail Corridor from Atlanta, Georgia. This High Speed Rail (HSR) designation and extension would serve two fast growing states and would connect the downtown and airport areas of Atlanta, Nashville, and Chattanooga to create multiple new intermodal (plane, train, transit, highway) connections while providing a new high speed link between these important cities. Of particular value, fast growing suburban areas and smaller towns such as Marietta, Georgia and Murfreesboro, Tennessee would also benefit from direct high speed rail connections to both laraer cities and their hub airports. Statewide, the proposed high speed rail service would provide dramatic new mobility for residents and visitors to Tennessee and Georgia.

It should be noted, that at this time, the technology option for this high-speed rail corridor extension has not been decided, but both steel wheel high-speed rail and Maglev technologies are under consideration. "Ridership" modeling in this application is based upon steel wheel technology speeds, but the final selection of the technology will come after environmental impact studies are complete.

This application has been developed through the guidelines set forth in the 23 U.S.C. Section 104 (d) (2) program as outlined in Notice No. 136, Volume 65, of the Federal Register. These aforementioned criteria along with direction from Federal Railroad Administration staff have been incorporated into this application to address and satisfy the five components of the corridor application:

- states' funding commitments,
- cooperation of the host railroad to seek this HSR corridor designation,
- a determination of the percent of the corridor capable of sustaining train speeds of 90+ MPH,
- expected annual "ridership," and
- the public benefits which accrue from realizing this investment.

It is the desire of both Georgia and Tennessee to offer high-speed ground transportation as a viable travel mode for citizens and visitors, and to create future travel alternatives to our increasingly congested Interstate Highway System.

The States of Tennessee and Georgia understand that extending the Southeast High Speed Rail Corridor to include a Chattanooga-Nashville connection will not result in immediate federal funding or financial support for this corridor extension. Both states are seeking HSR Corridor designation to make this extended corridor eligible for future federal funding if and when larger scale federal funding becomes available to make a national HSR system a reality.

Both Tennessee and Georgia also realize that, as with other highway, railroad, and transit projects, some share (ratio) of a "local" match will likely be required when larger scale federal funding for high speed rail becomes available. As the type and form of the federal funding is not yet known, developed, or even in place, it is equally difficult for both states to forecast the exact form or funding sources which each state will use to provide the local match.

We also understand that provisions of the Passenger Rail Investment Reform Act of 2003 would de-emphasize the importance of the HSR Corridors, but until that policy change is implemented, we are still respectfully seeking designation of the Chattanooga-Nashville extension to the southeast High Speed Rail Corridor so that subsequent planning and environmental analysis efforts can take place in a coordinated regional and national context.

Should you have any questions about this application, please contact Mr. Ben Smith, Tennessee Department of Transportation, Director of Public Transit, Railroads, and Waterways, at 615-741-2781. We look forward to working with the U.S. Department of Transportation to not only obtain this important designation, but to also make high speed rail a reality in Tennessee and Georgia.

Warmest regards,

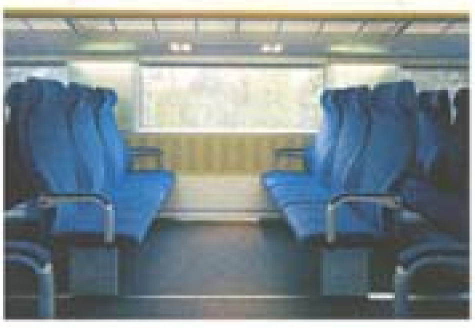
Phil Bredesen

cc: The Honorable Sonny Perdue, Governor, State of Georgia
The Honorable Shirley Franklin, Mayor, City of Atlanta
The Honorable Bob Corker, Mayor, City of Chattanooga
The Honorable Bill Purcell, Mayor, Metropolitan Nashville
The Honorable Gerald Nicely, Commissioner, Tennessee Department of Transportation
The Honorable Harold Linnenkohl, Commissioner, Georgia Department of Transportation

BACKGROUND

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA



Background

In 2000, the Tennessee Department of Transportation embarked upon the creation of a statewide rail plan. Completed in 2003, the Tennessee Rail System Plan (Rail Plan) would become the most comprehensive rail study ever performed for the State, and subsequently, a rail plan model for other states across America. Based upon the success of the Rail Plan and based upon recent current events, Tennessee seeks to "better connect" with its neighboring states that are currently making high speed rail plans. Thus, Tennessee is seeking an extension of the federally designated Southeast High Speed Rail Corridor from Atlanta to Chattanooga to Nashville.

In December 2000, the Tennessee Department of Transportation (TDOT) retained the services of a team consisting of engineering firms ARCADIS and STV Inc. (and others) to develop the Rail Plan for Tennessee. As defined by TDOT, the goal of the plan was to "provide policy, procedural and system management guidance and assist TDOT in its efforts to re-define its role with regard to rail system projects."

One of the major tasks of the Rail Plan was to study the potential for intercity passenger rail service in Tennessee.

Currently, passenger rail service in Tennessee is extremely limited. Though Tennessee has more than 3,000 miles of active rail lines, only 132 miles of track are used by passenger trains. Passenger rail service in Tennessee is completely confined to the western edge of the state where Amtrak's City of New Orleans (Chicago to New Orleans) route provides late-night, daily service to two Tennessee train stations.

A broad public involvement process paralleled the development of the Rail Plan. This process included a steering committee (Rail System Plan Advisory Committee-RSPAC), which helped provide project input and direction. RSPAC consisted of a variety of elected officials, local and state governmental agencies, Class I railroads, short line railroads, and public interest groups.

To help solicit public input, an extensive number of public "town hall" meetings were held across the state, in both smaller towns and larger metropolitan areas. During these meetings, a recurrent message from the citizens of Tennessee was that they supported and embraced reestablishing passenger rail service. Below is a selection of quotes from these public meetings:

"America has had a love affair with the automobile but we cannot keep widening our roadways...A convenient transportation alternative must be developed that will attract people."

"The government needs to start investing more money in rail projects."

"A rail fund needs to be established similar to the highway fund."

"Need City participation for mass transit thus overlapping with intercity passenger rail.."

"We need more environmental friendly transportation alternatives."

"...Tennessee would benefit from passenger rail."

The Intercity Passenger Rail component of the Rail Plan was completed in early **2003.** The results of that report demonstrated that reestablishing passenger rail service in Tennessee could have the following results:

- Provide a viable and attractive means of intrastate and intercity travel.
- Help improve air quality.
- Provide an alternative means of transportation for those unable to drive.
- Facilitate linkages with other public transport modes (e.g., bus, commuter rail, etc.).
- Enhance statewide economic development opportunities.
- Promote tourism throughout the state.

The report concluded that the most promising (highest benefit-to-cost ratio) passenger rail corridor in the state was the corridor linking the cities of Nashville to Chattanooga on to Atlanta, with eventual connection from Nashville to Louisville, Kentucky.

During development of the Rail Plan and immediately following the terrorist attacks of September 11,2001, when air travel was grounded, then-Tennessee Congressman Bob Clement wrote to TDOT to ask that the **State** work to establish a high speed rail corridor based upon the most promising rail comdor identified from the Rail Plan study.

Congressman Clement **wrote:**

> ***In doing so, Tennessee will be positioned to take part in some upcomingfederal initiatives now being discussed here in Washington. These initiatives aim to develop high-speedrail service in various communities across our nation*** *and* ***Tennessee must not be left behindas the rest of America further enhances its transportation offerings.***

In response to Congressman Clement's letter, the original Rail Plan contract was amended to task the contractor team with developing a High Speed Rail Corridor Designation Application for submittal to the Federal Railroad Administration (FRA). This work began in early **2003** with an application submittal to the FRA before the end of **2003.**

In conjunction with the activities of TDOT and **with** the support of U.S. Congressman **Zach** Wamp, the City of Chattanooga requested and received $1.5 million in appropriations from the Federal Highway Administration (FHWA) to continue investigating the high speed rail potential of the Atlanta-to-Chattanooga corridor. These efforts will build upon prior studies, such as the Tennessee Rail Plan intercity passenger rail report, results of the high speed rail corridor designation process, the Georgia Department of Transportation Intercity Rail Passenger Plan, and the Atlanta Regional Commission Atlanta-Chattanooga Maglev Deployment Studies.

It should be noted that it has not been decided whether steel wheel rail technology or Maglev technology is the preferred technology choice. However, for purposes of this application, steel wheel rail technology forms the basis for travel time estimates, ridership forecasts, and public benefits.

Background

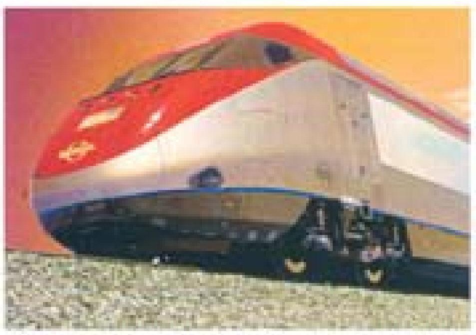
Tennessee recognizes the importance of a strong and viable intercity rail service. The application to extend the Southeast High Speed Rail Corridor from Atlanta to Nashville is just one part of a larger planning effort in progress. Eventually, high speed trains could connect the cities of Savannah, Macon, Atlanta, Chattanooga, and Nashville northward to Chicago. Such a network would link the two busiest airports in the United States, enhancing travel security in the Southeast and Midwest.

Clearly, the citizens of Tennessee are "on board" and support local and state efforts to improve statewide and regional mobility. Investments in transportation mobility now will help pay future dividends in economic growth, preservation, and enhancements in quality of life for years to come.

STATE/LOCAL COMMITMENT

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA



City of Chattanooga

OFFICE OF THE MAYOR
SUITE 100, CITY HALL (423) 757-5152
Chattanooga, Tennessee 37402

October 15,2003

The Honorable Norman Y. Mineta
U.S. Transportation Secretary
U.S. Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Secretary:

As a part of the U.S. Maglev Deployment Program (MDP), a positive Feasibility Study (FS) was submitted to the Federal Rail Administration (FRA) for the Atlanta-Chattanooga Maglev project on June 30, 2002. While the project was temporarily suspended for lack of available funds, Congress has since appropriated $1.5 million in 2003 to the City of Chattanooga with an additional $1 million being in the FY 2004 Department of Transportation appropriations to proceed with the next phase of this project.

There is a strong support between the states of Tennessee and Georgia for the Chattanooga-Nashville extension of the Southeast High Speed Rail Corridor from Atlanta, Georgia.

With traffic congestion increasing at times to critical levels on our two major interstates (I-75 and 1-24) and air quality levels continuing to reach alarming levels at times, we are convinced High Speed Rail/Maglev must come to pass if we arc to resolve these problems.

While the application our Tennessee Department of Transportation is submitting to the Federal Railroad Administration (FRA) indicates the technology option for this High Speed Rail Corridor extension has not been decided, both steel wheel and Maglev technologies are under consideration.

I respectfully request that F M work diligently with both Georgia and Tennessee Departments of Transportation to see this High Speed Rail Comdor become a reality between Atlanta, Chattanooga and Nashville.

Sincerely,

Bob Corker
Mayor

BC/wc

FAX: (423) 757-0005 • E-MAIL: MAYOR@MAIL.CHATTANOOGA.GOV

Metropolitan
Government of
Nashville and
Davidson
County

Bill Purcell Mayor

October 1,2003

Commissioner Gerald F. Nicely
Tennessee Department of Transportation
Suite 700 James K. Polk Building
Nashville, Tennessee 37243-0349

Dear Commissioner Nicely:

It is with great enthusiasm and commitment that I write this letter supporting the concept of developing the Nashville-Chattanooga-Atlantahigh speed passenger rail corridor. This Corridor would offer new mobility, which I believe, would provide future dividends in economic growth, and enhance our quality of life for years to come.

The recent results of the Corridor study conducted by the Tennessee Department of Transportation are encouraging:

> Implementation of high speed passenger rail service in the Nashville-Chattanooga-Atlanta Comdor would be highly successful in terms of its patronage. The results of the COMPASS multi-modal ridership model conservatively project approximately 2 million annual riders would use the high speed rail service in Year 2020, given a service of 12 week-day, nine Saturday, and eight Sunday round trips.
>
> The value to the user is greater convenience and/or reduced travel time. Studies show that high speed rail is one of the safest, most reliable modes of transportation.
>
> The value to the non-user is the potential congestion relief afforded by the diversion of the automobile and air trips. It is estimated that 1.67 million annual automobile trips will be diverted to the new high speed rail service. As a result travel times on major roads should improve.
>
> The value to the communities is the provision of a valuable economic development tool that will not only promote new tourism opportunities but also strengthen the transportation and economic links between Nashville and Chattanooga and Atlanta and points in between.

Office of *the* Mayor
Metro City Hall
225 Polk Avenue
Nashville,Tennessee 37203
Phone: 615.862.6000
Fax: 615.862.6040
rnayor@nashville.gov

In addition to the high speed passenger rail corridor, Metropolitan Nashville/Davidson County is developing a five-county commuter rail corridor with the Regional Transportation Authority. It is our intent that the design for the downtown commuter rail station will incorporate those design elements needed to also accommodate high speed passenger rail service. By doing so, Nashville should be able to minimize costs associated with constructing a separate station for high speed passenger rail in the Downtown area.

We recognize that providing transportation choices for the Nashville area is very important to our future prosperity and quality of life. Approval of the Chattanooga-Nashville Extension of the Southeast High Speed Rail Corridor would permit us to be proactive in developing a viable alternative transportation mode.

Sincerely,

Bill Purcell
Mayor

BP/dt

Department of Transportation

HAROLD E. LINNENKOHL
COMMISSIONER
(404) 656-5206

PAUL V. MULLINS
CHIEF ENGINEER
(404) 656-5277

State of Georgia
#2 Capital Square, S.W.
Atlanta, Georgia 30334-1002

LARRY E. DENT
DEPUTY COMMISSIONER
(404) 656-5212

EARL L. MAHFUZ
TREASURER
(404) 656.5224

November 18,2003

The Honorable Gerald F. Nicely, Commissioner
Tennessee Department of Transportation
Suite 700, James K. Polk Building
Nashville, TN 37243

Dear Commissioner Nicely:

Thank you for the opportunity to join with Tennessee Department of Transportation in this application to the United States Department of Transportation to extend the Southeast High Speed Rail Corridor (SEHSR) from Atlanta to Chattanooga and Nashville.

Georgia currently has two designated high speed rail corridors, the Southeast High Speed Rail Corridor and the Gulf Coast High Speed Rail Corridor, traversing our state. Both of these corridors converge in Atlanta making the proposed extension to Chattanooga and Nashville an important step toward making the existing corridors a truly regional high speed rail system. With unprecedented population and development growth projected in Georgia and the southeast over the next twenty years, transportation alternatives will be needed to assure mobility and economic growth. The development of a regional system of high speed rail corridors which includes Atlanta to Chattanooga and Nashville can fulfill this need.

We fully support the extension of the Southeast High Speed Rail Corridor from Atlanta to Chattanooga and Nashville, and look forward to working together to develop high speed rail passenger service in this corridor.

Sincerely,

Harold E. Linnenkohl
Commissioner

HEL/HW/sy

cc: Paul Mullins (GDOT)
David Studstill (GDOT)

ATLANTA REGIONAL COMMISSION 40 COURTLAND STREET, NE ATLANTA, GEORGIA 30303

RECEIVED
OCT 6 2003
Public Transportation Div.
Dept. of Transportation
State of Tennessee

October 1,2003

Mr. Gerald F. Nicely
Commissioner
Tennessee Department of Transportation
Suite 700, James K. Polk Building
Nashville. Tennessee 37243

Re: Atlanta-Chattanooga-Nashville Extension of the Southeast High Speed Rail (HSR) Corridor

Dear Commissioner Nicely:

Thank you for providing us the opportunity to review the application for an extension of the Southeasr High Speed Rail Corridor from Atlanta to Chattanooga and Nashville. As you know, the Atlanta Regional Commission has conducted an extensive study of the corridor between Atlanta and Chattanooga as part of the Magnetic Levitation (Maglev) Deployment Program and the results of our efforts were included in the preparation of the application.

We fully support the extension of the Southeast High Speed Rail Corridor to Chattanooga and Nashville. Atlanta has long been a major transportation hub in the Southeastern United States and will continue to be a leading economic development center for the Region. The growth and development in the corridor from Atlanta to Chattanooga is unprecedented and we expect it to continue. An alternative to auto or air travel is definitely needed and high speed rail or Maglev can fulfill that need.

Again. we fully support the designation you are requesting and look forward to participating with you as the project moves forward.

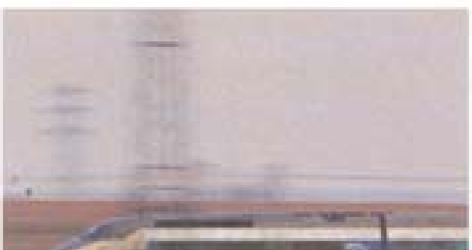
Sincerely,

Charles Krautler

Charles Krautler
Director

404-463-3100 Fax 404-463-3105 www.atlantaregional.com

CSX
MOU
HIGH SPEED TRAINS
NASHVILLE-CHATTANOOGA-ATLANTA



CSX Transportation, Inc. is an active participant in this application process for a high speed rail corridor designation and is agreeable to signing a Memorandum of Understanding. The complete details of the Memorandum of Understanding have not been finalized; therefore, an unsigned version follows.

Memorandum of Understanding

THIS MEMORANDUM OF UNDERSTANDING (MOU) is made this __ day of __________, 2003, by and between Tennessee Department of Transportation, an agency of the State of Tennessee ("Passenger Rail Agency") and CSX Transportation, Inc. ("CSXT")

WHEREAS, CSXT and Passenger Rail Agency are studying the feasibility of the development, construction and operation of a high-speed passenger rail system over portions of that certain rail corridor property between Nashville and Chattanooga, Tennessee, known as the CSXT Chattanooga Subdivision that is used for active rail operations and is owned and/or operated by CSXT (the "Property"); and

WHEREAS, CSXT requires and PASSENGER RAIL AGENCY understands and agrees that any such high-speed passenger rail operation must (i) secure and protect public safety and the safety of CSXT employees, especially as it relates to safety issues unique to high-speed operations, (ii) preserve existing rail freight operations in the corridor and provide capacity for projected rail freight operations, (iii) compensate CSXT for the fair market value of any real estate interests, right-of-way, or rail capacity required in furtherance of the introduction of the high-speed passenger rail service, and (iv) fully insulate CSXT from any tort liability risk arising out of or related to any local passenger rail operations, all as provided in the guiding principles set forth herein, and;

WHEREAS, to assist PASSENGER RAIL AGENCY in identifying those costs required to introduce high-speed passenger rail service on the Property while complying with the Guiding Principles, the parties intend to conduct studies which will quantify the primary impacts of introducing local passenger rail service in the affected corridor.

NOW, THEREFORE, PASSENGER RAIL AGENCY and CSXT understand and acknowledge the following:

I. <u>Statement of Purpose</u>

This MOU: (1) establishes the process and defines the Guiding Principles that will apply while the parties investigate and seek to resolve those issues necessary to determine whether CSXT and PASSENGER RAIL AGENCY may enter into binding definitive agreements, which may include any or none of the following: a right-of-way purchase agreement, an operating and maintenance agreement and/or a construction and reimbursement agreement all for the purpose of constructing and operating PASSENGER RAIL AGENCY's proposed passenger rail system on the Property; and (2) sets forth the basic parameters for the studies which will describe and quantify the impact on CSXT freight operations within said corridor associated with introducing the contemplated high-speed passenger rail service.

II. Guiding Principles

The parties recognize and agree that the following guiding principles will govern and facilitate any introduction of high-speed passenger rail service to CSXT's freight rail corridor:

- **Safety** – Safety is CSXT's and PASSENGER RAIL AGENCY's first priority for the contemplated high-speed passenger rail system. Accordingly, to the extent the parties can reach binding agreements for the introduction of high-speed passenger rail services within the Property, PASSENGER RAIL AGENCY will undertake all reasonable improvements necessary to ensure public safety and the safety of CSXT employees. Such improvements will be completed in accordance with FRA regulations and CSXT's safety policies. Such policies include, but are not limited to: grade crossing elimination, safe station locations, sufficient track center distances, derailment risk reduction techniques and complete physical separation of tracks from freight operations.

- **Capacity** - PASSENGER RAIL AGENCY understands that CSXT currently operates freight trains over the Property and that the Property represents a vital component of CSXT's freight network. Accordingly, proper planning and funding will be required at the sole cost and expense of PASSENGER RAIL AGENCY to introduce safe and reliable high-speed passenger services, without diminishing CSXT's current freight service, or future freight growth PASSENGER RAIL AGENCY recognizes and acknowledges that the construction and operation of any high-speed passenger rail system must not interfere with or impede CSXT's ability to conduct existing and future freight service as well as the ability to maintain its track/s and other facilities, and must be consistent with CSXT High-Speed Rail Operations Principle below. It is understood that it may be necessary to relocate certain of CSXT's existing railroad tracks and other telecommunication facilities or other utilities along the corridor prior to commencing any local passenger rail operations, all of which will be at PASSENGER RAIL AGENCY's sole cost and expense.

- **High-Speed Rail Operations** – PASSENGER RAIL AGENCY understands and acknowledges that the proposed new high-speed rail operation (any operation in excess of ninety miles per hour) are generally inconsistent and incompatible with slower speed freight operations in the said corridor for safety and capacity reasons. PASSENGER RAIL AGENCY acknowledges that CSXT policy is to require high-speed rail operations (in excess of 90 MPH) to locate in separate (physical or temporal), sealed (no highway grade crossings) corridors.

- **Fair Market Value** - PASSENGER RAIL AGENCY understands and acknowledges that CSXT is a publicly held company and will require full and fair compensation for any acquisition or use of CSXT real estate interests, rights of way, operating rights or capacity by PASSENGER RAIL AGENCY. Costs incurred by CSXT for surveys, title, investigation/commitment, appraisals and directly related studies necessary to study and progress the proposed PASSENGER RAIL AGENCY local passenger rail service will be fully reimbursed to CSXT by PASSENGER RAIL AGENCY.

- **Liability Protection** - PASSENGER RAIL AGENCY acknowledges and understands CSXT, as a publicly traded company responsible to its shareholders, will not assume any liability risks associated with introducing a high-speed passenger rail system into an active rail freight corridor where none currently exists. PASSENGER RAIL AGENCY further acknowledges that CSXT would not have entered into this MOU, nor will it enter into any binding agreements for the introduction of local passenger rail service, absent a commitment from PASSENGER RAIL AGENCY to assume **any and all risks** which would not have occurred but for the construction, presence and operation of the local passenger rail system and the attendant liabilities. As part of any agreement for the introduction of local passenger rail service, CSXT will require, and PASSENGER RAIL AGENCY will purchase/provide, the following:

  (1) The broadest possible contractual indemnity of CSXT, for itself, its assigns and affiliates, which will be secured by;
  (2) Appropriate liability insurance directly covering CSXT as a named insured on all policies securing all damages, losses and claims (including claims related to terrorist acts) arising out of or related to the presence of PASSENGER RAIL AGENCY's local passenger rail system. Currently, CSXT requires liability insurance with limits of not less than **$500 million dollars** in available coverage for both compensatory and exemplary damages. Depending on changes in liability risks, CSXT may require PASSENGER RAIL AGENCY to increase its required insurance coverage.

  During construction of the high-speed passenger rail system and any relocation of existing facilities, CSXT will further require PASSENGER RAIL AGENCY to procure and maintain Force Account Insurance to cover CSXT work, if any, Builders Risk Insurance to cover PASSENGER RAIL AGENCY'S contractors and agents, and Railroad Protective Liability insurance identifying CSXT as a named insured at limits and with deductible or self-assumed amounts agreed to by the parties.

  CSXT is aware many governmental bodies are protected from tort liability, in whole or in part, by sovereign immunity, or may have policies that discourage the purchase of insurance. CSXT encourages PASSENGER RAIL AGENCY to address such issues at the earliest possible time in assessing the feasibility of locating the proposed high-speed passenger rail system on the Property.

III. <u>Further Studies / Agreements</u>

A. In addition to establishing a common understanding and acknowledging the foregoing guiding principles, and to ensure that said high-speed passenger rail service is consistent with these guiding principles, CSXT and PASSENGER RAIL AGENCY are entering into this Memorandum of Understanding acknowledging the need to study the feasibility of the construction and operation of a local passenger rail system on the Property.

B. The scope of the studies, and PASSENGER RAIL AGENCY's full funding of such studies, shall be in accordance with a separate Cost Payment Agreement between the parties, which Cost Payment Agreement will also address PASSENGER RAIL AGENCY's obligation to pay CSXT for the direct costs of other activities related to this project, including, but not limited to engineering studies, real estate title work and appraisals.

C. As required, PASSENGER RAIL AGENCY will, at its sole cost and expense, undertake a property analysis to ensure that sufficient property exists to build and operate the high-speed passenger rail service on the Property consistent with CSXT Guiding Principles.

IV. <u>Further Understandings</u>

Other than the commitments to study and investigate the feasibility of the proposed high-speed passenger rail system (consistent with the terms of the Cost Payment Agreement), the parties understand and acknowledge that this MOU creates no binding rights and/or liabilities on any party. This MOU only prescribes a process by which the parties will investigate further whether and how PASSENGER RAIL AGENCY will satisfy the Guiding Principles that must be met as part of any subsequent binding agreement(s) to introduce high-speed passenger rail service on the Property.

IN WITNESS WHEREOF, the parties hereto have executed this Memorandum of Understanding by their respective duly authorized officers as of the date and year first above written.

"CSXT"
CSX TRANSPORTATION, INC.

By:______________________________________

Name: ___________________________________

Title: ____________________________________

"PASSENGER RAIL AGENCY"
TENNESSEE DEPARTMENT OF TRANSPORTATION

By: ______________________________________

Name:____________________________________

Title: _____________________________________

HIGH SPEED RAIL ALIGNMENT

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA

One of the FRA's evaluative criteria asks applicants seeking high speed rail corridor designation to determine the percentage of the corridor that can sustain running speeds of 90 miles per hour or greater. This section addresses that question.

Corridor Segments

The proposed extension of the Southeast High Speed Rail Corridor to include the cities of Nashville, Chattanooga, and Atlanta has been divided into two segments for internal planning purposes:

Nashville to Chattanooga Airport
Chattanooga Airport to Atlanta Airport

Nashville to Chattanooga Airport

The Nashville to Chattanooga Airport segment consists of two alignment alternatives that are being advanced for the purposes of this application. Between Nashville and Chattanooga, the two alternative alignments are:

- An alignment using a portion of the CSX Transportation railroad alignment.
- An alignment using a portion of the Interstate 24 right of way.

Comparing the differences between using the CSX alignment and the Interstate 24 alignment between Nashville and Chattanooga, the CSX alignment is 29.5 miles longer than the more direct 1-24 alignment. This is because the CSX alignment bypasses the hilly Monteagle area by passing to the southwest, while I-24 climbs over and through the Monteagle area with gradients of up to 6 percent.

Since 6 percent gradients are unsuitable for high speed trains, two tunnels totaling approximately 3 miles in length are proposed through the Monteagle area. If the 1-24 alignment were used, and if steel wheel on rail technology were employed, TDOT has expressed an interest in building a combined road and rail tunnel (appropriately partitioned off by use). A combined road and rail tunnel would enable construction costs to be shared and would greatly improve 1-24 roadway safety as the hilly profile and geological conditions result in problems with runaway trucks and landslides. Should Maglev become the chosen technology for an 1-24 alignment, these two tunnels would not likely be required as Maglev can operate on steeper gradients.

Chattanooga Airport to Atlanta Airport

The Chattanooga Airport to Atlanta Airport segment builds upon earlier planning studies undertaken in Georgia. Four routes for high speed and conventional intercity rail passenger service between Atlanta and Chattanooga have been identified and studied over the last several years. The four routes (as shown in Figure HSR-1) use various combinations of existing Norfolk Southern and CSX Transportation railroad routes, along with Georgia Department of Transportation (GDOT) railroad right of way and a new alignment along the 1-75 corridor.

In 1997, the GDOT Intercity Rail Passenger Plan evaluated routes between Atlanta and Chattanooga that used a combination of existing Norfolk Southern and CSX Transportation railroad freight lines along with GDOT railroad right of way. The route evaluation focused on both conventional speed service at 79 mph and higher speed service of 110 mph. The results of the various route evaluations indicated that travel time and ridership performance were adversely impacted by freight train congestion and the geometric limitations of the routes.

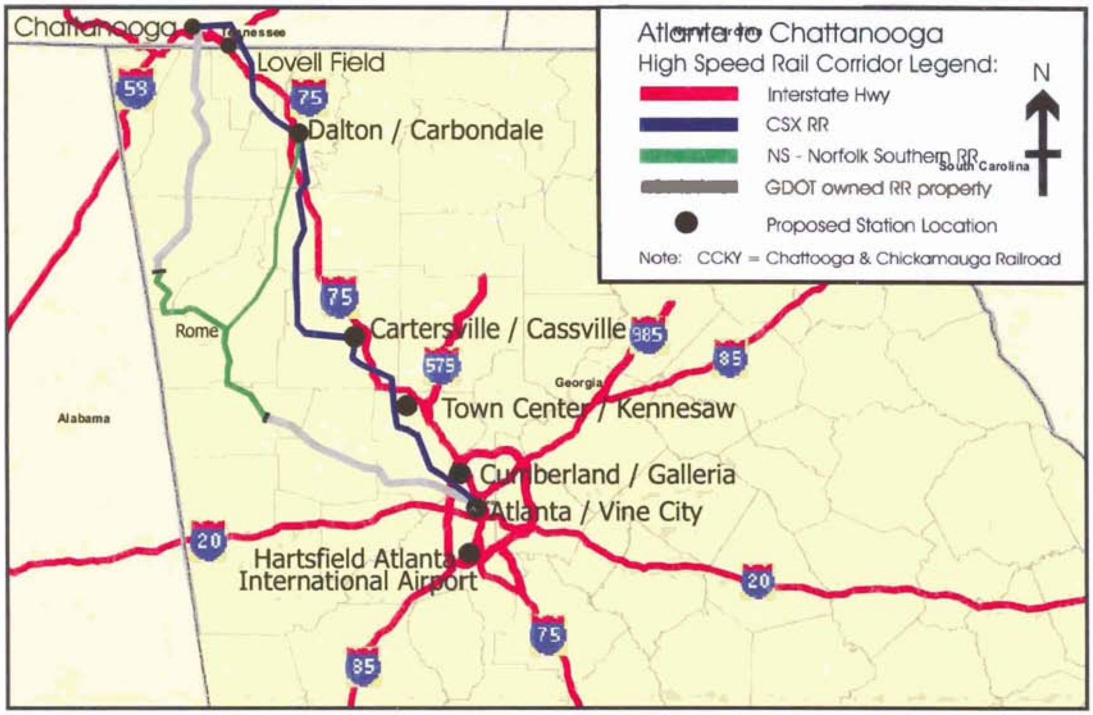


Figure HSR-1: Map of the previously studied high speed rail alignments for the Chattanooga-Atlanta segment of the Nashville-Chattanooga-Atlanta Corridor.
Source: Georgia Department of Transportation, Intercity Rail Passenger Plan. 1997

The evaluation also tested the concept of high speed service above 125 mph on a new separate alignment in the general corridor and found that this concept produced improved travel times and ridership. However, the Intercity Rail Passenger Plan did not identify or recommend a specific route or alignment for intercity rail passenger service from Atlanta to Chattanooga, but did determine that at higher speeds rail passenger service was feasible.

In 2002, the Atlanta Regional Commission in the Phase II Atlanta-Chattanooga Maglev Deployment Study Addendum examined high speed rail service above 125 mph on similar routes evaluated in the Intercity Rail Passenger Plan and a separate alignment near the 1-75 corridor. The Phase II Addendum determined that high speed rail, regardless of the technology employed, performed best when using a new separate alignment along the 1-75 corridor and along a portion of the existing CSX freight route to access the Atlanta area.

Place Names Used in This Application

Place Names Used in This Application In Figure HSR-2	Corresponding Place Names Used by GDOT In Figure HSR-1
Chattanooga	Chattanooga
Lovell Field Airport	Lovell Field
Dalton	Dalton/Carbondale
Cartersville	Cartersville/Cassville
Marietta	Town Center/Kennesaw
Beltway	Cumberland/Galleria
Atlanta	Atlanta/Vine City
Hartsfield International Airport	Hartsfield International Airport

Based upon the results of these previous studies, evaluations, and plans, the route using a new separate alignment near 1-75, along with access to Atlanta via the existing CSX rail right of way, was used to develop this application. However, **GDOT** has not identified this as the preferred alignment for a high speed rail corridor between Atlanta and Chattanooga. Instead, all the various alignments from Atlanta to Chattanooga should be studied in further detail to determine a preferred alignment and technology choice for high speed rail passenger service in the Nashville-Chattanooga-Atlanta corridor.

For the purpose of this application, the determination of high speed train running times (using steel wheeled technology) has been based upon using a predominantly 1-75 alignment with access to downtown Atlanta via a set of separate tracks via the CSX alignment.

Nashville-Chattanooga-Atlanta Corridor Map

A map of the Nashville-Chattanooga-Atlanta Corridor, along with the portions of each alignment that is capable of supporting sustained 90 mph (or greater) passenger train speeds (using steel wheeled technology) is shown in Figure HSR-2 below.

Figure HSR-2: Map of the proposed high speed rail alignments for the Nashville-Chattanooga-Atlanta Corridor.

Methodology

A train performance simulation was conducted to determine the portions of each alignment that, by virtue of their geometries, are capable of accommodating sustained 90 mile per hour (or higher) passenger train speeds (using steel wheel technology). Specifically, the Train Operations Model (TOM) computer program was used to simulate train operations and to calculate train speeds given the physical parameters of each alignment and the performance characteristics of the modeled passenger trainset.

Throughout this application, the calculations regarding train speeds, trip times, passenger demand, and public benefits were based upon using steel wheel rail technology. While similar calculations would have been possible for the Maglev technology option, it was not considered necessary to addressing the criteria by which FRA will evaluate this application.

For input, the TOM application incorporates locomotive performance characteristics (e.g., propulsion, braking rates, aerodynamic drag, auxiliary power consumption) and right-of-way information (e.g., grades, curves, speed limits, station locations). The computer model produces information about train position, speed, and acceleration at specified time increments, such as every 0.2 second, along the modeled alignment. The TOM simulation, for example, models the deceleration and acceleration of a trainset before entering and afier leaving a curved track segment as well as the effect of gradient changes. This approach provides a more realistic estimate of the portions of an alignment that can accommodate high speed operation as opposed to an approximation based only on track speed limits.

It is important to note that this simulation is concerned only with simulating a trainset's performance on its own dedicated track, i.e., without the effects of capacity constrained railway network. This assumption is consistent with a key TDOT application planning assumption: that any high speed passenger rail service between Nashville and Atlanta will operate on an entirely separate set of tracks with no commingling of operations with other railroads. Indeed, CSX as part of their Memorandum of Understanding (see CSX MOU section in this application) specifically states that any high speed trains operating within this corridor must be on a separate set of tracks.

This planning assumption of dedicated high speed tracks applies equally to the CSX and the 1-24 alignments, as well as to the 1-75 and CSX segments in Georgia.

The TOM model uses as input the performance characteristics of Bombardier's new JetTrain locomotive hauling four passenger cars. JetTrain is a fossil-fueled locomotive that can operate at speeds of up to 150 mph, where track and signaling conditions permit. The operational characteristics of the JetTrain locomotive, including horsepower, braking rates, and tractive effort, were obtained from Bombardier and used as input to the TOM simulation.

The physical characteristics of the highway alignment (e.g., grade, curvature, position) were provided by the relevant state transportation agencies or derived from United States Geological Service (USGS) topographical survey maps. Information on the physical characteristics of the CSX alignment was determined using the railroad's internal track charts.

Simulation Results

The results of the simulation indicate that both the **1-24** and the CSX alignments between Nashville and Chattanooga, as well as the predominantly **1-75** alignment between Chattanooga and Atlanta, are capable of supporting sustained, high speed running throughout most of the respective alignments.

As shown in Table **HSR-2,** the **1-24** alignment from Nashville to Chattanooga can support speeds of **90** mph (or greater) over approximately **84** percent of its length, while the predominantly **1-75** alignment from Chattanooga to Atlanta can support high speeds over an estimated **82** percent of its length. Collectively, these alignments support speeds of 90 mph or greater over 83 percent of the Corridor.

The alternate **CSX** railroad alignment between Nashville and Chattanooga can sustain 90 mph or greater operation over an estimated **79** percent of its length.

The ability to operate trains within the Corridor at speeds of 90 mph or greater is a key element in making the proposed high speed service attractive to customers and is a key input into the ridership forecasting process, as detailed in the Ridership section of this application).

TABLE HSR-2

Percentage of Each Alignment Capable of Supporting 90+ MPH Speedq

Alignment	Total Length of Alignment (miles)	Total Length of High Speed Segments (miles)	HighSpeed Segments (percent)
Highway Alignment			
1-24 Nashville to Chattanooga	134.8	113.2	84
1-75 Chattanoogato Atlanta	128.2	105.3	82
Combination I-24/I-75 Total	263.0	218.5	83
Rail Alignment			
CSX Line Nashville to Chattanooga	164.3	129.5	79

RIDERSHIP
HIGH SPEED TRAINS
NASHVILLE-CHATTANOOGA-ATLANTA



The ridership model indicates high speed passenger rail service in the Nashville-Chattanooga-Atlam Corridor would be highly successful in terms of patronage.

Introduction to the Ridership Model

The importance of sound ridership projections to the implementation of any new passenger rail service cannot be overstated. Project viability is established primarily on the basis of projected riders and the revenues that they are expected to generate. The expected revenues, in turn, must demonstrably offset the costs of annual operations and maintenance and the long-term costs of project financing. In addition, the decision to invest public funds in a new transportation facility is also driven by other expected societal benefits; the beneficial implications of a new rail line include the relief of traffic congestion on major roads, travel time and energy savings, and emissions reductions, all of which result when automobile and air trips are diverted to the passenger rail mode. Therefore, it is critical to select a reliable ridership model, supply it with accurate travel demand and behavior inputs, and test it for sensitivity to variations in rail travel costs, running times, and train frequency.

Given the critical importance of the ridership projections, a proven multi-modal ridership model, known as the COMPASS model, was selected for application to the Nashville-Chattanooga-Atlanta Comdor. The COMPASS Model (Model) is a multimodal travel demand forecasting and modal share analysis tool that produces assessments of potential rail ridership given varying socioeconomic conditions and transportation network configurations.

This effort utilizes the modal split module of the Model to estimate the shares of intercity trips accommodated by rail, automobile, air, and bus modes. Total intercity travel demand in the Corridor, however, was obtained from the 1995 American Travel Survey (conducted by the USDOT Bureau of Transportation Statistics). Travel demand for intercity trips was adjusted for future years according to expected regional growth projections. This approach will be discussed in detail in a following section.

The COMPASS Model applied here is sophisticated, allowing the user to test ridership results across a range of values for important input parameters such as fares, running times, and frequencies. In addition, the Model is calibrated for two trip purposes, business and non-business travel, and is segmented according to short and long distance trips; the characteristics of short distance (i.e., less than 160 miles) and long distance (i.e., greater than 160 miles) vary markedly and must be treated separately.

The COMPASS Model was recently used to project ridership for the proposed Cleveland-Columbus-Cincinnati (3C) High Speed Rail Comdor and has also been tested for comparability with other passenger rail ridership models. When the Model's parameters were tested to ensure its proper calibration, the Model produced comparable results to models of the following corridors:

- Illinois Corridor (Chicago-Springfield-St. Louis)
- New York Empire Corridor (Buffalo-Albany-New York City)
- Tri-State Corridor (Chicago-Milwaukee-Twin Cities)
- Virginia Corridor (Lynchburg-Richmond-Washington D.C.)
- Ontario-Quebec Corridor (Windsor-Toronto-Montreal-Quebec City)

The parameters of the COMPASS Model were generally in very good agreement with those of the tested corridors, thus providing essential reassurance of the Model's appropriateness for this application.

Summary of Ridership Results

The results of the ridership model indicate that the implementation of high speed passenger rail service in the Nashville-Chattanooga-Atlanta Corridor would be highly successful in terms of its patronage. Table R-1 below summarizes the projected ridership for Years 2010 and 2020 by station for two weekday train frequency scenarios, 8 and 12 weekday round trips; service frequencies for Saturday and Sunday are 25 and 33 percent less, respectively, than the weekday frequencies for Years 2010 and 2020.

Year 2010 is envisioned as a startup year for the service provided an aggressive implementation schedule is adopted. The Year 2020 projection represents ridership levels expected when the service has matured after several years of successful operation. The total annual ridership is projected to be approximately 1.65 and 2.00 million for Years 2010 and 2020, respectively. As expected, increasing the frequency from 8 to 12 daily weekday round trips results in greater ridership for the 12-daily round-trip scenario.

TABLE R-1

Projected Ridership: Annual Boarding by Station (125MPH Maximum Speed)

	8 Daily Trains		12 Daily Trains	
Stations	Year 2010	Year 2020	Year 2010	Year 2020
Nashville	314,609	355,864	335,504	379,584
Nashville Airport	330,642	373,130	352,478	397,857
Murfreesboro	65,707	79,000	71,122	85,507
Manchester	34,960	39,699	37,940	43,092
Chattanooga	64,185	73,913	71,030	81,791
Lovell Field	43,737	49,743	48,193	54,806
Marietta	77,584	90,974	84,655	99.259
Beltway	65,187	76,648	70,710	83,149
Atlanta	303,166	396,416	318,629	414,047
Atlanta Airport	252,810	352,080	261,373	361,947

Note: Projections are based on 8 and 12 daily weekday round trips. Service levels we reduced by 25 and 33 percent for Saturday and Sunday, respectively. The fare is based on a rate of 40 cents pe mile plus a $5.00 surcharge.

TABLE R-2

Total Annual Corridor Travel Demand by Transportation Mode (Year 2020)

Travel Mode	Business Travel		Non-Business Travel		All Travel	
	Total Trips	Mode Share	Total Trips	Mode Share	Total Trips	Mode Share
High speed rail	1,070,428	8.55%	930,611	4.95%	2,001,039	6.39%
Intercity bus	17,700	0.14%	114,991	0.61%	132,691	0.42%
Airplane	382,621	3.06%	374,164	1.99%	756,785	2.42%
Automobile	11,053,675	88.26%	17,366,873	92.44%	28,420,548	90.77%
Totals	12,524,425	100.00%	18,786,638	100.00%	31,311,063	100.00%

Note: Total trips are all one-way trips The maximum speed of the high speed rail mode is 125 mph

Ridership is highest at stations located in the downtown and airport zones of the Nashville and Atlanta metropolitan areas. This is also not unexpected as these metropolitan areas are separated by more than **250** miles, making them highly competitive with the automobile and air travel modes. Note that rail travel from the terminal stations (i.e., Nashville and Atlanta) to the intermediate stations is significantly lower than between the terminal stations. Accordingly, travelers are more likely to use the private automobile for these trips, which are generally less than **150** miles long.

The Model was checked for reasonableness throughout its development process. However, the final test for reasonableness resides in an examination of the share of the total travel market that may be accommodated by the high speed rail mode. Table R-**2** presents a summary of the total travel market and mode share for each of the intercity modes under consideration.

The model predicts that a new high speed rail service has the potential to attract approximately 8.6 and **5.0** percent of the total market for Business and Non-Business travelers, respectively. Overall, the high speed rail mode is expected to attract approximately 6.4 percent of the total intercity travel market **in** the Nashville-Chattanooga-Atlanta Corridor. These mode share results are reasonable considering that, as expected, the overwhelming choice for intercity travel remains the automobile. Also, the airplane mode captures about **2.5** percent of the total market, consistent with nationwide intercity air travel statistics.

In further fulfillment of expectations, the intercity bus mode—the least popular form of intercity transportation–captures less than 1 percent of the total intercity travel market. An overall market capture of 6.4 percent is also reasonable for the high speed rail mode considering that it offers quick access between the major cities of the Corridor without the hassle of increased airport check-in times, security clearance times, and flight delays. The diversion of approximately **2** million trips—almost entirely from the air and auto modes—will help ease congestion at airports and on major highways of the Corridor.

Ridership Methodology

The ridership model for the Nashville-Chattanooga-Atlanta Corridor comprises two modules, one for estimating the total travel market in the Corridor and another for determining the mode share for each of the intercity travel modes. A discussion of the essential characteristics of these two modules is provided below.

Modal-Split Module of the COMPASS Model

The Hierarchical Modal Split Model of the Compass Model System was employed to estimate the modal shares for the high speed rail, intercity bus, air, and automobile travel modes. The modal shares were calculated by comparing the travel costs, times, and frequencies of each of the transportation modes. The modal split calculation is conducted through a three-step procedure using the nested logit structure depicted in Figure R-1.

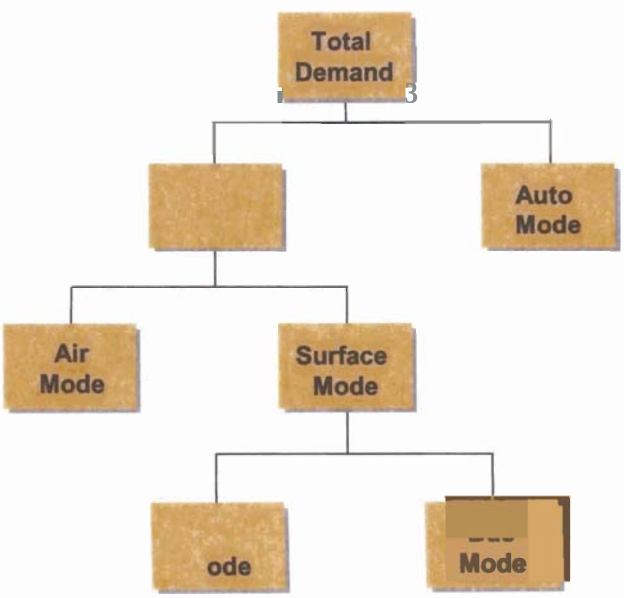


Figure R-1. Nested logit structure of the hierarchical modal split model.

The first level of modal split analysis separates automobile travel from all public forms of transportation, that is, the air, rail, and bus modes. This is a logical first step in the modal split analysis as it represents the traveler's initial travel consideration of whether or not to drive (i.e., use the auto mode). If the traveler opts not to drive, the remaining choice is a form of public transportation where the traveler is essentially sharing the ride with other individuals—hence the term public mode. At the second level of analysis, if the traveler has chosen to take a public mode, a choice between the surface and air modes arises. The air mode is undoubtedly the fastest, yet most expensive, mode of travel in this Corridor. The bus and rail modes compromise time for the sake of travel costs that are significantly less than airfares in this Corridor. Finally, if the traveler opts for a surface mode over the air mode, another level of probabilistic analysis is conducted to determine the respective shares of the rail and bus modes.

The equations that govern the mode shares at each of the three steps of the analysis are segmented by trip type and distance. For example, to reflect the values that different types of travelers place upon travel time and mode frequency, the modal split analysis was segmented into business and non-business trips; the latter category, under which travelers are less concerned with strict adherence to schedules, includes recreational, social, and other trip types. The modal split analysis also segments the travel market into short distance (less than 160 miles) and long-distance trips (greater than 160 miles) in consideration of the significance of trip length in the traveler's mode decision. Clearly, the average traveler is more likely to use the automobile for short-distance trips than the rail or air modes.

At each level of the modal split analysis, a term is computed that compares the probability of the use of one mode with respect to its counterpart in the hierarchy. For example, at the first level of analysis a logsum function--derived from travel utility theory-calculates the percentage of public mode use to the percentage of auto use, or P_{Pub}/P_{Auto}. Since the sum of P_{Pub} and P_{Auto} is equal to 1 (i.e., the sum of the probabilities for two mode choices), values of P_{Pub} and P_{Auto} can be determined algebraically. This is repeated for the values of P_{Surf} (for the surface modes), P_{Rail}, P_{Air}, and P_{Bus}. To calculate the percentage of use of the rail mode as compared with the total travel market, the product of the percentage of public, surface, and rail modes is taken and expressed mathematically as:

$$T_{Rail} = T_{Total} \times P_{Pub} \times P_{Surf} \times P_{Rail}$$

where T_{Rail} equals the total number of high speed rail trips and T_{Total} represents the total travel market for the Corridor.

It is important to note that mode shares were calculated for each origin and destination combination of the Corridor. The specific origins and destinations are based upon the system of travel analysis zones—typically referred to as traffic analysis zones in travel demand modeling terminology—that was designed for this effort. This zonal system of the model is described in detail in the following section.

Zonal System for the Corridor

An initial step in the formulation of any travel demand and mode split model is the creation of a travel zone system. The zonal system establishes the geography of origins and destinations, and in this sense, determines the areas from which aggregate trips are produced and attracted. The zonal system created for this effort thus established the necessary foundation for both estimating total travel demand for trips between the various urbanized areas of the corridor as well as their travel mode shares.

The zonal boundaries were carefully drawn in consideration of logical tripsheds, access routes to rail, bus, and air terminals, and natural physical barriers to travel. Zonal boundaries were also drawn to take advantage of spatial databases available from the US Census Bureau and the relevant Metropolitan Planning Organizations (e.g., Nashville, Chattanooga, and Atlanta). The zonal system is depicted in Figure R-2 along with the locations of rail stations.

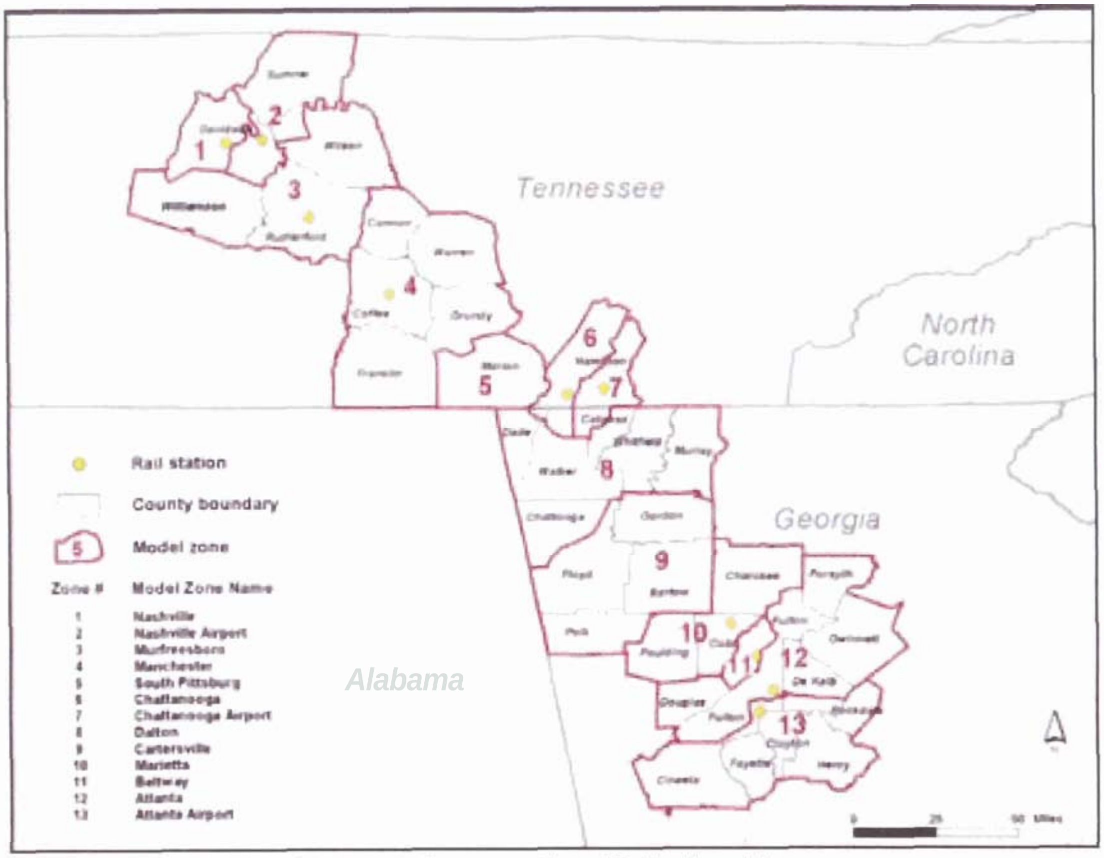


Figure R-2: Zonal system structure of the Nashville-Chattanooga-Atlanta HSR ridership model.

Locations of High Speed Rail Stations

The stations selected for the Nashville-Chattanooga-Atlanta Comdor have been designed to serve new customers by being conveniently located:

- **Downtown stations.** Direct high speed train service to downtown Nashville, Chattanooga, and Atlanta helps keep these urban cores well connected and vital.

- **Suburban stations.** These stations are located at the crossroads of major interstate highways and are intendeded to attract customers with trip origins or destinations in suburban areas. Suburban stations eliminate the need to travel downtown to board a train. An example is the Beltway Station in Cobb County, Georgia.

- **Multimodal station.** High speed trains have been planned to connect the airports of Atlanta, Nashville, and Chattanooga to offer new intermodal connections. By using high speed rail as another "spoke" in an airport hub, a high speed train traveler could travel not only regionally, but make connections to the rest of the world. Joint rail-air tickets and aireline code sharing between reservation systems (and possible baggage integration) could help make this a seamless connection for the air-rail traveler.

- **Smaller town stations.** High speed rail can offer a convenient transportation alternative to smaller towns and cities, such as Murfreesboro or Manchester, which lack airports or attractive public transportation options.

Although the cities of South Pittsburg, Dalton, and Cartersville and their environs are encompassed by model zones, these cities are not served directly by the proposed high speed rail system in the initial phase of operations. The initial phase of operations provides express service only between the major cities of the corridor. (Residents of Dalton and Cartersville, for example, must travel to Chattanooga or Marietta stations, respectively, to access the rail service.) However, as the service matures, it is expected that some of these smaller cities, such as Dalton and Cartersville, could be served by "local service" high speed trains that are added in later phases.

Zones that represent the tripshed areas of South Pittsburg, Dalton, and Cartersville have, however, been included since they have the ability to provide access to rail stations in adjacent zones (e.g., Chattanooga, Manchester, and Marietta) via private automobile or taxi. In the tally of total high speed rail ridership for the Corridor, rail trips accessed from these zones are incorporated into zones that are served by the rail line. In a similar manner, travelers who may decide to use the air mode, but are located outside the airport zones can also access the airports via automobile or taxi. The combined effects of travel time and costs, including station or terminal access and egress, are discussed in the following section.

Calculation of Generalized Costs and Model Input Assumptions

Generalized costs for each of the intercity travel modes are the key variables used in the equations of the hierarchical modal split model. As mentioned earlier, the modal split is determined by comparing the relative costs of each travel mode for a specific origin and destination pair. The equation for generalized costs is so termed as it converts the various characteristics of travel modes—travel time, travel cost, and frequency—into the same units. For example, the generalized cost of travel in this model is expressed in units of time, (i.e., minutes) as opposed to dollars.

Conversion factors (e.g., Values of Time and Value of Frequency), obtained through stated-preference surveys and incorporated into the generalized cost equation, allow the travel cost and frequency of each mode to be expressed in units of time. For example, this modeling effort uses consumer attitudinal parameters generated by the stated-preference surveys conducted for the 3C Corridor. The Value of Time for each of the four travel modes and the Value of Frequency for the public modes (i.e., bus, air, and rail) from the 3C Corridor were assumed appropriate for use in the Nashville-Chattanooga-Atlanta Corridor.

The generalized cost equation of the COMPASS Model has four components: 1) total travel time between zones, 2) generalized travel costs between zones, 3) generalized cost of mode frequency, and 4) generalized cost of reliability.

The first component of the generalized cost equation includes access time to the station (or terminal), in-vehicle time, wait time at the station, and egress time, if applicable. Access time is computed for each zone by finding the average distance to the population centers within the zone and calculating auto access time by assuming an average travel speed of 25 miles per hour. Station access distances range from 7 to 15 miles. The in-vehicle time was obtained for the air and bus modes from current schedules while the rail in-vehicle time was derived from a train performance simulation. (The latter is discussed in more detail in the High Speed Rail Alignment section of this submittal.) The ridership results presented here assume 125 miles per hour maximum train speed.

Egress time is not included in the calculation of total travel time as, for the purposes of this effort, the station (or terminal) is assumed to be the final destination of the trip for each travel mode. Egress times are computed if the chosen travel mode does not provide direct access to the destination zone. For example, since South Pittsburg is not directly served by the rail mode, the cost and time of taking a taxi from the nearest rail station —ither Chattanooga or Manchester depending on the direction of travel—to South Pittsburg is incorporated into the total travel time. In this instance, a taxi travel time is estimated by calculating the travel time incurred by driving an average rate of 25 miles per hour over the egress distance; higher average speeds are used as the egress distance increases. The same rationale applies for air and bus modes that may not directly serve a destination. Wait times are assumed as 30 minutes for rail mode, 20 minutes for bus mode, and 45 minutes for air mode.

The second component of generalized cost is the actual travel cost. This is calculated as dollars and then converted to time via the Value of Time conversion factor. For the public modes, the travel cost includes the fare, the cost of station/terminal access, parking fees, and egress costs (if applicable). The rail fare is calculated by assuming a rate of 40 cents per mile plus a $5.00 surcharge. Greyhound fares are used for the bus costs while the air fare is the lowest fare offered by a major air carrier for each city pair. The cost of automobile travel for both station access and intercity travel is assumed to be $0.30 per mile for business travelers and $0.125 for non-business travelers; non-business travelers pay less as they are able to share the costs with their passengers (typically family members). Bus riders are assumed to take local transit to the bus terminal; the transit fare-ranging from $0.75 to $2.00--is comparable to the cost of access by private automobile, thus the latter estimate is used. For the purposes of this effort, parking is assumed free at high speed rail stations. However, an average parking rate of $50 is incorporated into the generalized costs for air travel. Egress costs are calculated only if the chosen travel mode does not provide direct access to the destination. In this case, a taxi charge of $1 per mile is assumed for the taxi fare to the final destination zone.

The third component of generalized cost is the cost of mode frequency to the traveler. For the automobile mode, which provides instantaneous service frequency, this term is not calculated as there is no perceived frequency cost associated with it. However, the cost of frequency is important for the bus, rail, and air modes. The calculation of this factor requires the actual service frequency, Values of Time and Frequency (as determined through stated-preference surveys), and the operating hours of the service. The latter term is established as 168 hours (7 days/week times 24 hours/day) since the Model estimates modal split on the basis of weekly service patterns.

The fourth term, the cost of reliability, was not deemed non-essential to this modeling effort. It can safely be assumed that the high speed rail mode, which would operates on its own dedicated right-of-way without interference from other rail traffic (including freight trains), would provide the best on-time performance among all of the public modes. The exclusion of this term tends to make the Model slightly more conservative with respect to potential high speed rail ridership projection.

The generalized costs are calculated for each origin and destination pair and then used as inputs to the probabilistic functions of the hierarchical modal split model.

Total Travel Demand

The total intercity travel demand for the Nashville-Chattanooga-Atlanta Corridor is the sum of the total travel between each origin and destination pair. Given that the Model is comprised of 13 zones, travel demand must be estimated for a total of 169 (i.e., 13 x 13) zonal, or city, pairs. Since the states of Tennessee and Georgia do not maintain statewide travel demand models, there is no readily available or official source for travel demand between all of the various urbanized areas of the Corridor. However, data on intercity travel for large metropolitan areas are available from the USDOT Bureau of Transportation Statistics. Fortunately, the Bureau of Transportation Statistics collected detailed intercity travel data during 1995 for Nashville, Chattanooga, and Atlanta, the three major metropolitan areas of the Corridor. These data-obtained from the 1995 American Travel Survey—are used to construct an intercity travel demand model that, for intermediate zones (e.g., Murfreesboro, Manchester, Cartersville), is based on an interpolation of travel demand between the major metropolitan zones of the Corridor.

The interpolation of intercity travel data is based on the reasonable assumption that intermediate zones, because of their smaller populations, will attract and produce fewer trips relative to the larger metropolitan areas. However, since the intermediate zones are closer to each other and to their respective metropolitan areas, they have a distance advantage. That is, if the populations of two urbanized areas are equal, the urbanized area that is closest to a metropolitan center will attract the larger number of trips. This rationale follows the concept of the Gravity Model used ubiquitously in travel demand modeling.

According to the Gravity Model concept, the trips between two urban centers vary directly with their populations and inversely with their distances. The equation employed in regional travel demand models follows this rationale, albeit in a more complex and sophisticated manner than our simplified interpolation. However, for the purpose of this effort, the interpolation described above is deemed suitable for an initial estimation of intercity travel demand.

It is also important to note that the majority of boardings and alightings on a high speed passenger rail line occur in metropolitan areas; for these key areas of the Corridor, detailed intercity travel data are already available and used herein.

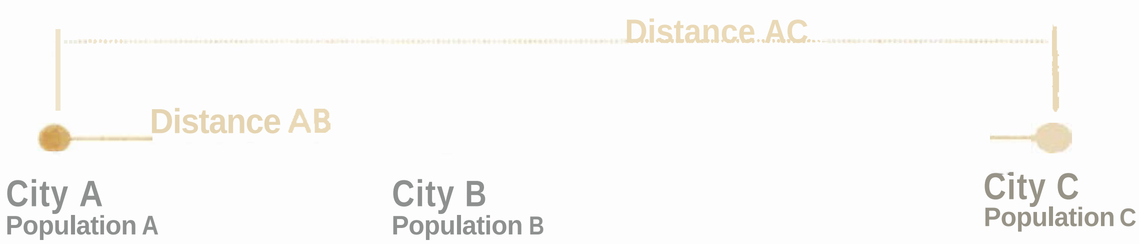


Figure R-3: Schematic diagram for the intercity travel demand interpolation function.

The interpolation function that was used to calculate trip productions and attractions for trips between the intermediate-to-intermediate and intermediate-to-metropolitan zones is expressed mathematically below. The formula references the simplified spatial diagram of two distant metropolitan areas (i.e., cities A and C) and a an intermediate City B (Figure **R-3.),** where:

$$T_{AB} = T_{AC} \times (Pop_B / Pop_c) \times LN(Dist_{AC}) / LN(Dist_{AB})$$

and where "T" equals the number of trips and "Pop" is the city population.

The interpolation function for travel demand was applied to this Corridor using the intercity travel demand data from the 1995 American Travel Survey (survey). The survey provides the total annual round trips for all modes to and from the major metropolitan areas of the Corridor by persons who reside in the Corridor. In addition, the survey segments the total annual round trips by type, allowing the identification of business and non-business trips. The differentiation between business and non-business trips is an important requirement of the modal split model, which calculates modal shares separately for these trip categories. Assuming that a hip initiated in the Corridor will return to the same origin and in the same travel mode, the round trips are multiplied by two to calculate the total number of trips in the Corridor.

The survey was completed in 1995. Since that time, significant growth has occurred in the Corridor, and the Corridor is expected to continue growing well into the future. Thus, the 1995 travel data were adjusted to simulate projected travel for years 2010 and **2020** by applying zonal growth rates. Specifically, population projections were collected for each of the counties within the Corridor, and an average growth for origin and destination zones (i.e., city pairs) was applied to the 1995 travel demand to project future travel demand in years **2010** and **2020.** Table R-3 depicts the growth in total intercity travel demand for years **2010** and **2020.**

The metropolitan areas are each segmented by their respective downtown and airport zones. (See Figure R-2, Zonal System Structure.) In each case, the travel demand of the entire metropolitan area was apportioned to the downtown and airport metropolitan zones on the basis of population.

TABLE R-3

Total Annual Intercity Corridor Travel Demand

Trip Type	Base Year 1995	Projection Year 2010	Projection Year 201
Business Travel	8,194,380	10,789,432	12,524,425
Non Business Travel	12,291,569	16,184,148	18,786,638
Total Travel Demand	20,485,949	26,973,580	31,311,063

Trips from the airport zone to the downtown zone were established for the Chattanooga and Nashville metropolitan areas by assuming an approximate market capture rate of air travelers. It is assumed that 2 percent of passengers boarding and alighting at a metropolitan airport would use the rail line for downtown access. In the case of the Atlanta metropolitan area, an estimated 1,400 riders are assumed to travel daily between the downtown and airport zones. This figure was obtained from the ridership estimates for high speed rail service as derived in the final report of the Atlanta-Chattanooga Maglev Deployment Study.

Finally, it should be recognized that the total corridor travel demand estimate does not include air travelers who would potentially use the rail service to make a connecting flight as part of a code-sharing arrangement with a major air carrier. Thus, the total intercity travel demand calculated here may be viewed as a conservative estimate.

Conclusions

The ridership model projects that approximately two million annual riders would use the high speed rail service in Year 2020, given a service frequency of 12 weekday, nine Saturday, and eight Sunday round trips. This result implies that high speed rail service in the Nashville-Chattanooga-Atlanta Corridor would be highly successful. This conclusion is supported by the use of a proven mode share model (i.e., the Hierarchical Mode Split Module of the COMPASS Model System) and the customized total travel demand model that is based on the 1995 American Travel Survey. In addition, the modal splits for the intercity travel modes match well with nationwide average mode splits for the air, bus, and automobile modes. Furthermore, a high speed rail market capture rate of 6.4 percent of the total intercity travel market is reasonable and offers a considerable diversion of two million automobile and air travelers to the rail mode.

It is important to emphasize the ridership projections presented here should be considered conservative for the following reasons:

- The ridership model does not include new trips induced by implementation of the high speed rail system. Whenever any new transportation facility is opened, the total travel demand has been shown to increase above levels that existed prior to inauguration of the new facility. The ridership model developed for this effort estimates only the portion of the existing total intercity travel market- which is currently served solely by the air, bus, and automobile modes-that would be diverted to the high speed rail mode.
- The ridership projections do not include the contribution of travelers who through joint rail-air tickets or code sharing, may opt to use the rail service instead of the air mode to reach connecting flights. In general, the ridership model considers only intra-corridor trips, that is, trips with both an origin and destination within the Corridor; these trips form the bulk of the total Corridor travel demand that maybe diverted to the rail mode. Other trip types, including through trips (external-to-external zone) and inter-corridor (internal-to-external and external-to-internal) trips, are not modeled.
- The ridership model assumes comparable reliability for the auto, air, bus, and rail modes. However, in realistic terms, the proposed high speed rail service would offer the greatest travel time reliability of the four modes since it would operate on its dedicated tracks, free from the interference of other rail or vehicular traffic. Such reliability would be expected to further attract additional riders.

The assumptions described above are consistent with this study effort, which is chiefly concerned with demonstrating the feasibility of high speed rail service in the Nashville-Chattanooga-Atlanta Corridor. More sophisticated models developed during future phases of this project's development should incorporate the additional trip types and reliability factors. With such improvements incorporated into future modeling efforts, the ridership projections are certain to increase, providing further justification for the proposed high speed rail service.

PUBLIC BENEFITS

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA

Public Benefits

New transportation projects are justified on their potential to provide society with tangible benefits. While the benefits of a new transportation service my be readily apparent to the general public, that is, from a qualitative perspective, transportation planners are typically required to quantify the expected benefits of a transportation investment. The quantification of expected benefits is typically converted to monetary units, thus providing an absolute measure of public benefits for a particular project as well as a comparative measure of benefits among competing projects. Public benefits estimates may then be used for policy analysis and decision making.

This section will provide an estimate of the potential benefits that may accrue to the actual users of the proposed high-speed rail service as well as to non-users, or members of the general public- even those who do not ride the train. In the latter instance, non-users still enjoy benefits of the investment in high speed rail service through a reduction in highway and airport congestion, improved air quality, and other societal benefits.

Methodology for Public Benefits

Public benefits are typically categorized according to benefits that accrue to users and non-users of the proposed transportation project. The public benefits estimate for high speed rail service in the Nashville-Chattanooga-Atlanta Corridor is calculated given the following assumptions:

- The service provides 12 weekday, nine Saturday, and eight Sunday round trips, for a total of 77 weekly round trips.
- Trains operate at a maximum speed of 125 mph.
- The ridership projections upon which public benefits are based are for Year 2020. The estimates of public benefits are expressed in Year 2003 dollars.

User Benefits

Users, or customers who actually ride the train, derive value from their use of the rail mode according to the actual fare paid, which translates collectively across all users into system revenues. System revenues come from a variety of sources including ticket sales, advertising revenues, dining/food service revenues, small package courier shipments, joint developments around station areas, and leasing rights of ways for telecommunications. For the purposes of this analysis, system revenues are based only on ticket sales and thus produce a conservative estimate of user benefits.

Consumer surpluses are also realized when a user obtains more value from the rail trip, such as greater convenience and/or reduced travel time, than was actually represented—and paid for—in the fare. The consumer surplus can also be thought of as the difference between the fare the rider would be willing to pay to use the service and actual fare.

The estimation of consumer surplus is fairly complicated, involving the number of trips diverted to the rail mode and the increased utility of the rail mode to each user. Consumer surplus is calculated by comparing the number of trips taken and their generalized costs incurred (for each mode) both before and after implementation of the high speed rail service.

Consumer surplus is expressed mathematically as follows:

Consumer Surplus =

$$[(T_2 \cdot GC \cdot VOT]_{Rail} + [(T_2 - T_1) \cdot GC \cdot VOT]_{Bus} + [(T_2 - T_1) \cdot GC \cdot VOT]_{Air} + [(T_2 - T_1) \cdot GC \cdot VOT]_{Auto}$$

Where:

T_2 = *the number of trips taken for each mode after high speed rail service startup.*

T_1 = *the number of trips taken for each mode prior to high speed rail service startup.*

GC = *the generalized cost for each mode and for each origin and destination pair, expressed in units of time (in this instance, hours).*

VOT = *the value of time as perceived for each mode (expressed as $/hr).*

The values of T_1, T_2 and *GC* are outputs of the ridership model presented in the previous section, while values of VOT are adopted from the 3C Corridor ridership model for each travel mode and trip type (i.e., business and non-business trips). The values of time, as provided in Table PB-1, were obtained through stated-preference surveys in the 3C Comdor. For the purposes of this analysis, it is assumed that the travel preferences of travelers in the 3C Corridor are comparable to those in the Nashville-Chattanooga-Atlanta Corridor.

TABLE PB-1

Values of Time ($/hr) for Each Travel Mode and Trip Type

	Mode			
Trip Purpose	Air	Bus	Air	Auto
Business	$30	$20	$67	$23
Non-Business	$19	$19	$44	$17

The total user benefits are thus the combination of the total fares and additional utility, expressed mathematically as follows:

User Benefits = System Revenues + Consumer Surplus

Applying the values of time and generalized costs to the total trips prior to and following implementation of the high speed rail service yields a consumer surplus of $22.4 million annually in Year 2020. System revenues for the same scenario amount to $125.9 million annually. According to the formula expressed above, the total user benefits for Year 2020 is $148.3 million. (All costs are expressed in Year 2003 dollars).

Non-User Benefits

Non-User Benefits are enjoyed by travelers who choose modes other than high speed rail. For the purposes of this effort, the benefits afforded by the diversion of trips to rail from the automobile and air mode were estimated; these benefits—which are calculated as savings–-result from: 1) highway congestion relief, 2) airport congestion relief, 3) accident reduction, and 4) energy savings and emissions reductions. Similar to the calculation of user benefits, the estimate of non-user benefits was performed for the high speed rail scenario that offers 12 weekday round trip trains that operate at a maximum speed of 125 mph for projection Year 2020.

Highway Congestion Relief Savings

It is anticipated that highway congestion and travel delays will be alleviated somewhat as former automobile users will opt to use the new passenger rail service for intercity travel. Based upon ridership projections for Year 2020, it is estimated that 1.67 million automobile trips will be diverted annually to the new high speed rail service. These automobile-to-rail diversions will, in turn, free up capacity along the major roads of the Corridor. At a minimum, the diversions will reduce the growth of congestion as compared to rates without implementation of high speed rail service.

As automobile travel is diverted from the highways, travel times on major roads should also improve. These improvements in travel time can be expressed in monetary terms as congestion relief savings. The 3C Corridor study used a benefit unit of $23.48 per diverted automobile trips—which was obtained from Federal Railroad Administration calculations-to estimate congestion relief savings. Applying this value to the estimated number of diverted automobile trips (1.67 million diverted trips) yields a congestion savings benefit of approximately $39.2 million.

Airport Congestion Relief

In a manner similar to the estimation of highway congestion relief savings, it is also possible to calculate the congestion relief savings at airports serving the Corridor. Using the projections of the ridership model, it is expected that 321,600 air travelers will divert from the air to rail mode annually in Year 2020. Applying the benefit unit of $43.64 per air trip diverted to rail that was used for the 3C Corridor to the expected diversions yields an airport congestion relief savings of $14 million.

Reduction in Accidents and Fatalities

As verified by accident statistics maintained by the U.S. Department of Transportation, rail transportation is inherently safer than highway travel. The diversion of intercity automobile trips to the passenger rail mode will provide measurable societal benefits by reducing the number of automobile accidents, some of which result in fatalities.

A measure of the societal benefit of accident reduction can be expressed in monetary terms given the rate of accidents per miles traveled and the average cost of an automobile accident (including vehicle replacement or repairs and/or hospitalization for injured parties). According to the Bureau of Transportation Statistics (BTS) for Year 1999, 332 vehicular accidents can be expected per every 100 million highway miles traveled, at an average cost of $25,459 per accident. To calculate the cost savings of accident reduction, the accident rate is applied to the total reduction in vehicle miles traveled (i.e., 208 million vehicle miles) and the average vehicle occupancy (i.e., 1.5 persons per vehicle for highway travel per BTS) to obtain the number of accidents prevented, which, in turn, is applied to the cost per accident. This calculation is expressed mathematically as follows:

$$\textit{Accident savings (\$)} = \frac{\textit{Vehicle Miles Traveled}}{\textit{Avg Vehicle Occupancy}}$$

$$\textit{times No. of Accidents per VMT}$$

$$\textit{times Cost per Accident (\$)}$$

Applying the results of the ridership model, which provides the number of automobile-to-rail mode diversions, the formula above yields a total of 460 accidents prevented annually at a total annual savings of $11.7 million.

Energy Savings and Emissions Reduction

Improving energy efficiency is an important societal benefit, particularly with respect to the need to conserve non-renewable fuel supplies and to reduce reliance on foreign sources of crude oil. The intercity rail mode is considerably more energy efficient than the automobile or the airplane in terms of energy required per passenger mile. For example, the average automobile consumes 1.7 times more energy per passenger mile than Amtrak. (The BTS estimates that the passenger rail and automobile modes require 2,138 BTUs and 3,672 BTUs per passenger mile, respectively.)

Energy savings can be determined by calculating the amount of fuel saved by diverting automobile trips to the rail mode. Energy savings is a product of the vehicle miles saved (by diversion from automobile to rail mode), the fuel cost per mile, and the rail-automobile energy use ratio. This calculation yields an annual energy savings of $5.7 million.

The diversion of automobile travelers to the rail mode also results in a net reduction in emissions. These emissions reductions can also be expressed in monetary **terms** following a **FRA** methodology–also used by the 3C Corridor—for calculating emissions savings. The emissions savings are calculated by applying a $0.02 emissions benefit (Year 2001 data) per vehicle mile to the vehicle miles saved by diversion from the automobile to rail mode. The emissions savings is calculated as $0.02 per vehicle mile times 138.6 million vehicle miles saved, or $2.8 million.

A summary of user and non-user benefits that can be expected in Year 2020 for a proposed 125-mph high speed rail service with 12 weekday, nine Saturday, and eight Sunday round trips is summarized in Table **PB-2.**

TABLE PB-2

Annual Public Benefit for Projection Year 2020

Users Benefits	
System Revenues	$125.9
Consumers Surplus	$22.4
Total Users Benefits	$148.3
Non-Users Benefits	
Highway Congestions Savings	39.2
Airport Congestion Savings	14.0
Accident Savings	11.7
Energy Savings	5.7
Emissions Savings	2.8
Total Non-User Benefits	$73.4

CONCLUSION

HIGH SPEED TRAINS

NASHVILLE-CHATTANOOGA-ATLANTA

Conclusions

At a Glance

- High speed rail has support of DOT Commissioners and elected officials in both Tennessee and Georgia.
- ✓ CSX railroad is willing to cooperate in the effort to make high speed trains a reality in the Nashville-Chattanooga-Atlanta Corridor.
- ✓ Depending upon the alignment selected high speed trans can operate at speeds of 90 mph or more for 79-83% of the corridor.
- More than 2 million annual riders (Year 2020) are expected to use this high speed rail service, based on a maximum speed of 125 mph.
- ✓ More than $39 million (Year 2020) in highway congestion savings would be realized.

Making the Connection!

The Nashville-Chattanooga-Atlanta City pairs have ideal spacing for making high speed rail service highly competitive with other travel modes.

The distances between the Chattanooga-Atlanta, Chattanooga-Nashville, and Nashville-Atlanta city pairs make for flights that are short, inconvenient, and comparatively expensive. Travel to the airport, predeparture airline check-in delays, and security screenings add to the overall journey times, and that is assuming there are no weather- or airport-related delays.

Driving by car is time-consuming and frequently aggravating, particularly if there are accidents, inclement weather, or highway construction.

In contrast, the city spacings between Nashville-Chattanooga, Chattanooga-Atlanta, and Nashville-Atlanta are well-suited for high speed train travel. High speed rail travel times between these city pairs are projected at 1 hour, 20 minutes; 1 hour, 13 minutes; and 2 hours, 34 minutes, respectively.

Operating on dedicated tracks, the proposed high speed trains are not subject to most weather-related delays, roadway delays, or even delays from other freight or passenger trains. Thus, high speed rail is reliable and punctual. On board, high speed rail customers can work productively, engage in social interaction, or just relax.

The stations selected for the Nashville-Chattanooga-Atlanta Corridor have been designed to provide convenient boarding and arrival locations and feature a mix of downtown, suburban, multimodal, and smaller town stations. The three multimodal stations, located at airports serving Atlanta, Nashville and Chattanooga, create new regional, national. and international connections by enabling high speed rail to become another "spoke" in an integrated airport hub.

High speed rail within the Nashville-Chattanooga-Atlanta Corridor offers several attractive benefits:

New mobility. High speed rail offers travelers a convenient alternative to air travel and to increasingly crowded interstate highways within the Nashville-Chattanooga-Atlanta Corridor.

Making Better Use of Time. High speed train travelers make better use of their time. Business travelers can work from comfortable seats in a variety of seating configurations with handy desk areas. Leisure travelers can relax and enjoy the scenery, watch a video, or listen to music. Families experience the travel adventure together. Food and drink are just steps away. No need to stop to eat, drink, or unwind. No need to waste time in highway traffic or at crowded airprots.

Eco-friendly. High speed rail increases the transportation capacity while consuming a small "footprint" upon the land. As additional capacity is required, trains can be lengthened or run more frequently. In addition, a significant reduction in vehicular emissions will result as rail passengers park their cars and ride the train instead driving.

Promotes tourism. High speed rail promotes tourism along the Corridor by making travel more convenient for visitors from abroad, from other parts of the United States, and from along the Corridor.

Regional connections. As an extension of the Southeast High Speed Rail Corridor, Tennessee will now be "plugged into" and linked with other cities within that Corridor, such as Savannah, Jacksonville, Charlotte, and Washington D.C. Being plugged in means integration with a larger high speed transportation network- and we depend upon ease of travel between business centers for economic prosperity

With these benefits—and more—it is time for high speed rail to make the connection!

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