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16. Abstract

The proposed study is a two-phase investigation designed to facilitate the planning of the intermodal infrastructure improvements in a thirteen county region of western West Virginia. The counties to be studied will be: Boone, Cabell, Clay, Jackson, Kanawha, Lincoln, Mingo, Mason, Putnam, Roane, Wayne and Wood. The investigation will gather information describing commodity flows to and from the study region, assess the current costs of the transportation services that facilitate these flows, and identify intermodal infrastructure improvements that could measurably reduce these costs, thereby enhancing the competitive position of the region.

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Transportation and the Potential for Intermodal Efficiency-Enhancements in Western West Virginia

FINAL PHASE I REPORT

Prepared on Behalf of
The Appalachian Regional Commission,
The West Virginia Department of Transportation, and
West Virginia Planning and Regional Development
Council, Regions II, III, and IV

By the Appalachian Transportation Institute and
The Center for Business and Economic Research

Marshall University
Huntington, West Virginia

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ACKNOWLEDGEMENTS

Perhaps more than any other form of economic analyses, effective transportation studies require the active participation of myriad constituencies representing both public and private interests. Shippers, transportation carriers, government personnel, and policy makers must all contribute their expertise for such studies to yield information useful to the planning process.

In this light, the current analysis is fortunate to have enjoyed the support of any number of individuals and institutions. Regional shippers, too numerous to mention, have provided the study team with information describing their shipping practices. CSXT, Norfolk Southern, the West Virginia Motor Truck Association, and a number of regional motor carriers have also been tremendously cooperative. Certainly, much of the credit for the study’s accomplishments also must go to the development authorities and countless officials in the 13 counties that form the study region. Not only have these individuals directly contributed valuable information to the analysis, they have encouraged others to do so. Also, the sponsoring agencies – The Appalachian Regional Commission and the West Virginia Department of Transportation – have provided information, expertise, and leadership that has proven invaluable. Finally, immeasurable thanks must go to Representative Nick J. Rahall from West Virginia’s 3rd Congressional District for bringing both additional attention and resources to the issue of transportation in Appalachia.

The completion of Phase I, by no means, signals an end to the need for cooperation and input from those who buy and sell transportation services and those who work to create the environment in which such transactions take place. To the contrary, as the current study works to interpret the Phase I results and identify opportunities for improvements, the expertise that past contributors can offer will be of even greater importance to the study’s success.

Mark L. Burton
Principal Investigator

1. INTRODUCTION AND STUDY BACKGROUND

1.1 INTRODUCTION

The rugged terrain of West Virginia, combined with its widely dispersed population, leaves the State with transportation needs that are markedly different from those required in other areas of the United States. Historically, these differences have disadvantaged the State, leaving its residents both physically and economically isolated.

Starting in the early 1960's, however, both federal and regional transport policies began to more effectively address the State's transport needs by augmenting existing rail and barge transport networks with significant new highway capacity. The diversification of the State's transportation infrastructure has played an important role in a similar diversification of available economic opportunities. This broader range of economic activities, in turn, affords the West Virginia a greater degree of protection from the highly cyclical economic patterns observed in heavy manufacturing and resource extraction.[1]

Clearly, the past four decades demonstrate the important link between transportation infrastructure and economic development. However, it would be incorrect to conclude that West Virginia has achieved its full economic potential or that its past gains are invulnerable to foreseeable changes in national policies and global markets. To the contrary, the State continues to face innumerable transportation challenges.

It is within this context that the West Virginia Department of Transportation (WVDOT) and West Virginia Planning and Development Council Regions II, III, and IV, in conjunction with the Appalachian Regional Commission (ARC), have engaged the Appalachian Transportation Institute (ATI) and the Center for Business and Economic Research (CBER) at Marshall University to produce a comprehensive transportation planning study, examining a 13 county region in western West Virginia.[2] This study is organized into two distinct phases. Phase I, which is documented within the current report, was intended to gather information describing current transportation practices within the study region. Accordingly, investigators have worked to carefully identify and document commodity and passenger flows. At the same time, the Phase I analysis has also sought to

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[1] It is also important to note that, even as more diverse economic opportunities have been made available through new highway construction, simultaneous improvements in the region's railroad and commercial navigation networks have helped to preserve the competitive positions of West Virginia's more traditional industries.

[2] It is hoped that the current study will be sufficiently successful so that the same methodology may be applied to other regions of the State and in other states as well.

catalogue and inventory the transportation infrastructures that support the observed flows, with the ultimate aim of assessing transportation network capacity and operating costs.

Phase II of this investigative process is scheduled for completion in the fall of 2000. It will combine the data gathered during the study's initial phase with additional public input and advanced spatial modeling techniques to identify the transportation elements that may unnecessarily raise the cost of transportation to and from the study region.

1.2 THE STUDY REGION

The study region (Figure 1.1) is comprised of 13 western West Virginia counties, including: Boone, Cabell, Clay, Jackson, Kanawha, Lincoln, Logan, Mingo, Mason, Putnam, Roane, Wayne, and Wood. Summary statistics describing both the economies and populations of these counties are provided in Table 1.1. It should be noted that seven of these counties (Boone, Clay, Lincoln, Logan, Mason, Mingo, and Roane) have been identified as "distressed" by the ARC.[3]

The study region counties are remarkably diverse. Cabell, Kanawha, Putnam, and Wood counties are relatively urban. Together, these four counties contain 63 percent of the study region's population. Conversely, Clay, Lincoln, and Roane are decidedly rural. Moreover, there is a similar variety in economic characteristics. Per-capita income varies by as much as a factor of two. Finally, the form of commerce that provides incomes and employment also varies considerably within the 13 county region. On the one hand, Cabell, Kanawha, Putnam, Jackson, and Wood counties exhibit a wide array of both manufacturing and service sector activity. At the same time, Logan, Mingo, and Boone County employment and incomes are dominated by coal production and related activities.

While the study region includes roughly 25 percent of the State's 55 counties, this region captures a significantly greater portion of the State's population and economic activity. Table 1.2 summarizes a number of county-specific economic and demographic measures relative to the West Virginia State total. The study region includes roughly 37 percent of the State's population, 40 percent of its personal income, 39 percent of State-wide business establishments, and 31 percent of new housing starts. Perhaps as importantly, three study region counties – Cabell, Kanawha, and Wood contain nearly 25 percent of the states inhabitants and account for nearly 25 percent of State-wide personal income.

[3] ARC designates counties as distressed based on low per-capita income and high rates of poverty and unemployment. Currently, there are 111 such counties within the ARC region.

Figure 1.1
Transportation Study Region

While the overall region is measurably stronger than in past decades, the data describing the study region nonetheless tell the story of an area that has been repeatedly challenged by the cyclical nature of the extractive and heavy manufacturing industries that comprise its historical economic base. As recently as the middle 1980's, the region was rocked by a significant economic downturn. Populations, incomes, and overall economic activity declined measurably during that period. From roughly 1990 forward, the region began its recovery from the difficulties of the 1980's, but this recovery has been relatively slow compared to the nationally strong economic performance observed over the past decade.

Table 1.1
County Demographic and Economic Summary

County	1980 Population	1998 Population	Percent Population Change	Per-Capita Income (1994 $)	Largest Employment Sector	Employment Concentra. Index[4]
Boone	30,447	26,118	-14.22%	$14,303	Mining	0.3179
Cabell	106,835	94,273	-11.76%	$18,727	Service	0.2415
Clay	11,265	10,530	-6.52%	$10,689	Mining	0.2158
Jackson	25,794	27,972	8.44%	$15,323	Manufac.	0.2588
Kanawha	231,414	202,011	-12.71%	$20,997	Service	0.2170
Lincoln	23,675	22,192	-6.26%	$10,961	Retail	0.2220
Logan	50,679	41,080	-18.94%	$14,614	Service	0.2175
Mason	27,045	25,869	-4.35%	$14,372	Service	0.2207
Mingo	37,336	31,926	-14.49%	$15,025	Mining	0.2078
Putnam	38,181	51,164	34.00%	$19,632	Retail	0.2009
Roane	15,952	15,342	-3.82%	$12,806	Manufac.	0.2100
Wayne	46,021	41,957	-8.83%	$13,142	Service	0.1959
Wood	93,648	86,768	-7.35%	$19,095	Service	0.2319

Sources: US Department of Commerce 1997 County Business Patterns and CBER calculations.

Table 1.2
The Study Region and the West Virginia Economy

County	Percent of Estimated 1999 WV Population	Percent of Estimated 1994 WV Income	Percent of Estimated 1995 WV Establishmnts.	Percent of 1997 WV Housing Starts
Boone	1.46%	1.30%	0.92%	0.68%
Cabell	5.18%	6.04%	6.51%	1.92%
Clay	0.59%	0.37%	0.32%	0.34%
Jackson	1.57%	1.32%	1.20%	1.22%
Kanawha	11.03%	14.59%	14.40%	2.75%
Lincoln	1.24%	0.81%	0.65%	0.27%
Logan	2.22%	2.15%	2.17%	0.27%
Mason	1.47%	1.22%	0.89%	0.34%
Mingo	1.74%	1.67%	1.79%	0.15%
Putnam	2.87%	2.81%	2.29%	11.82%
Roane	0.85%	0.64%	0.75%	0.02%
Wayne	2.32%	1.85%	1.87%	1.83%
Wood	4.78%	5.52%	5.67%	9.50%
Total Region	**37.31%**	**40.29%**	**39.44%**	**31.12%**

Sources: US Department of Commerce 1997 County Business Patterns and CBER calculations.

[4] The Employment Concentration Index is the sum of the squared employment shares of the various commercial sectors.

1.3 GUIDING PRINCIPLES

Both the collection and interpretation of data during Phase I and the more comprehensive analysis planned within Phase II have been influenced by three guiding principles. First among these is the recognition that efficient transportation outcomes are the result of spatially-inclusive, competitive economic relationships. The only way to understand and evaluate currently observed transportation practices is to understand the economic circumstances that give rise to these practices. Likewise, the only way to achieve policy changes that will yield efficient transportation in the future is to match these policies to the economic circumstances that are most likely to reveal themselves in coming decades.[5] Moreover, the effectiveness and efficiency of the entire process is dependent upon the presence of effective competition in both transportation markets and the markets in which study-region commodities are bought and sold. Thus, policy-makers must include transportation decisions within the broader context of those policies that will encourage effective competition at all levels of production.

Second, as indicated above, spatial economic relationships do not necessarily conform to jurisdictional boundaries. Any attempt to superimpose jurisdictional bounds on the analysis of currently observed transportation practices or within the development of an efficient future policy course is likely to lead to analytical errors and sub-optimal policies.

Finally, because transportation services are provided across space rather than within the confines of a closed facility, they are far more likely to yield what economists refer to as external costs – costs borne by people who are not a part of the transaction that produces them. Specifically in the case of transportation, people who live and work in the midst of ongoing transportation are subjected to additional environmental costs that would not be present in the absence of the transportation services.[6] Further, both the scale and scope of transport-related external costs can be materially affected by public policies. Formally accounting for the magnitude of all transportation-related external costs is beyond the scope of the current analysis. Nonetheless, where such costs are now or may become a significant issue, they will be appropriately noted here in the hopes that policy-makers will further explore them within the course of future policy formulation.

[5] Increasingly, accommodating economic change requires the development of "seamless," multi-modal transport networks that utilize the best possible combinations of equipment and services in addressing specific shipper needs.

[6] Within the current context, "environmental" carries a broader than normal definition that includes exposure to increased risk of accidents, traffic congestion costs, and other costs along with more traditional environmental concerns.

1.4 SHIPPER AND CARRIER CONFIDENTIALITY

The Phase I study used a variety of data sources including federal data and interviews with shippers and carriers within the study region that are confidential. Many elements within these data depict firm-specific business practices. In some cases, the public release of these confidential data is statutorily prohibited. In other instances, data were obtained directly from shippers and carriers based on promises of confidentiality. In every case, however, data are presented at a level of aggregation sufficient to ensure the privacy of the buyers and sellers of transportation services within the study region.

1.5 CAUTIONS AND CAVEATS

As described in Section 1.1, the current study is an ambitious attempt to provide policy-makers with the information necessary to engage in effective transportation planning. Certainly, the data describing commodity flows and the transportation systems that accommodate these flows developed within the first study phase will be useful toward this end. There are, however, a number of important cautions and caveats that readers should bear in mind as they proceed through the remainder of the Phase I report.

First, while specific transportation practices and general commercial circumstances are continually changing, the data employed within the ongoing analysis are anchored in one specific time period – generally 1997 or 1998. Thus, the study may reference conditions, practices, and outcomes that are not entirely current. More importantly, all data should be interpreted with a forward-looking eye for change. The purpose of the study is to facilitate transportation planning for the future. Hence, the status quo should be viewed within the context of an evolving West Virginia economy.

Second, no data source or analytical technique is fully capable of entirely capturing the complex interrelationships that produce transportation outcomes. Generally, the information and methods employed within the current study are most reliable at significant levels of aggregation. Consequently, the total regional data are likely to be more dependable than county-specific or industry-specific values. This is not to say that the disaggregated results reported here are not valid. Readers should, however, employ a greater measure of caution when making inferences based on these disaggregated values.

Finally, while the analysis that accompanies the Phase I findings necessarily includes explanations that may hint at potential transportation problems and/or opportunities, the reader is encouraged to use these explanations as the starting point for further study rather than the basis of for policy conclusions. Phase II will provide significant additional information that should bring additional clarity to the overall picture of transportation within the study region. It is, therefore, the author's judgment that any policy discussions conducted in the absence of the Phase II results would be premature.

2. COMMODITY FLOWS

The diversity of the commodities flowing to and from the study region counties reflects the significant variation in populations and economic activities across these counties. For those southern counties where coal dominates the economic environment, and where populations are relatively small, the movement of coal is the dominant flow. Coal is also important in the central and northern counties. However, there is also considerable chemical, steel, aluminum, and manufactured goods traffic to and from these counties. The general pattern with regard to non-coal commodity movements involves the transport of raw materials into the region – generally by rail and barge – and the outbound movement of manufactured goods and refined or processed intermediate products by truck.

2.1 MOTOR CARRIER TRAFFIC FLOWS

Truck movements to, from, and within the study region can be divided into a number of different categories – traffic originating or terminating at manufacturing facilities, deliveries to retail establishments, pass-through traffic that neither originates nor terminates in the region, and movements that combine motor carriage with railroad or barge transportation. Retail deliveries are largely driven by population and may be predicted on that basis. Similarly, pass-through traffic volumes are generally a function of the broader regional and national economies and should exhibit stable long-run growth. Consequently, the current study focuses primarily on assessing the shipping patterns of manufactures.

2.1.1 Overall Truck Traffic

Motor carrier flows were developed through a combination of shipper survey data and the 1997 State-wide Commodity Flow Survey (CFS) compiled by Oak Ridge National Laboratories for the U.S. Department of Commerce and the Bureau of Transportation Statistics.[7]

Table 2.1 summarizes aggregate motor carrier activity within each of the study region counties. Commodity-specific flows are not reported at the county level in order to assure shipper confidentiality. Kanawha

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[7] See 1997 Commodity Flow Survey, US DOT, Bureau of Transportation Statistics. In addition to the CFS data, county-specific flows are based on shipper-supplied data. Nearly 100 regional shippers were surveyed by telephone or in person. These survey results were extended to the entire study region commercial population based on industry and firm size.

Table 2.1
Motor Carrier Flows[8]

County	1999 Originating Tonnage	1999 Terminating Tonnage
Boone	654,133	700,992
Cabell	12,446,470	5,188,343
Clay	206,586	237,553
Jackson	3,161,836	2,326,069
Kanawha	14,919,619	5,254,059
Lincoln	376,857	335,043
Logan	1,432,613	712,216
Mason	2,031,966	726,118
Mingo	1,349,124	920,407
Putnam	3,540,298	1,551,618
Roane	2,426,916	1,194,155
Wayne	3,939,505	838,899
Wood	11,512,851	4,390,932
TOTAL	**57,998,774**	**24,376,405**

Sources: US Department of Transportation Bureau of Transportation Statistics Commodity Flow Survey and CBER shipper interviews.

County leads the study region in the volume of outbound traffic, followed closely by Cabell and Wood. The remaining 10 study region counties originate significantly less truck traffic. Given, the distribution of manufacturing within the region, this result is unremarkable. Kanawha, Cabell, and Wood counties also lead the region in terms of inbound, or terminating, truck traffic. The distribution of this traffic is, however, a bit more uniform, reflecting the fact that a significant amount of inbound truck traffic is related to supplying retail establishments that are more evenly distributed than manufacturing across the study region.

One of the more striking results depicted in Table 2.1 is the considerable imbalance between inbound and outbound traffic in Kanawha, Cabell, and Wood counties. In these counties, originating shipments outnumber terminating shipments by nearly three-to-one. This imbalance reflects the fact that many input commodities are transported by rail or barge, while outputs are moving by truck. This result is important because it implies that a large number of trucks and trailers must enter the region empty – an outcome that can lead to higher than average trucking costs.

[8] Estimates exclude the truck movement of coal to barge transload facilities.

Table 2.2 reports manufacturing truck traffic by type of industry.[9] Originating traffic is topped by the movement of concrete, clay, glass, and stone – primarily movements of building materials that travel relatively short distances.[10] The next commodities for which originating quantities are the largest – chemicals and lumber and wood products – reflect the outbound movement of manufacturing or processing operations.

Lumber and wood products are also important as a terminating commodity. Firms using these products, along with those who use primary and fabricated metal products represent the largest receivers of truck traffic.

2.1.2 Trucking and Intermodal Movements

Motor carriage is used in combination with other transport modes to provide service to shippers within the study region. However, because intermodal routings are currently used by a relatively small number of shippers, the survey data describing these routings can not be reliably extended to approximate the behavior of the entire shipping population within the study region.

The next best source of information is the Commodity Flow Survey described earlier. The base CFS data are reported at the State level. There are, of course, reliable techniques for distributing State-level data across individual counties, but these methods are only appropriate when the number of shippers is relatively large and, again, this is not the case for truck-inclusive intermodal movements. Thus, there is little choice but to examine the undistributed State-level data and interpret them based on the shipper comments obtained through the survey process. The necessary 1997 West Virginia CFS records are reported in Table 2.3.

The majority of West Virginia's plastics production takes place within the study region – particularly in Jackson, Kanawha, and Wood counties, so that the truck/rail movements of these commodities identified in the CFS are almost certainly relevant here. In addition to plastics, the shipper survey also identified containerized outbound movement of fabricated metal products, transportation equipment, and electronic equipment, so

[9] Terminating retail delivery traffic is largely excluded from these figures, so that the totals reported in Table 2.1 and 2.2 will not necessarily agree.

[10] These materials are either produced locally or are shipped to the region in large volumes by rail or truck for distribution to local vendors.

Table 2.2
Study Region Truck Traffic by Commodity

Commodity	Originating 1999 Tonnage	Terminating 1999 Tonnage
Agricultural Products and Services	3,741,867	1,431,585
Apparel – Finished Prdcts	2,824,308	1,080,540
Chemicals and Allied Products	8,870,782	79,630
Electronic Elctrcl Eqpmnt & Cmpnts Excpt Computer Eqpmnt	17,225	42,029
Fabricated Metal Prdcts Except Machinery & Transport Eqpmnt	2,810,985	2,693,511
Food and Kindred Products	78,995	78,995
Forestry	173,961	66,555
Furniture and Fixtures	1,125,630	430,650
Industrial and Commercial Machinery and Computer Equipment	47,250	115,290
Leather and Leather Products	3,411	1,305
Lumber and Wood Products Except Furniture	6,231,156	5,096,967
Mesr/Anlyz/Cntrl Instrmnts; Photo/Med/Opt Gds	24,600	60,024
Metal Mining	34,110	13,050
Mining and Quarrying of Nonmetallic Minerals Except Fuels	429,786	164,430
Miscellaneous Manufacturing Industries	569,637	217,935
Paper and Allied Products	968,724	370,620
Petroleum Refining and Related Industries	162,644	1,460
Primary Metal Industries	2,749,270	2,861,945
Printing Publishing and Allied Industries	5,188,131	1,984,905
Rubber and Miscellaneous Plastic Products	2,513,907	961,785
Stone Clay Glass and Concrete Products	17,161,926	381
Textile Mill Products	1,865,817	713,835
Transportation Equipment	404,652	408,978
TOTAL	**57,998,774**	**18,876,405**

Sources: US Department of Transportation Bureau of Transportation Statistics 1997 Commodity Flow Survey and CBER shipper interviews.

Table 2.3
1997 Originating West Virginia Intermodal Movements

Commodity	Mode	1997 Tons	Average Total Shipment Distance (miles)
All commodities	Truck and rail	221,000	2,522
Plastics and rubber	Truck and rail	130,000	2,688
Wood products	Truck and rail	49,000	2,947
Coal[11]	Truck and water	12,800,000	535
Petroleum Products	Pipeline and water	**D**	**D**
TOTAL (excluding Pipeline)		**13,200,000**	

"D" indicates that data were withheld to prevent the disclosure of confidential information.

Sources: US Department of Transportation Bureau of Transportation Statistics 1997 Commodity Flow Survey, Surface Transportation Board Carload Waybill Survey, and CBER shipper interviews.

that the study assumes that a significant portion of the unidentified 42,000 truck/rail tons also originated within the study region. In all but one case identified, shippers loaded containers at their facilities.[12] One shipper did, however, trailer its products to Chicago, where they were then loaded into containers. In 1997, the year in which the CFS data were collected, West Virginia produced approximately 170 million tons of coal. While the vast majority of this coal was loaded directly to rail, the CFS indicates, that approximately seven percent of originating coal was trucked an average of 37 miles. In all but a very few cases, these truck movements were used to access barge transportation for line-haul movements that averaged roughly 500 miles. Assuming legal loading weights, this equates to nearly 600,000 truck movements during that year, with the majority of these taking place within the study region. Information provided by the West Virginia Motor Truck Association suggests, however, that the lower coal production observed in 1999 has sharply reduced the number of truck/barge coal movements.

[11] The CFS did not actually identify truck/barge coal tonnage. It did, however, indicate that nearly 13 million tons moved an average of 37 miles by truck. The vast majority of this coal was, in fact, moved to transload facilities for further barge transport.

[12] While research reveals a number of instances where outbound traffic moves by container, no evidence of inbound container movements was discovered.

Neither the CFS nor the shipper survey conducted as a part of the current study identified any truck/air intermodal movements. Information does suggest, however, that a small number of such movements do take place. Federal Aviation Administration (FAA) data indicate that, for West Virginia as a whole, there were 1,916 tons of enplaned air-freight and mail during 1996.[13] It is likely that the majority of this traffic was observed at one of the three study region airports and that there was an associated motor carrier movement. However, little additional information is available

2.1.3 Pass-Through Traffic

As indicated above, the vast majority of annual motor carrier ton-miles observed in West Virginia involve movements that neither originate nor terminate within the State (87 percent, based on the 1993 CFS). This pass-through traffic is the result of larger regional and national traffic patterns and the design of the nation's highway network. For the purpose of the current analysis, it is assumed this traffic was routed over the State's Interstate highway components and is, thereby, captured in the traffic counts for those Interstate segments that lie within the study region.

2.1.4 Beyond the Study Region

Tables 2.4 and 2.5 were constructed using 1997 CFS. These data are, however, entirely consistent with the information obtained through the shipper surveys. Table 2.4 provides average transit distances for truck movements by commodity. Table 2.5 summarizes the distances that originating traffic travels by truck. This information is also summarized in Figure 2.1.[14] Based on this information, it appears the majority of truck movements that originate within the study region also terminate there. Recalling the relatively large truck shares of coal, building material and wood products movements, the relatively local nature of study region truck traffic is not surprising.[15] However, both the CFS data and the shipper surveys suggest that manufactured or processed commodities such as fabricated metal products and chemicals travel significantly further by truck. This latter observation is inconsistent with least-cost transportation practices observed elsewhere and may indicate an opportunity for improving study region efficiency.

[13] See the FAA Statistical Handbook, 1996, Table 4.6.

[14] The data contained in Tables 2.4 and 2.5 reflect actual highway distances, while the mileage bands portrayed in Figure 2.1 reflect Euclidean distances. As a consequence, this figure slightly overstates the reach of motor carrier movements.

[15] The average transit distance of 111 miles for natural sands reported in the CFS data is somewhat surprising.

Table 2.4
Average Truck Distances by Commodity

Commodity	Average Truck Distances (miles)
Alcoholic beverages	22
Animal feed and products of animal origin, n.e.c.	35
Articles of base metal	92
Base metal in primary or semifinished forms	184
Basic chemicals	----
Cereal grains	----
Chemical products and preparations, n.e.c.	----
Coal	37
Coal and petroleum products, n.e.c.	----
Electronic and other electrical equipment and components	135
Fertilizers	105
Fabricated Aluminum Products	----
Fabricated Steel Products	----
Fuel oils	----
Gasoline and aviation turbine fuel	32
Gravel and crushed stone	13
Live animals and live fish	----
Logs and other wood in the rough	----
Machinery	----
Meat, fish, seafood, and their preparations	170
Metallic ores and concentrates	44
Milled grain products and preparations, and bakery products	81
Monumental or building stone	54
Motorized and other vehicles (including parts)	121
Natural sands	111
Nonmetallic mineral products	----
Nonmetallic minerals n.e.c.	68
Other prepared foodstuffs and fats and oils	54
Paper or paperboard articles	53
Pharmaceutical products	150
Plastics and rubber	105
Precision instruments and apparatus	----
Primary Metals Production	----
Printed products	----
Pulp, newsprint, paper, and paperboard	----
Textiles, leather, and articles of textiles or leather	596
Tobacco products	95
Transportation equipment, n.e.c.	----
Waste and scrap	109
Wood products	142

---- Data was unavailable or statistically unstable.

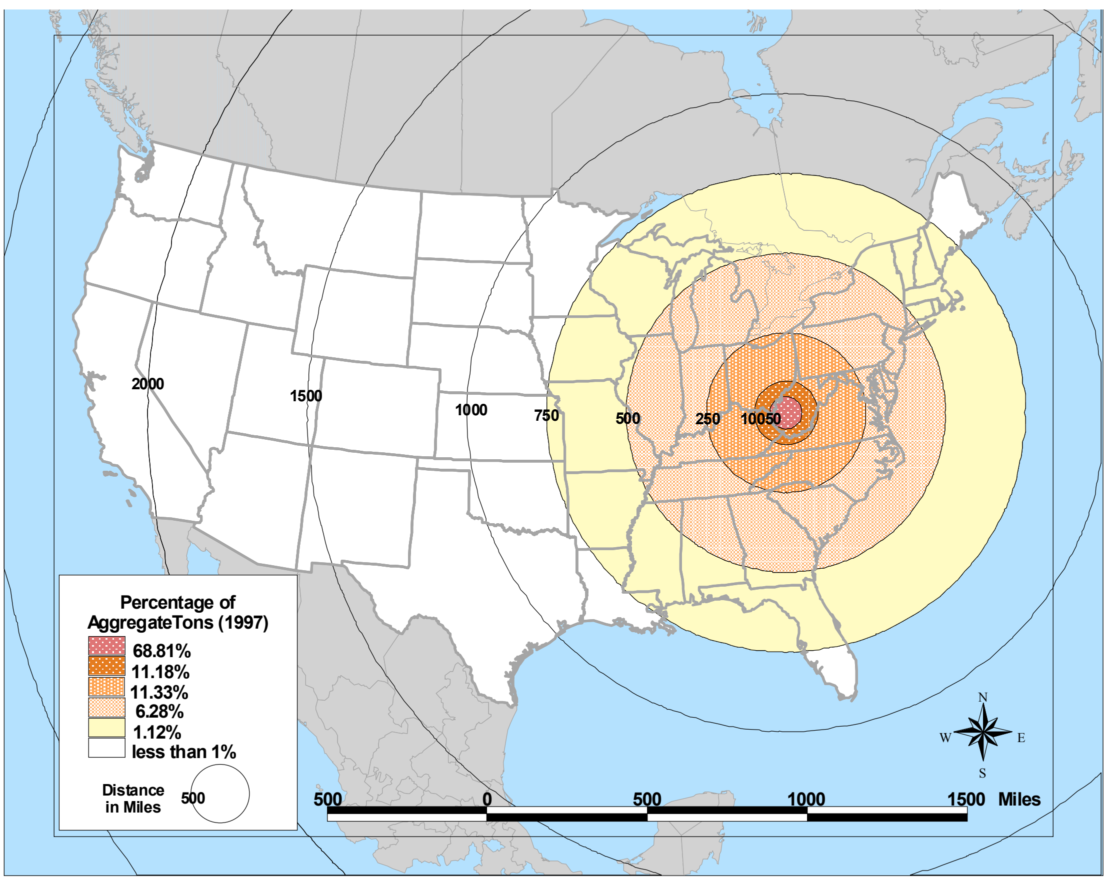
Source: US Department of Transportation Bureau of Transportation Statistics 1997 Commodity Flow Survey.

Table 2.5
Aggregate Motor Carriage Shipment Distances

Shipment Distance	1997 Tons	Percentage of 1997 Tons
Less than 50 miles	40,930,000	68.81%
50 to 99 miles	6,650,000	11.18%
100 to 249 miles	6,741,000	11.33%
250 to 499 miles	3,738,000	6.28%
500 to 749 miles	666,000	1.12%
750 to 999 miles	310,000	0.52%
1,000 to 1,449 miles	232,000	0.39%
1,500 to 1,999 miles	55,000	0.09%
2,000 or more miles	161,000	0.27%

Source: US Department of Transportation Bureau of Transportation Statistics 1997 Commodity Flow Survey.

Figure 2.1
Aggregate Motor Carriage Shipment Distances



2.1.5 Intertemporal Changes

While the economic base within the study region and the demands it places on highway infrastructure is evolving reasonably slowly, there are, perhaps, more rapid changes in two important determinants of overall regional truck traffic – the volume of pass-through traffic and the population distribution that dictates local retail-related truck traffic.

Section 2.1.3 indicates that, based on 1993 data, 87 percent of all regional truck traffic neither originates nor terminates within the study region. As significant as that value may seem, there have been national and regional economic changes that suggest a more current figure would capture even greater volumes of pass-through traffic. Unfortunately, the current study's principal investigator was unable to glean a figure for comparison from the 1997 Commodity Flow Survey. There is, nonetheless, information that can be brought to bear on the issue of intertermporal change. For example, between 1993 and 1997, overall US truck volumes are estimated to have grown by 20.6 percent.[16] Assuming that regional traffic was largely static over the same period and that geographic flow patterns were largely unchanged, study region pass-through traffic is likely now in the range of 90 percent rather than 87 percent. Thus, from a planning perspective, national trends increasingly influence the demands on regional highway infrastructure.

As noted in Section 2.1.1, study region truck flows are also influenced by the need to provide local populations with retail goods and services. Hence, any significant changes in these populations are likely to measurably alter commodity flows. Table 2.6 provides study region county population estimates for 1980, 1990, and 1999. While population declines were evident in 12 of 13 counties, these declines were greatest in the coal field counties within the southern-most portion of the study region. In contrast, the population of Putnam County grew precipitously over the same 19 -year period.[17] It is, therefore, likely that earlier investigations would have found corresponding differences in the relative volumes of truck traffic needed to accommodate local retail operations.

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[16] See 1997 Economic Census: Transportation, 1997 Commodity Flow Survey, US Department of Transportation and US Department of Commerce, EC97TCF-US, December, 1999, Table 1b, p. 9.

[17] The growth in Putnam County's population, in combination with population declines in Cabell and Kanawha Counties, reflects the migration of both Huntington and Charleston area residents to a more central location where both cities may be more easily accessed.

Table 2.6
Study Region Population Changes

County	1980 Population	1990 Population	Estimated 1999 Population	Estimated Percentage Change
Boone	30,447	25,870	26,302	-13.61%
Cabell	106,835	96,827	93,562	-12.42%
Clay	11,265	9,983	10,609	-5.82%
Jackson	27,594	25,938	28,294	2.54%
Kanawha	231,414	207,619	199,263	-13.89%
Lincoln	23,675	21,382	22,346	-5.61%
Logan	50,679	43,032	40,183	-20.71%
Mason	27,045	25,178	26,618	-1.58%
Mingo	37,336	33,739	31,480	-15.68%
Putnam	38,181	42,835	51,936	36.03%
Roane	15,952	15,120	15,413	-3.38%
Wayne	46,021	41,636	41,860	-9.04%
Wood	93,623	86,915	86,337	-7.78%

Source: Population Estimates Program, Population Division, US Census Bureau, Washington, DC, 2000.

2.2 RAILROAD TRAFFIC FLOWS

The study region is served by two Class I railroads, CSX Transportation (CSXT) and Norfolk Southern (NS). Together, during 1998, these railroads originated or terminated over 75 million tons of freight traffic – a volume roughly comparable to total motor carrier tonnage[18]. This tonnage parity is rather uncommon and points to the continued relative importance of railroad transport to the study region and the State of West Virginia as a whole.

2.2.1 Overall Rail Traffic

Total originating and terminating tonnages are reported in Tables 2.7 and 2.8.[19] These values are depicted graphically in Figures 2.2 and 2.3.

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[18] Roughly 75 million tons of rail traffic originated in the study region and approximately 26 million tons terminated in the region. However, 24 million tons had both their origin and destination in West Virginia. Motor carrier traffic totaled 82 million tons for the same period.

[19] Railroad tonnages were calculated based on the Surface Transportation Board's confidential Carload Waybill Sample (CWS).

Table 2.7
1998 Originating Study Region Rail Traffic

Originating County	Coal (Tons)	Chemicals (Tons)	Other Commodities (Tons)	TOTAL
Boone	**D**	----	----	**D**
Cabell	----	----	46,800	46,800
Clay	2,794,600	----	----	2,794,600
Jackson	----	----	52,100	52,100
Kanawha	3,556,800	415,400	99,700	4,071,900
Lincoln	----	342,280	30,500	372,780
Logan	**D**	----	----	**D**
Mason	----	333,700	21,000	354,700
Mingo	23,110,220	----	----	23,110,220
Putnam	----	----	14,300	14,300
Roane	----	----	----	----
Wayne	2,088,400	224,280	7,420	2,320,100
Wood	----	72,800	36,600	109,400
TOTAL	**73,046,872**	**1,388,460**	**308,420**	**74,743,752**

D = Withheld to prevent disclosure of confidential data.
Source: Surface Transportation Board 1998 Carload Waybill Sample
Note: ---- indicate that the Carload Waybill Sample capture no originating railroad traffic for the county.

Figure 2.2
1998 Originating Study Region Rail Traffic

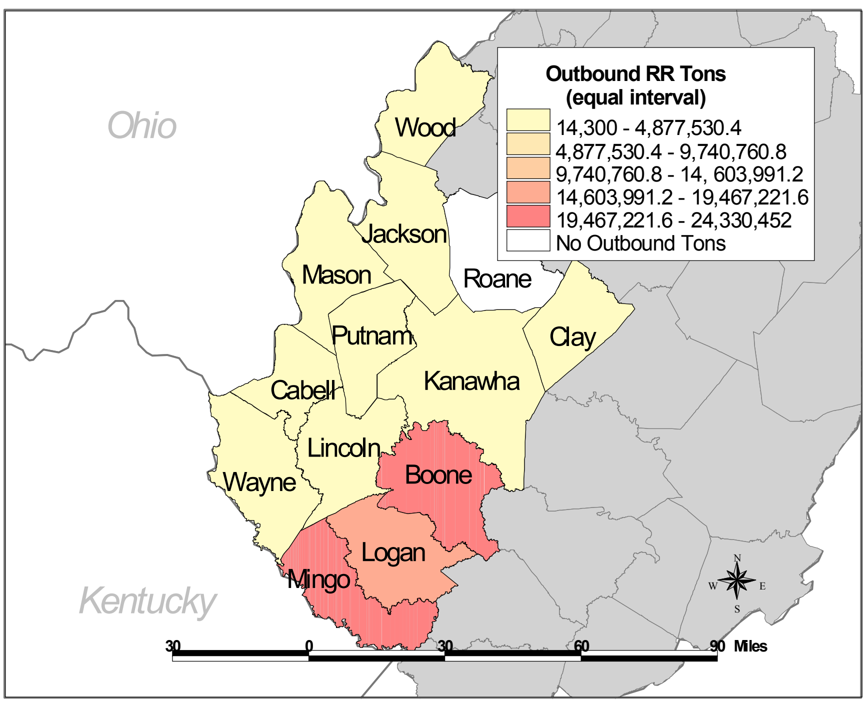


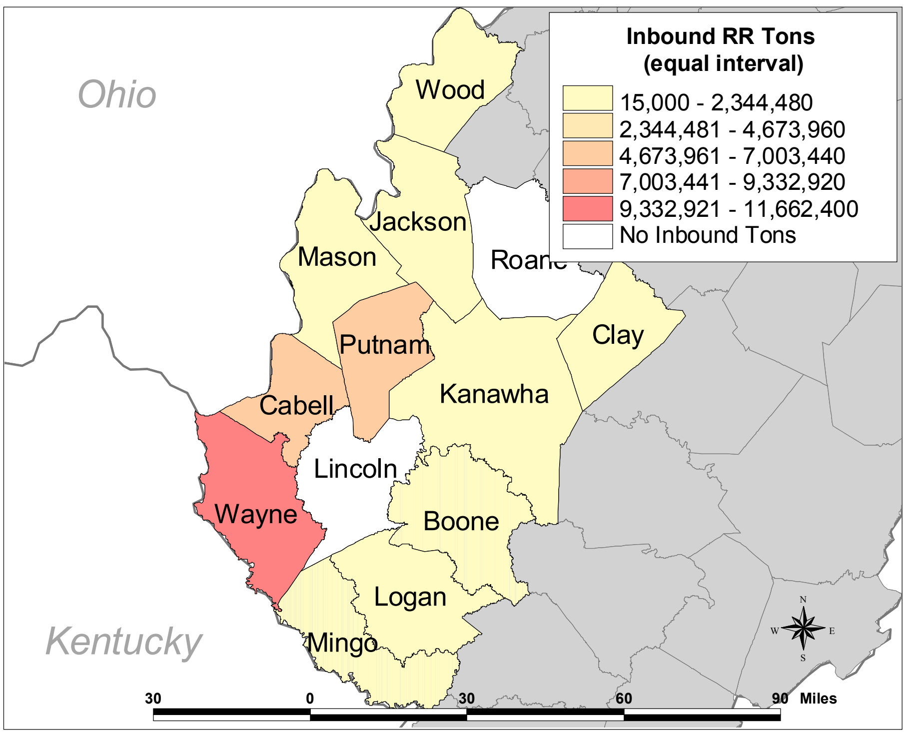
Table 2.8
Terminating Study Region Rail Traffic

Originating County	Coal (Tons)	Chemicals (Tons)	Other Commodities (Tons)	TOTAL
Boone	----	----	205,300	205,300
Cabell	6,880,900	23,100	38,600	6,942,600
Clay	----	----	15,000	15,000
Jackson	----	20,500	28,200	48,700
Kanawha	----	793,820	302,400	1,096,220
Lincoln	----	----	----	----
Logan	----	----	179,200	179,200
Mason	----	305,800	76,000	381,800
Mingo	----	----	16,000	16,000
Putnam	**D**	----	----	**D**
Roane	----	----	----	----
Wayne	**D**	171,000	142,400	11,662,400
Wood	----	305,900	152,900	458,800
TOTAL	**24,855,000**	**1,620,120**	**1,156,000**	**27,631,120**

D = Withheld to prevent disclosure of confidential data.
Source: Surface Transportation Board 1998 Carload Waybill Sample

Note: ---- indicate that the Carload Waybill Sample capture no originating railroad traffic for the county.

Figure 2.3
Terminating Study Region Rail Traffic



Transported volumes are reported by county and by commodity groupings which are limited to coal, chemicals, and other commodities in order to preserve the confidentiality shipper and carrier-specific information.

Outbound coal movements dominate originating rail traffic, with the 73 million 1998 tons representing 97.7 percent of the study region total. The dominance of coal as an originating commodity reflects both the importance of this mineral in terms of aggregate economic activity within the region and the fact that manufactured or processed commodities almost always leave the region by truck.

Ironically, coal movements also dominate terminating railroad traffic within the study region, with the nearly 25 million tons of delivered coal representing 89.8 percent of terminating railroad traffic. The majority of the terminating coal is bound for transload facilities on the Ohio and Big Sandy Rivers where it is transferred to barge. In addition to coal movements, the rail data also reflect the movement of primary metal, metal scrap, and chemical feedstocks into the study region.

2.2.2 Estimating Future Coal Traffic

Clearly, railroad transportation practices within the study region are almost entirely dictated by the demand for the transportation of coal. At the same time, a number of factors have combined that point to potential reductions in the production of West Virginia coal and the subsequent need for its transport.[20] Thus, a forward-looking assessment of the transportation challenges and opportunities within the study region requires a reasonable forecast of future coal movements to and from the region.

While developing the necessary forecasts within the context of the current study would be impossible, similar forecasts have been developed in conjunction with other CBER investigations.[21] It was, therefore, possible to modify these existing forecasts for inclusion here.

Table 2.9 provides county-specific coal production forecasts under two scenarios for Boone, Kanawha, Logan, and Mingo. Together, these counties accounted for 93 percent of the coal originated within the study region during 1998. The two scenarios include a baseline scenario under

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[20] The specific factors include electric utility restructuring, increasingly stringent air quality standards, increased international competition, and potential prohibitions on some forms of surface mining.

[21] See Dr. Michael J. Hicks and Dr. Mark L. Burton, "The Localized Impacts of Reduced Coal Production: Special Report to the West Virginia Senate Finance Committee," Center for Business and Economic Research, Marshall University, Available May 1, 2000. The reader should be aware that the numbers reported here are preliminary estimates, so that final estimates may vary slightly.

Table 2.9
Predicted Coal Production
(Output in Millions of Tons)

	BOONE		KANAWHA		LOGAN		MINGO	
Year	**Base**	**Altern.**	**Base**	**Altern.**	**Base**	**Altern.**	**Base**	**Altern.**
2001	17.6	11.9	9.2	1.1	6.7	1.2	12.2	7.5
2002	17.3	11.6	9.2	1.1	6.5	1.0	12.2	7.5
2003	17.0	11.3	9.2	1.1	6.3	0.9	12.2	7.5
2004	16.7	11.1	8.8	0.8	6.1	0.7	11.6	7.0
2005	16.4	10.8	8.4	0.5	6.0	0.5	11.1	6.6
2006	16.1	10.5	8.1	0.2	5.8	0.4	10.6	6.1
2007	15.9	10.2	7.7	0.0	5.6	0.2	10.1	5.7
2008	15.6	10.0	7.4	0.0	5.5	0.0	9.7	5.3
2009	15.3	9.7	7.0	0.0	5.3	0.0	9.2	5.0
2010	15.1	9.4	6.7	0.0	5.2	0.0	8.8	4.6

Source: CBER calculations.

which production is impacted by electric utility restructuring, more stringent clean air regulations, and increased international competition. The alternative scenario includes each of the baseline effects, plus the predicted impact of the immediate elimination of surface mining.

2.2.3 Pass-Through Traffic

As in the case of motor carriage, some of the railroad traffic observed within the study region neither originates or terminates there. Unlike trucking, however, this pass-through traffic (38%) does not represent the majority of total study region rail tonnage. There are a number of reasons this is the case. Some are tied to the route networks of the two rail carriers. The capacity that is absorbed by the large volume of coal traffic is also a contributor to the relative lack of pass-through traffic. Finally, the specific physical characteristics of trackage designed to accommodate large volumes of coal are also associated with the modest volume of pass-through traffic. These topics are discussed at length in Section 3.

2.2.4 Beyond the Study Region

As indicated, roughly one third of all originating study region railroad traffic also terminates in region. Final destination states and provinces for the traffic that does leave the study region are summarized in Table 2.10, while the origin states for commodities moving into the study region are summarized in Table 2.11. Values in both tables are aggregated across the study region to ensure the confidentiality of individual shippers and carriers. These same values are depicted graphically in Figures 2.4 and 2.5.

Apart from coal movements that both originate and terminate in West Virginia, the largest destination state for West Virginia coal was Virginia. Importantly, the majority of this coal was shipped for subsequent export and increasing competition in international fuel markets has since sharply reduced this traffic. Coal traffic destined for Ohio and North Carolina was also an important part of overall traffic.[22] Chemical shipments were bound for a variety of destinations, with Texas receiving the greatest overall tonnage. Finally, with regard to other commodities, no single destination state appears dominant. Instead, the various movements within this commodity grouping were bound for a wide array of states, primarily within the mid-west and mid-Atlantic regions.

Interestingly, the data reveal roughly five million tons of inbound coal from other states in addition to the coal that both originates and terminates in the study region.[23] In addition to this coal, a significant volume of chemical traffic originates in the chemical producing regions of Texas, Louisiana, and Alabama. As with the case of outbound traffic, “Other” commodity traffic terminating in the study region had a wide array of origins.

[22] Much of the coal moving by rail to Ohio is actually destined for Canada. After reaching Ohio, it is loaded onto Great Lakes vessels for further transport.

[23] The careful reader will notice that originating and terminating study region values do not quite reconcile. The minor deviations owe to the sample nature of the data.

Table 2.10
Destination States for Originating Study Region Railroad Tonnages
(Parenthetical Values Indicate Average Shipment Miles)

Destination State or Province	Coal	Chemicals	Other Commodities
Alabama	647,400 **(764)**	3,900 **(784)**	1,800 **(1,648)**
Arkansas		6,600 **(1,038)**	3,600 **(902)**
Arizona		7,800 **(2,248)**	
California		49,900 **(2,778)**	6,400 **(2,859)**
Delaware	225,300 **(881)**	44,500 **(615)**	
Florida	28,200 **(1,225)**	19,600 **(1,009)**	
Georgia	4,064,500 **(604)**	112,400 **(825)**	15,500 **(668)**
Illinois	348,800 **(605)**	44,400 **(565)**	49,400 **(505)**
Indiana	2,048,700 **(484)**	70,000 **(471)**	11,200 **(490)**
Kansas			3,400 **(831)**
Kentucky	3,049,800 **(394)**	7,300 **(425)**	7,120 **(207)**
Louisiana		31,600 **(1,354)**	14,480 **(1,225)**
Massachusetts		11,400 **(985)**	

Table 2.10 (cont.)

Destination State or Province	Coal	Chemicals	Other Commodities
Maryland	289,100 **(602)**	30,600 **(627)**	72,200 **(372)**
Michigan	2,987,500 **(491)**	25,200 **(455)**	5,500 **(466)**
Minnesota			3,000 **(906)**
Missouri		26,860 **(723)**	3,200 **(810)**
Mississippi		56,800 **(967)**	
North Carolina	11,017,652 **(518)**	19,100 **(496)**	
New Jersey		16,800 **(829)**	6,000 **(554)**
New Mexico		7,200 **(2,600)**	2,700 **(1,838)**
New York	814,400 **(742)**	32,500 **(742)**	9,400 **(816)**
Ohio	8,434,300 **(304)**	29,880 **(284)**	4,200 **(202)**
Pennsylvania	440,200 **(787)**	73,600 **(672)**	6,600 **(506)**
South Carolina	432,200 **(587)**	28,620 **(828)**	4,160 **(437)**
Tennessee	59,700 **(253)**	21,800 **(628)**	
Texas		369,400 **(1,451)**	16,560 **(1,457)**
Utah			2,600 **(2,022)**
Virginia	18,761,300 **(459)**	41,700 **(452)**	
Washington		3,900 **(2,829)**	
Wisconsin			24,000 **(866)**
West Virginia	19,397,800 **(135)**	195,100 **(66)**	35,400 **(161)**

Source: Surface Transportation Board 1998 Carload Waybill Sample

Table 2.11
Origination States for Terminating Study Region Railroad Tonnages
(Parenthetical Values Indicate Average Shipment Miles)

Origin State or Province	Coal	Chemical	Other Commodities
Alberta, Canada		7,400 **(1,466)**	3,800 **(1,287)**
Alabama		255,800 **(812)**	17,200 **(863)**
Arkansas			3,600 **(777)**
Colorado			6,100 **(1,606)**
DC			5,700 **(587)**
Florida		35,400 **(1,042)**	15,000 **(1,256)**
Georgia		53,800 **(588)**	19,100 **(619)**
Idaho			4,900 **(2,084)**
Illinois		29,500 **(568)**	78,200 **(549)**
Indiana		22,200 **(530)**	121,100 **(518)**
Kansas		3,700 **(1,100)**	
Kentucky	1,994,900 **(134)**	103,800 **(560)**	14,200 **(272)**
Louisiana		249,220 **(1,382)**	
Maryland		4,900 **(650)**	37,300 **(515)**
Maine			5,700 **(1,229)**
Michigan		18,200 **(450)**	56,200 **(426)**
Missouri			59,400 **(712)**
Mississippi		53,100 **(1,127)**	
Montana			6,700 **(2,148)**
North Carolina		7,800 **(769)**	

Table 2.11 (cont.)

Origin State	Coal	Chemical	Other Commodities
New Jersey		3,800 **(573)**	11,200 **(723)**
New York		55,600 **(586)**	
Ohio		124,600 **(259)**	53,200 **(291)**
Oklahoma			16,000 **(1,201)**
Ontario, Canada		121,000 **(552)**	26,900 **(1,195)**
Oregon			5,800 **(2,774)**
Pennsylvania		6,400 **(700)**	21,800 **(618)**
South Carolina		6,700 **(855)**	37,300 **(831)**
Tennessee		66,800 **(618)**	
Texas		240,900 **(1,398)**	2,000 **(1,458)**
Virginia	982,100 **(240)**	3,500 **(446)**	193,100 **(426)**
West Virginia	21,878,000 **(105)**	146,000 **(82)**	327,500 **(164)**
Wyoming			7,000 **(1,562)**

Source: Surface Transportation Board 1998 Carload Waybill Sample

Figure 2.4
Destinations for Originating Study Region Railroad Tonnages

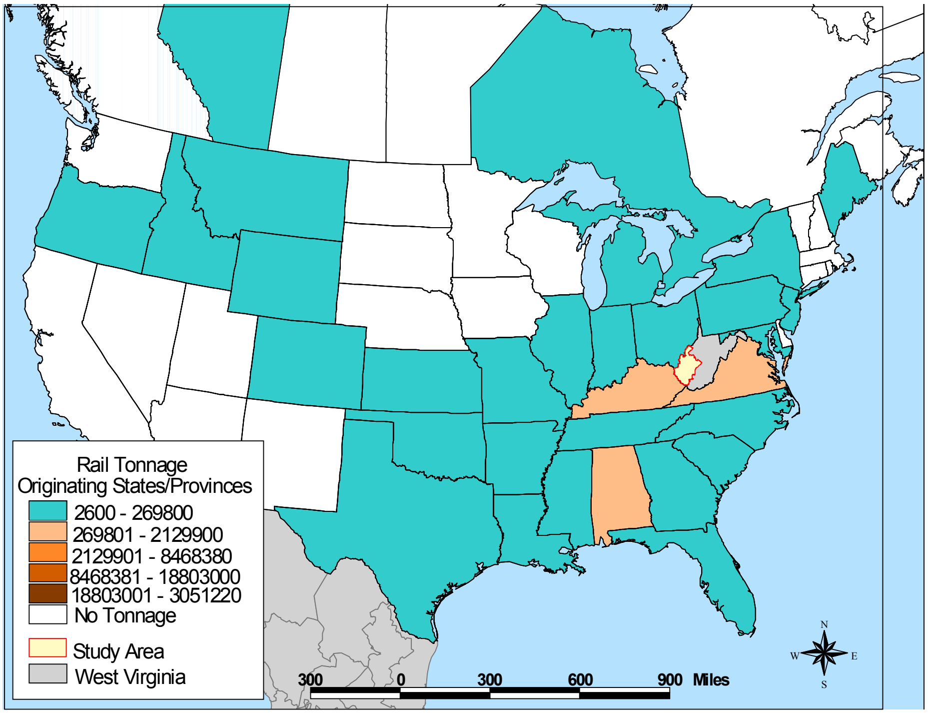
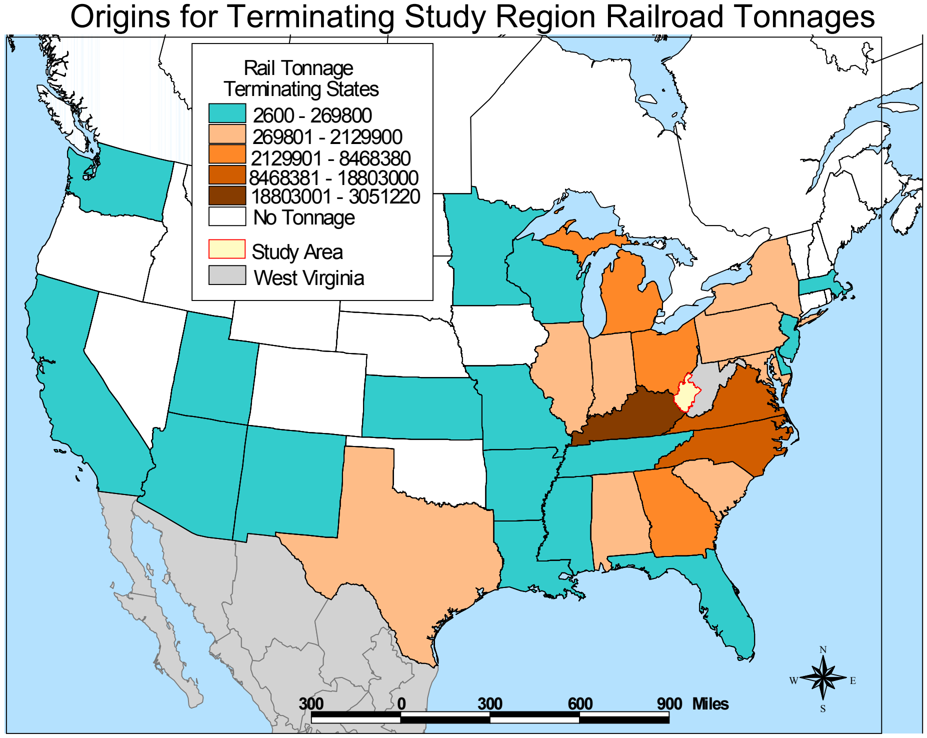


Figure 2.5
Origins for Terminating Study Region Railroad Tonnages



2.3 WATERBORNE COMMERCE

The study region contains three principal navigable waterways and their tributaries – the Ohio, Big Sandy, and the Kanawha Rivers. Together, these rivers host several million tons of commercial barge traffic each year. In many instances commercial navigation complements other surface modes. In other instances, there appears to be direct competition between barge transport and Class I rail carriers.

2.3.1 Overall Barge Traffic

Tables 2.12 summarizes barge traffic both originating and terminating in the study region. These results are disaggregated only by the three general commodity groupings used so far within this report.

Table 2.12
1998 Originating and Terminating Barge Tonnage

	Coal	Chemicals	Other Commodities
Originating Tonnage	39,828,928	52,607	7,195,776
Terminating Tonnage	1,147,609	699,544	6,440,804
Intra-Region Tonnage	767,151		144,637
TOTAL	**41,743,688**	**752,151**	**13,781,217**

Source: 1998 Waterborne Commerce Statistics

These data indicate that the study region originated nearly 40 million tons of coal during 1998 – an amount roughly equal to the sum of the truck and rail volumes that terminated within the study area (38 million). The region also originated over 7 million tons of other commodities, the majority of which were petroleum products.

The region also terminated over 8 million tons of barge traffic in 1998, including 700,000 tons of chemicals and a broad array of other commodities, most notably limestone, sand, aggregates, and metallic ores.[24]

[24] In many cases, the terminating shipments utilized the same general barge type necessary for the origination of coal traffic.

2.3.2 Pass-Through Traffic

As is the case of all modes, the ability of the available infrastructure to accommodate local traffic is affected by the volume of pass-through traffic that also utilizes the local infrastructure. Based on the total barge traffic moving to, from, and within, the study region (approximately 56.2 million tons) and the tonnages locked through at the Greenup and Willow Island navigation locks, we estimate that pass-through traffic accounted for roughly half of the barge traffic observed within the study region.

2.3.3 Beyond the Study Region

Unlike the cases of motor and rail carriage, nearly all the barge traffic that originates within the study area terminates elsewhere and the traffic that terminates within the region almost always originates elsewhere. Tables 2.13 and 2.14 summarize the origin and destination states of study region barge traffic.

Table 2.13
Destination States of Barge Traffic Originating in the Study Region

Terminating State	Coal	Chemicals	Other Commodities
Alabama	349,677		6,598
Florida	90,606		
Iowa	160,728		
Illinois	1,006,067	7,255	3,000
Indiana	1,275,027		20,424
Kentucky	4,738,668		2,766,996
Louisiana	2,294,774		6,458
Minnesota	24,939		
Missouri	486,886		96,050
Mississippi	52,537		
Ohio	14,030,930	666	1,743,480
Oklahoma	114,062		
Pennsylvania	7,778,705	19,360	1,186,321
Tennessee	364,396	1,647	22,823
Texas		23,679	
Wisconsin	1,527		
West Virginia	7,059,399		1,343,626

Source: 1998 Waterborne Commerce Statistics

Table 2.14
Origin States of Barge Traffic Terminating in the Study Region

Originating State	Coal	Chemicals	Other Commodities
Alabama			3,849
Arkansas		22,950	4,108
Florida		500	
Illinois		28,362	593,995
Indiana			2,108,346
Kentucky	39,015	10,191	1,586,229
Louisiana		446,539	283,128
Minnesota			11,504
Missouri		9,698	97,654
Ohio	40,724	1,374	1,202,256
Oklahoma		5,000	
Pennsylvania	1,953	5,910	58,919
Tennessee		5,200	7,275
Texas		132,120	477,834
West Virginia	1,065,917	31,700	5,707

Source: 1998 Waterborne Commerce Statistics

The only remarkable observation stemming from these data is that most study region shipments tend to originate or terminate in states relatively near the region, including Illinois, Indiana, Kentucky, Pennsylvania, and West Virginia. Thus, these data confirm the generally accepted notion that Ohio River barge traffic travels relatively short distances compared to traffic on other segments of the inland navigation system.

2.4 AIR FREIGHT

What is generally referred to as “air freight” is actually divisible into three distinct forms of transportation – air cargo, cargo hold or “belly freight,” and air express. Air cargo shipments typically involve relatively large shipments of higher-valued, light-weight commodities packed in specially designed aircraft containers.[25] Belly freight refers to the more sporadic

[25] Examples of commodities routinely shipped by air include high-end electronics, pharmaceuticals, clothing apparel, and increasingly perishable food stuffs.

movement of commodities in the cargo holds of passenger aircraft. Air express involves the shipment of small express parcels through firms such as FedX, the U.S. Postal Service, Airborne, and UPS.[26]

The study region contains three commercial airports – Yeager in Charleston, Tri-State in Wayne County, and the Wood County Airport near Parkersburg – at which shippers may originate or terminate belly freight. However, the relatively small size of the aircraft that serve Tri-State and Wood County necessarily constrains shipment sizes at that location. The region offers a full complement of air express services. FedX transfers express to and from aircraft at Tri-State, while other air express providers transfer air express shipments outside the study region. Finally, no study region airport is served by air cargo aircraft, so that all air cargo shipments are transloaded outside the study region – principally at Cincinnati or Columbus.

Section 2.1.2 concludes that there are no available data that reliably describe air cargo or air freight shipments to and from the study region, although the shipper surveys certainly provide evidence of such movements. The same is largely true of express shipments to and from the region except to note that FedX originates and terminates eight flights per night at Tri-State, representing an aggregate inbound and outbound total lift of several thousand tons per year.

2.5 PETROLEUM AND NATURAL GAS PIPELINE SHIPMENTS

Unlike other modes of surface transportation, pipeline movements go largely unobserved by the public as a whole. Within many regions, however, pipelines represent an important means for both originating and terminating commodity movements. Within the study region, the principal uses of pipeline transport are the introduction of the State's natural gas production into the national distribution system and the acquisition of petroleum products for distribution. A large volume of petroleum products is also moved by pipeline from refining facilities in eastern Kentucky to a transload location near Kenova, West Virginia for subsequent barge transport.

2.5.1 Natural Gas Production and Transportation

Relatively small by comparison to natural gas producing states in the western and southwestern regions of the United States, West Virginia is still the largest natural gas producing state east of the Mississippi River,

[26] Some carriers such as Airborne or UPS offer all three types of air freight services.

each year producing roughly 175 trillion cubic feet of gas for distribution across the northeast.[27]

Typically, independent producers access gathering pipeline networks operated by firms that both produce and transport natural gas. The gathered product is then processed and introduced into the major transmission pipelines that traverse the study region from south to north. There are also numerous underground storage locations within the State.[28]

Beyond local utility usage, there are few significant natural gas consumers within the study region. At one time, natural gas was used as a feedstock commodity for chemical manufacturing in the Charleston area. However, anecdotal evidence suggests that this practice ceased decades ago. There are currently plans for the construction of two peak-load electric generating facilities within the region – one in Putnam County and one in Wayne County. Local producers have suggested that the demand represented by these facilities will be important because the generating facilities will remove natural gas from the pipeline at a time (summer months) when historically high pipeline volumes have made it difficult for local producers to introduce their output into the transmission system.

There is currently no transloading of natural gas to other transport modes within the study region. The movement of natural gas by truck, rail, or barge requires that the gas be liquefied through a cooling process. Generally, where volumes are sufficient to support a liquefaction facility, the construction of additional pipeline facilities is a more cost effective alternative.

2.5.2 Petroleum Product Pipelines

Within the study region, there are two instances of petroleum products moving by pipeline. These include the movement of both feedstock and finished petroleum products into the Charleston area and the movement of petroleum products from Kentucky to Kenova, West Virginia for transload to barge. In both cases, confidentiality concerns make it impossible to present more specific information regarding quantities or specific products. However, in the case of the refined petroleum products that are moved by pipeline to the Charleston area, it should be observed that a portion of these movements support final delivery by truck.

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[27] See Natural Gas Annual: 1998, Energy Information Administration, Office of Oil and Gas, US Department of Energy, DOE/EIA-0131(98), October, 1999, Table 2, p. 7.

[28] In some instances, these underground storage facilities are located near primary transmission lines. For other storage fields, this is not the case. The principal determinant of storage location is geology rather than transportation.

3. STUDY REGION PASSENGER FLOWS

Estimates suggest that the study region has a population of over 679,000, with another 265,000 nearby residents in the Kentucky and Ohio counties that help to form the Huntington and Parkersburg Metropolitan Statistical Areas (MSA's). This population is, however, remarkably dispersed. Of the 679,000 residents within the 13 county region, no one resides in a city or town with a population that exceeds 60,000. Indeed, most regional inhabitants live in rural areas. This relatively extreme population dispersion is certainly important in explaining commodity flows. It is, however, even more important to the understanding of the movement of individuals to, from, and within the study region.

3.1 PASSENGER VEHICLE FLOWS

By describing commodity flows, Section 2.1 provides some sense of heavy vehicle movements within the study region. The picture of overall vehicle traffic is made clearer still by considering passenger vehicle movements.[29]

Neither county nor State specific data describing personal vehicle movements are currently available. Reliable national data are, however, available through the 1990 Personal Transportation Survey.[30] Anecdotal information suggests that West Virginian's driving habits are, however, substantially different from residents elsewhere, so it was necessary to modify these national data to reflect the specific demographic and spatial characteristics of the State. This involved a two-step process. First, the national values were transformed to reflect the relatively dispersed nature of West Virginia residents based on the assumption that greater dispersion leads to longer vehicle trips.[31] Next, driving habits were modified to reflect age and income differences between West Virginia's population and the national population as a whole. Results of this process are presented in Table 3.1.

These results suggest that, with the exception of Cabell County, most study region residents drive considerably more than the 28.7 mile national daily average.

[29] This picture is, nonetheless, incomplete. The study does not include commercial vehicle movements where commodity flows are not involved – such as service vehicle traffic.

[30] See 1990 Nationwide Personal Transportation Survey (US DOT, Federal Highway Administration, Office of Highway Management), Washington, DC.

[31] This method applies a one-to-one linear relationship between population density and vehicle travel, so that it, at best, provides a rough estimate of the difference between West Virginia travel patterns and the national average.

Table 3.1
Study Region Passenger Motor Vehicle Flows

County	Total Population	Largest City	Largest City Pop.	Sq. Miles	Per-Capital Daily Vehicle Miles	Aggregate Daily Vehicle Miles	Aggregate Daily Vehicle Miles / Square Mile
Boone	26,422	Madison	3,051	503	53	1,404,732	2,793
Cabell	95,061	Huntington	54,844	282	30	2,873,126	10,188
Clay	10,513	Clay	592	342	55	577,393	1,688
Jackson	27,554	Ravenswood	4,189	466	53	1,450,254	3,112
Kanawha	203,646	Charleston	57,287	903	39	7,986,773	8,845
Lincoln	22,220	Harts	2,332	437	53	1,184,345	2,710
Logan	41,293	Amherstdale	2,435	454	50	2,067,437	4,554
Mason	25,971	Pt. Pleasant	4,996	432	53	1,364,864	3,159
Mingo	32,562	Williamson	4,154	423	51	1,666,983	3,941
Putnam	50,204	Hurricane	4,461	346	46	2,294,447	6,631
Roane	15,313	Spencer	2,279	484	55	839,908	1,735
Wayne	42,077	Kenova	3,748	506	51	2,133,141	4,216
Wood	87,029	Parkersburg	33,862	367	38	3,331,693	9,078
Average	**52,297**		**13,710**	**457**	**48**	**2,244,238**	**4,819**
Total	**679,865**	**0**	**178,230**	**5,945**		**29,175,096**	

Sources: 1990 Nationwide Personal Transportation Survey (US DOT, Federal Highway Administration, Office of Highway Management) and CBER Calculations.

3.2 RAIL PASSENGER TRAFFIC

Amtrak operates three eastbound (No. 50) and three westbound (No. 51) trains through the study region each week. Huntington and Charleston are the only two station stops within the region. Eastbound, Train 50 originates in Chicago, with stops in Indianapolis and Cincinnati in advance of its arrival in Huntington and Charleston. The train continues through southern West Virginia, providing service to several communities there before leaving the State for final destinations that include Richmond, Virginia, Washington, DC, and destination in the northeast. The westbound routing of Train 51 simply reverses the eastbound route. During the 1999 federal fiscal year, 9,282 Amtrak passengers arrived at or departed from Charleston, while 7,669 passengers arrived at or departed from Huntington during the same period. It should be noted that the ratio of rail passengers to airline passengers in Huntington (6.4%) is relatively high when compared to national figures.

3.3 AIRLINE PASSENGER TRAFFIC

As previously noted, the study region contains three airports that support commercial aviation, including commercial passenger operations. These include Yeager in Charleston, Tri-State in Wayne County, and Wood County Airport near Parkersburg. In 1996, these airports enplaned approximately 390 thousand airline passengers. Very little information is available regarding the final destinations of these passengers. However, Table 3.2 summarizes available connections from these three airports.

Table 3.2
Study Region Commercial Passenger Airline Service[32]

YEAGER AIRPORT (270,000 Enplanements)

Arrv. Flights	Carrier and Connection	Depart. Flights	Arrv. Flights	Carrier and Connection	Depart. Flights
	ASA			**United Express**	
7	Atlanta	7	3	Chicago (O'Hare)	3
			5	Washington (Dul.)	5
	Comair				
5	Cincinnati	5		**US Airways / Express.**	
	Continental Exprs.		----	Buffalo	1
4	Cleveland	4	5	Charlotte	5
			2	Philadelphia	2
	Northwest Airlink		5	Pittsburgh	5
5	Detroit	5	3	Washington (Natl.)	3

TRI-STATE AIRPORT (61,000 Enplanements)

Arrv. Flights	Carrier and Connection	Depart. Flights	Arrv. Flights	Carrier and Connection	Depart. Flights
	ASA			**US Airways Exprs.**	
3	Atlanta	3	6	Pittsburgh	6
			4	Charlotte	4

Wood County Airport (57,000 Enplanements)

Arrv. Flights	Carrier and Connection	Depart. Flights	Arrv. Flights	Carrier and Connection	Depart. Flights
	US Airways Exprs.				
9	Pittsburgh	9			
3	Washington, DC	3			

[32] For the purpose of creating Table 3.2, "daily" means available Monday through Friday. Weekend variances in schedules were ignored.

4. STUDY REGION INFRASTRUCTURES

The commodity and passenger flows described thus far rely on the availability of appropriate transportation infrastructures. In the cases of highway, air, and waterborne transport, these infrastructures are largely provided by the public sector. In the case of railroad and pipeline transport, infrastructure is provided by the privately held firms who provide railroad service, although infrastructure projects are often undertaken with the cooperative input and financial support of the public sector.

Transportation infrastructures are typically long-lived. Thus, whether infrastructure decisions are made by the public sector, the private sector, or a combination of both, efficient and effective planning requires decision-makers to both accurately assess current capacities and successfully predict desired capacities well into the future. The Phase I examination of infrastructures focuses on the former of these requirements, while a forward-looking description of future infrastructure needs is reserved for Phase II of the study.

4.1 HIGHWAY INFRASTRUCTURE

4.1.1 Study Region Overview

Table 4.1 provides a general description of the highway infrastructure available in each of the study region counties, along with a few spatial and demographic characteristics. These route segments are depicted graphically in Figure 4.1.[33] The figures help to capture the effects of the spatial population dispersion described above. Table 4.2 divides roadway miles by the population density, defined here as population per square mile. These figures reflect precisely what would be expected. More densely populated areas require relatively fewer miles of roadways, while more sparsely populated areas require relatively large roadway mileages. These values merely quantify what policy-makers routinely claim – the highly dispersed nature of the region's population places relatively large demands on highway and road building funds in a region where building costs are as much as four times the national norm.

While the comparison of roadway miles to population densities helps to clarify or characterize the challenge faced by State highway officials, a more disaggregated analysis of route characteristics is even more instructive.

[33] The graphical represntation in Figure 4.1 was developed based on the National Planning Highway Network (NHPN) GIS coverage. Consequently, the road representations are not consistent with the State taxonomy that divides roadways into Expressways, Trunklines, Feeders, and Local Roads.

Table 4.1
Study Region Roadways Summary

COUNTY CHARACTERISTICS					MILES OF ROADWAY			
County	Total Pop.	Largest City	Largest City Pop.	Sq. Miles	Express way	Trunkline	Feeder	Local
Boone	26,422	Madison	3,051	503	23	2	88	276
Cabell	95,061	Huntington	54,844	282	51	20	60	519
Clay	10,513	Clay	592	342	9	24	41	460
Jackson	27,554	Ravenswood	4,189	466	53	24	47	783
Kanawha	203,646	Charleston	57,287	903	100	43	66	1,151
Lincoln	22,220	Harts	2,332	437	5	38	64	557
Logan	41,293	Amherstdale	2,435	454	18	37	36	395
Mason	25,971	Pt. Pleasant	4,996	432	37	37	59	660
Mingo	32,562	Williamson	4,154	423	21	56	40	320
Putnam	50,204	Hurricane	4,461	346	14	24	66	541
Roane	15,313	Spencer	2,279	484	15	56	46	729
Wayne	42,077	Kenova	3,748	506	6	50	117	705
Wood	87,029	Parkersburg	33,862	367	52	7	85	677
TOTAL	**679,865**		**178,230**	**5,945**	**404**	**418**	**815**	**7,773**

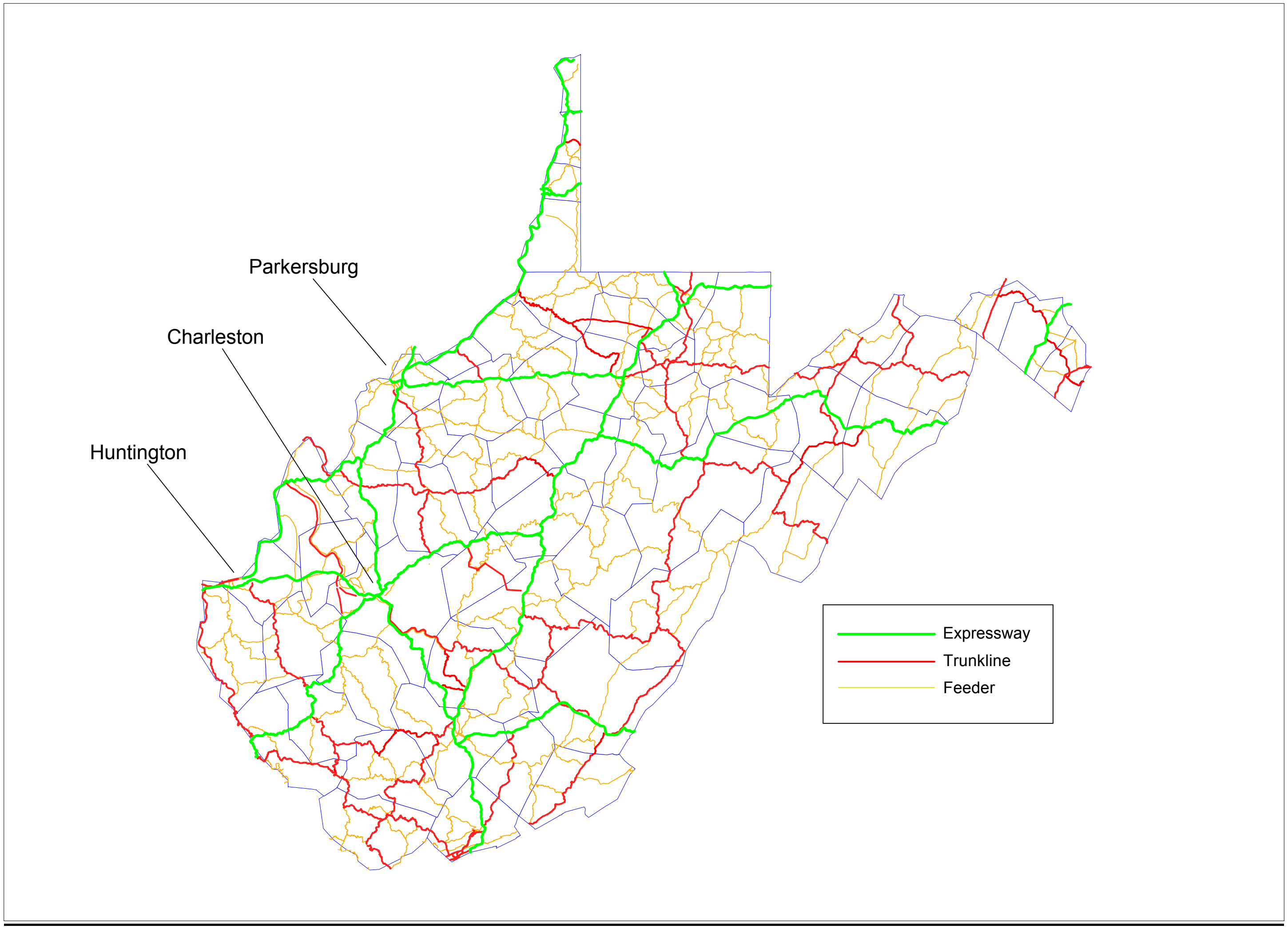
Source: West Virginia Department of Transportation, Division of Highways 1999 Annual Inventory Tables.

Table 4.2
Study Region Roadways and Population Density

COUNTY CHARACTERISTICS					ROADWAY / POP. DENSITY			
County	Total Pop.	Largest City	Largest City Pop.	Sq. Miles	Express way	Trunkline	Feeder	Local
Boone	26,422	Madison	3,051	503	0.438	0.038	1.675	5.254
Cabell	95,061	Huntington	54,844	282	0.151	0.059	0.178	1.540
Clay	10,513	Clay	592	342	0.293	0.781	1.334	14.964
Jackson	27,554	Ravenswood	4,189	466	0.896	0.406	0.795	13.242
Kanawha	203,646	Charleston	57,287	903	0.443	0.191	0.293	5.104
Lincoln	22,220	Harts	2,332	437	0.098	0.747	1.259	10.955
Logan	41,293	Amherstdale	2,435	454	0.198	0.407	0.396	4.343
Mason	25,971	Pt. Pleasant	4,996	432	0.615	0.615	0.981	10.978
Mingo	32,562	Williamson	4,154	423	0.273	0.727	0.520	4.157
Putnam	50,204	Hurricane	4,461	346	0.096	0.165	0.455	3.729
Roane	15,313	Spencer	2,279	484	0.474	1.770	1.454	23.042
Wayne	42,077	Kenova	3,748	506	0.072	0.601	1.407	8.478
Wood	87,029	Parkersburg	33,862	367	0.219	0.030	0.358	2.855
TOTAL	**679,865**		**178,230**	**5,945**	**0.328**	**0.503**	**0.854**	**8.357**

Source: West Virginia Department of Transportation, Division of Highways 1999 Annual Inventory Tables.

Figure 4.1
Study Region Roadway Route Segments



4.1.2 Dissagregated Roadways and Attriburtes

Tables 4.3 – 4.5 provide county-level route segment attribute information for Expressway, Trunkline, and Feeder route segments. These data provide considerable additional information that is useful in understanding the roadway system within the study region.

As might be expected, Expressway mileage's are greatest in larger and more urban counties such as Cabell, Kanawha, Putnam and Wood.[34] However, the reverse is true with regard to trunkline routes, where relatively rural counties such as Logan, Mingo, Roane, and Wayne tend to have a relatively large share of Trunkline routes. Together, this information suggests a configuration that resembles a hub-and-spoke system where lighter traffic is collected to central locations then moved in greater volumes along central corridors.[35]

Table 4.3
Expressway Route Segments

County	Percent in Urban Area	Average Daily Traffic	Average Number of Lanes	Crash Rate Per 100 M Vehicle Miles	Percentage Heavy Vehicles	Total County Miles of Roadway
Boone	0%	11,365	4.00	86	7.00%	23
Cabell	43%	21,650	3.15	258	9.28%	51
Clay	0%	13,500	4.00	50	17.00%	9
Jackson	0%	16,054	3.58	86	14.79%	53
Kanawha	42%	32,663	4.26	92	13.21%	100
Lincoln	0%	11,688	4.00	68	7.00%	5
Logan	0%	11,040	4.00	71	7.00%	18
Mason	0%	5,123	2.03	344	7.00%	37
Mingo	0%	6,016	3.98	94	8.73%	21
Putnam	25%	40,762	4.00	71	13.16%	14
Roane	0%	13,500	4.00	37	17.00%	15
Wayne	79%	26,042	4.00	57	16.21%	6
Wood	9%	16,709	3.62	179	11.39%	56
ALL COUNTIES	19%	19,689	3.67	141	11.43%	407

[34] This is even more true when one considers that the expressway segments in Boone, Mason, Lincoln, and Logan are non-Interstate routes, with characteristics that are sometimes inferior to those observed on Interstate highways.
[35] The ability to concentrate motor vehicle traffic into densely used corridors is discussed at length in Mark L. Burton, "Transportation Challenges and Opportunities in West Virginia," The Regional Economic Review, Marshall University, Lewis College of Business, Spring, 1999.

Table 4.4
Trunkline Route Segments

County	Percent in Urban Area	Average Daily Traffic	Average Number of Lanes	Crash Rate Per 100 M Vehicle Miles	Percentage Heavy Vehicles	Total County Miles of Roadway
Boone	0%	2,084	2.00	161	7.00%	2
Cabell	23%	8,459	2.42	327	7.69%	20
Clay	0%	1,431	2.00	241	4.20%	24
Jackson	0%	4,010	2.00	229	6.87%	24
Kanawha	62%	12,955	2.88	232	8.81%	43
Lincoln	0%	3,125	2.00	234	6.47%	38
Logan	0%	6,811	2.24	125	7.85%	37
Mason	0%	6,425	2.01	237	11.09%	37
Mingo	0%	5,013	2.00	145	10.90%	56
Putnam	9%	10,305	2.09	130	14.29%	24
Roane	0%	2,906	2.00	257	7.62%	56
Wayne	1%	4,671	2.00	90	15.00%	50
Wood	0%	7,677	2.00	238	7.00%	7
ALL COUNTIES	8%	5,856	2.14	197	9.41%	418

Table 4.5
Feeder Route Segments

County	Percent in Urban Area	Average Daily Traffic	Average Number of Lanes	Crash Rate Per 100 M Vehicle Miles	Percentage Heavy Vehicles	Total County Miles of Roadway
Boone	0%	4,173	2.00	212	8.16%	88
Cabell	41%	10,780	2.45	335	6.42%	60
Clay	0%	2,076	2.00	171	7.00%	41
Jackson	0%	1,574	2.00	556	4.63%	47
Kanawha	35%	8,833	2.12	297	7.44%	64
Lincoln	0%	2,036	2.00	246	5.47%	64
Logan	0%	4,357	2.00	100	6.77%	45
Mason	0%	2,421	2.00	502	5.20%	59
Mingo	0%	3,333	2.00	159	7.08%	40
Putnam	8%	5,353	2.02	252	7.60%	66
Roane	0%	804	2.00	329	5.19%	46
Wayne	5%	2,925	2.06	272	8.31%	117
Wood	39%	10,389	2.29	337	6.59%	85
ALL COUNTIES	11%	4,819	2.08	292	6.81%	822

The Average Daily Traffic (ADT) counts reported in these tables also reflect relative populations along with the pass-through traffic described in Section 2.1.3. The ADT's are generally greatest in Cabell, Kanawha, Putnam, and Wood Counties across all three roadway categories. This disparity would likely be even larger were it not for pass-through traffic. The relatively high usage and associated need for more frequent repairs, combined with the urban nature of these counties suggests a very predictable outcome – If vehicle operators face traffic delays, it is far more likely to be in these counties.[36]

Tables 4.3 – 4.5 reveal significant variations in vehicle crash rates within each of the roadway categories. Rates vary by 690 percent, 360 percent, and 340 percent for Expressway, Trunkline, and Feeder route segments, respectively. These variations appear to owe to the specific attributes that characterize route segments within counties and functional classes. Functional classes are, after all, based on the intended use of the route segment in question, not its physical characteristics. Consequently, a route that is intended for Trunkline or Expressway use may have not been fully developed to its targeted use. For example, State Route 2 in Mason County is classified as an Expressway segment because that is its intended use. However, this particular route segment still has attributes that are more characteristic of Trunkline or Feeder segments, so that the associated crash rate is higher than for fully developed Expressway segments.[37]

4.2 RAILROAD INFRASTRUCTURE

As noted, two Class I railroads provide service to, from, and within the study region – CSXT and Norfolk Southern. Together, they operate approximately 2,632 miles of main-line and branch-line trackage within West Virginia, along with a variety of mechanical, operational, and managerial facilities. Both CSXT and NS have provided CBER and ATI with extensive information detailing the characteristics of their railroad networks both within and beyond the study region. This information is summarized in the text that follows.

4.2.1 CSXT Infrastructure

CSXT maintains and operates significant study region trackage. Its network is depicted in Figure 4.2. Using the Huntington, Kenova,

[36] A more formal analysis of route segment capacity requires information describing the ability to legally overtake (pass) other vehicles. While this information is currently unavailable, it is being developed in conjunction with Phase II research.

[37] For more detailed crash data see, 1998 Accident Data, West Virginia Department of Transportation, Division of Highways, 1998.

Cattletsburg area as a central point of orientation, main-line CSXT trackage stretches northeast through Parkersburg, north toward Columbus Ohio and east through Charleston. CSXT also operates southbound main-line trackage just beyond the study region on the Kentucky side of the Big Sandy River. Finally, a number of branch-lines connect the southern coal producing region to main-line trackage at Barboursville, St. Albans, and Charleston.

The east-west CSXT routing that links Huntington and Charleston consists of high-speed, high-capacity trackage both within and beyond the study region. The vast majority of this routing is double-tracked, with triple mainline trackage in some locations. The entire routing is also controlled by Centralized Traffic Control (CTC).[38] Timetable train speeds are generally 50 m.p.h. for freight traffic and 79 m.p.h. for passenger movements. Moreover, there is nothing particularly problematic with either alignment or grade. The only notable deficiencies in this routing are the width and height restrictions that generally preclude the operation of double-stack container (well) cars and tri-level automobile carriers.

Currently, CSXT estimates that Huntington-Charleston trackage accommodates 30 empty or loaded coal trains and four merchandise trains each day, along with local operations necessary for switching area shippers.[39] Based on the characteristics of this trackage and traffic levels observed on route segments of similar quality elsewhere, it is the author's judgement that the principal east-west CSXT routing is more than adequate to accommodate all current and any foreseeable regional rail traffic.

In addition to the principal east-west route, CSXT also operates what might be termed a "secondary" mainline between Huntington and Parkersburg. The characteristics and configuration of this trackage are certainly adequate to support the roughly 12 trains per day which are currently observed. However, any significant increase in traffic along this routing would likely require infrastructure improvements, including longer sidings, the installation of signals, and improvements to track structures necessary to increase train speeds.

As Figure 4.2 indicates, CSXT provides service to the study region's coal producing counties through two principal branch-lines that diverge from

[38] Different railroads refer to similar signaling systems with differing terminologies. For the sake of consistency, a single set of description is used within the current document. Here, CTC is used to describe a signaling system in which a train dispatcher directly controls track switches and signals from a centralized location.

[39] There is some modest seasonal variation in traffic levels owing to traffic to and from the Great Lakes terminals that close during winter months.

east-west mainline trackage at Barboursville and St. Albans. These two principal branch-lines then split into multiple, short branches that serve various coal producing communities. In general, this branch-line trackage is characterized by attributes that are typical of route segments designed to accommodate long, slow-moving, and reasonably dense local coal traffic, with relatively long sidings and a mixture of CTC and Automatic Block Signals (ABS).[40]

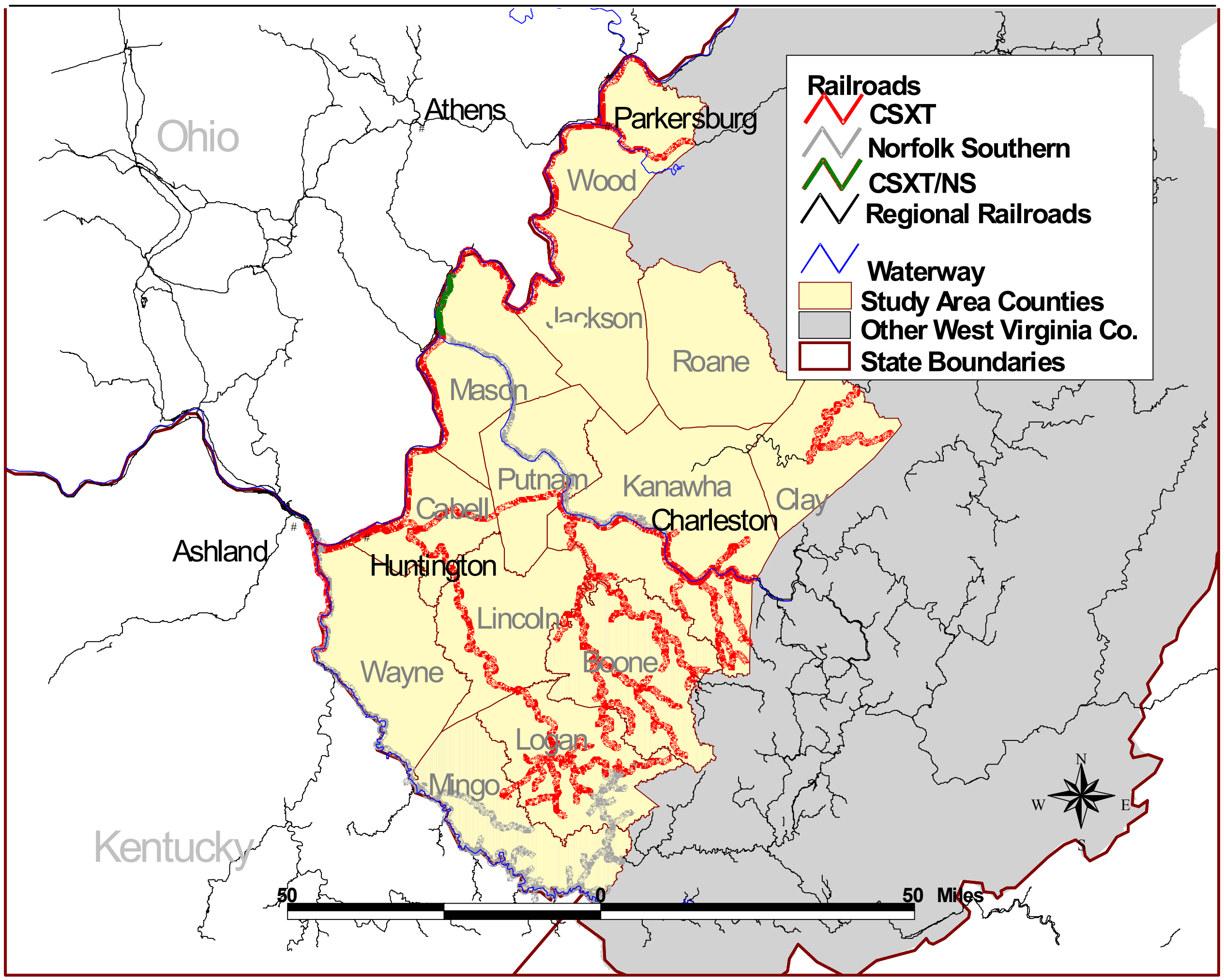
Finally, it is worth noting that the CSXT mainline trackage to which study region routes connect is generally of the same high caliber as the principal east-west mainline between Huntington and Charleston. Specifically, both the mainline trackage located along the west bank of the Big Sandy River and the CSXT route toward Columbus consist of double-tracked, 50 m.p.h. railroad.

Table 4.6
CSXT Study Region Trackage

	Principal Mainline Trackage	**Huntington – Parkersburg Secondary Main**	**Coal Field Branch Lines**
Number of Main Tracks	2	1	1
Number of Sidings	N/A	4	8
Representative Siding Length	N/A	5,000 ft.	9,000 ft.
Signal Systems	CTC	None	CTC / ABS
Typical Timetable Speed	50	30	30
Daily Coal Movements	30	6	30
Other Daily Trains	4	6	30

[40] Automatic Block Signals (ABS) rely on electronic track circuits and train movements that interrupt and restore these circuits as a means of determining signal indications.

Figure 4.2
CSXT Study Region Trackage



4.2.2 Norfolk Southern Infrastructure

NS operates over two principal routes within the study region (Figure 4.3). The first of these extends westward from Bluefield, West Virginia to the State's border, then northward along the Big Sandy River to Kenova in Wayne County. Beyond the study region, the route continues to Portsmouth, Ohio where traffic may proceed toward either Columbus or Cincinnati. This same route proceeds from Bluefield east toward Roanoke and any number of destinations. The characteristics of this route are summarized in Table 4.7. From an operational perspective, the Bluefield-Kenova NS route appears similar to the CSXT mainline trackage described above. The entire route is double tracked, with train movements being controlled by dispatchers with the aid of ABS. The timetable train speeds of 35 to 40 m.p.h. are somewhat slower than similar speeds on CSXT. On the other hand, the NS trackage appears to feature long and relatively frequent sidings, in addition to the two mainline tracks. Estimated daily train movements are in the range of 50 trains per day, with study region traffic being dominated by coal movements.[41]

The second NS mainline route within the study region may well represent an opportunity for increased rail capacity within the study region – particularly for the Charleston area. This route extends to the northeast from Charleston, through Point Pleasant toward Columbus. From Charleston to the south, southeast, the route proceeds through Deepwater, where it eventually converges at Princeton with the principal east-west NS route described above. Prior to the Conrail transaction (Section 4.2.3), this route was owned and operated by Conrail from Deepwater north and by NS between Deepwater and Princeton.

Information describing the physical characteristics of this route between Deepwater and Point Pleasant is not currently available. However, from Deepwater south, the trackage resembles the secondary CSXT mainline between Huntington and Parkersburg, with a single mainline, relatively low train speeds, and shorter sidings. On the lower end of this mainline, between Elmore and Princeton, there are approximately eight trains daily.[42] From Elmore to Charleston, estimates suggest, perhaps, one train per day and from Charleston toward Point Pleasant, there appear to be three daily train movements. The majority of the traffic moving along this routing appears to be comprised of chemical shipments.

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[41] These estimates are based on annual tonnages reported by NS and the assumption of a 100 percent empty return ratio in combination with 10,000 ton train consists.

[42] At Elmore, the route from Princeton diverges into two routes, with one heading north toward Deepwater, while the other proceeds west toward Williamson where it converges with Norfolk Southern's Bluefield-Kenova routing.

Figure 4.3
Norfolk Southern Study Region Trackage

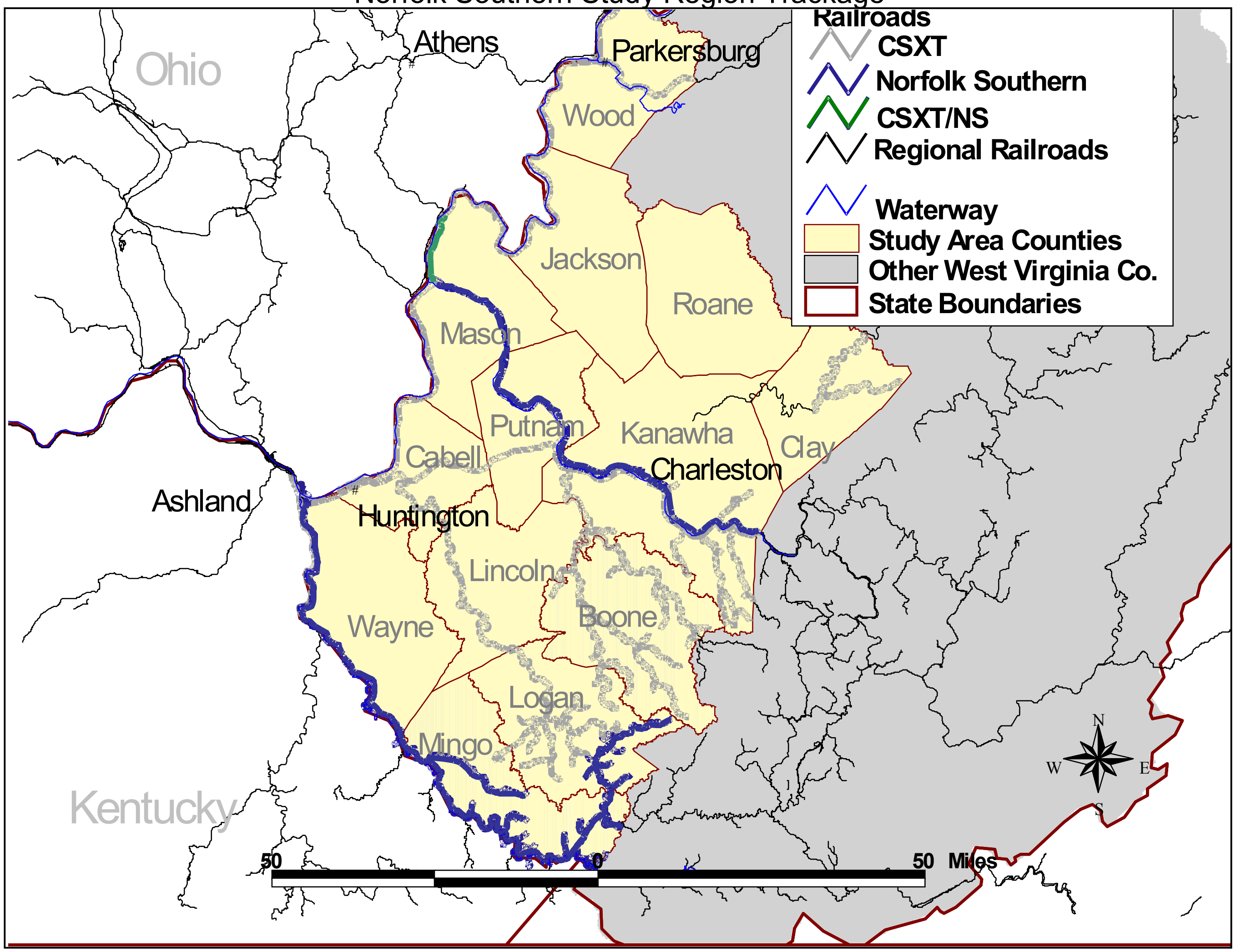

Table 4.7
Norfolk-Southern Study Region Trackage

	Bluefield – Kenova Route	Princeton – Deepwater (Charleston) Route
Number of Main Tracks	2	1
Number of Sidings	22	5
Representative Siding Length	8,500 ft.	8,000 ft.
Signal Systems	ABS	ABS / None
Typical Timetable Speed	40	25
Daily Coal Movements	48	0
Other Daily Trains	2	1-8

The potential of the Point Pleasant-Charleston-Princeton route depends upon the operational strategy of Norfolk Southern. In theory, at least, the consolidation of this route under single ownership could facilitate its conversion to a more heavily trafficked mainline routing between Virginia, the Carolina's, and the Midwest. Developments of this sort could, in turn, provide significant increases in NS train frequency through the Charleston area.

4.2.3 The Conrail Transaction and Freight Movements

In 1997, CSXT and Norfolk Southern began the process that would eventually allow them to purchase the Consolidated Rail Corp. (Conrail) and divide the latter's assets. The actual transaction took place in 1998, but was not implemented until last year. The implementation of the Conrail transaction has not gone smoothly. Both CSXT and NS have struggled to integrate Conrail routings and traffic into their existing systems, while rail customers throughout the eastern U.S. have endured observable declines in the quality of railroad service.

Again, the only direct transaction-related change to the railroad infrastructure within the current study area is Norfolk Southern's acquisition of former Conrail trackage through the Kanawha Valley. This acquisition provides Charleston area shippers with a more direct all-NS routing to the East Coast and to the western gateway of Kansas City. Indirectly, however, both CSXT and NS customers have been affected by the transaction implementation in much the same way as other rail shippers, enduring lost or delayed shipments, car shortages, and other service problems.

Officials from both carriers have very candidly admitted responsibility for the current service problems and claim to be doing all that is necessary to resolve them. Moreover, the Surface Transportation Board (STB) continues to monitor the transaction implementation process on a weekly basis.[43] With these measures in mind, and considering a recent STB decision placing a 15 month moratorium of further railroad consolidations, it is the judgment of the author that the service problems resulting from the Conrail transaction are transitory. Both CSXT and NS will ultimately succeed in restoring service to at least pre-transaction levels. Thus, further concerns regarding the effects of the Conrail transaction appear to be unwarranted within the current study.

4.2.4 Amtrak Facilities

As indicated in Section 3.2, between 15,000 and 20,000 rail passengers arrive in or depart from the study region by rail each year aboard Amtrak trains 50 and 51. The line-haul portion of these routings is principally over CSXT trackage except in the immediate Chicago and Washington, DC areas. Within the study region, both trains traverse CSXT's east-west mainline where they are restricted to speeds of 79 m.p.h.[44] Amtrak operates two stations within the study region – one at Charleston and one at Huntington.

4.3 COMMERCIAL NAVIGATION INFRASTRUCTURE

Commercial navigation to, from, and within the study region is accommodated through a blend of both publicly and privately provided infrastructure. The navigation locks and dams and other navigation structures necessary to provide a stable nine-foot navigable channel are provided by the federal government through the U.S. Army Corps of Engineers. Port and dock facilities, on the other hand, are predominantly provided by private for-profit concerns.

[43] While the STB is legally constrained in the scope of actions it may take to address competitive issues, it is far more able to both monitor and guide the resolution of service problems. This ability was clearly evidenced in its treatment of similar service problems resulting from the Union Pacific – Southern Pacific merger.

[44] In the wake of the Conrail transaction and the redistribution of freight traffic in and near Chicago, CSXT has had consistent problems meeting timetable scheduled arrivals and departures for trains 50 and 51. West Virginia's 3rd District Representative to the US House of Representatives, Nick J. Rahall, has worked with Amtrak to resolve these difficulties and, like transaction-related problems for freight customers, Amtrak's current problems are assumed to be transitory.

4.3.1 Line-Haul Navigation Infrastructure

There are a total of eight navigation projects in or near the study region – five on the Ohio River and three on the Kanawha River. The capacity and performance of these projects are summarized in Table 4.8.[45]

The 1200 x 100 main chambers at each of the Ohio River study region locks can accommodate 15 barges and 1 towboat in a single lockage. This is, in fact, true of all Ohio River locks below Wheeling. The relatively large chamber size provides Ohio River navigation with a decisive advantage in comparison to other reaches of the inland navigation system, where smaller lock dimensions require a 15 barge tow to be locked through in two separate cuts.[46]

4.3.2 Private Port and Dock Facilities

Private port and dock facilities are summarized on a county-specific basis in Table 4.9 and depicted graphically in Figure 4.4. Of the 126 terminals included here, 47 are rail served – 26 by CSXT, 20, by NS, and 1 by both carriers. All terminals have highway access. The reader should note that storage capacity does not necessarily measure annual through-put.

Table 4.8
Study Region Navigation Projects

Project Name	River Mile	Main Chamber Size	Aux. Chamber Size	Total Tons (Millions)	Average Tow Size	Average Process Time (Min)
Willow Isl.	O-162.4	1200x110	600x110	44.8	10.7	76
Belleville	O-203.9	1200x110	600x110	48.7	10.6	73
Racine	O-237.5	1200x110	600x110	49.5	10.7	85
RC Byrd	O-279.2	1200x110	600x110	57.8	10.4	92
Greenup	O-341.0	1200x110	600x110	70.6	10.8	195
London	K-82.8	360x56	360x56	7.3	4.1	140
Marmet	K-67.8	360x56	360x56	16.3	5.5	337
Winfield	K-31.1	800x110	(2)360x56	21.3	8.7	99

Source: U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, "Ohio River Navigation System Report, 1999". Values include lock delay and processing times.

[45] Within the current context, "project" refers to Corps of Engineers navigation facilities that are currently in operation.

[46] For example, most locks on the upper Mississippi River (above St. Louis) feature 600 x 110 main chambers. It is also important to note that there are no navigation locks on the Mississippi below St. Louis, so that down-bound Ohio River traffic enjoys a competitive advantage relative to traffic from the upper Mississippi basin.

Figure 4.4
Private Dock Facilities

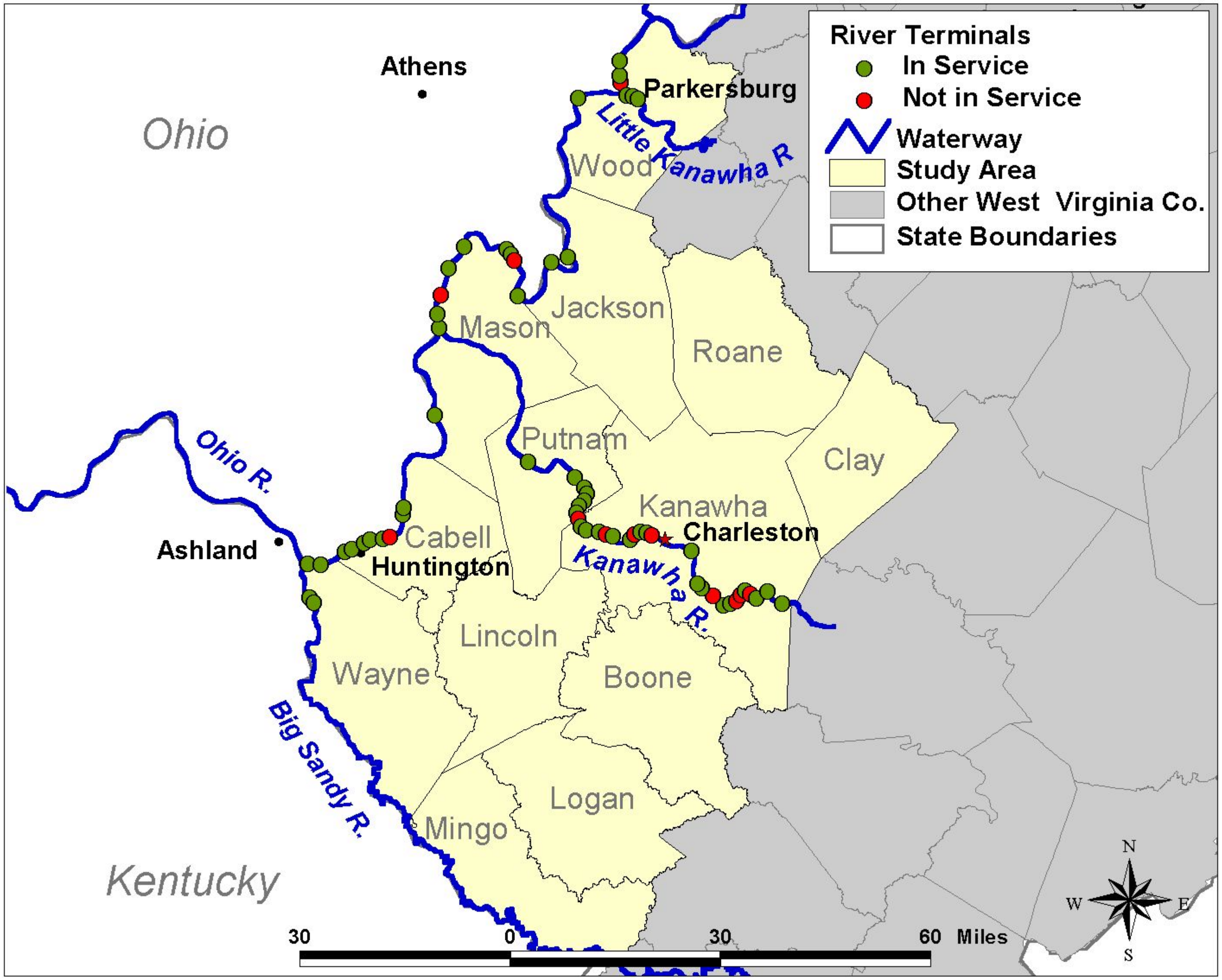

Table 4.9
Number of and Average Storage for Private Dock Facilities[47]
(Parenthetical Values Reflect Storage)

County	Coal (Tons)	Dry Bulk Commodities (Tons)	General Commodities (Tons)	Liquid Commodities (Gallons)	Petroleum Products (Barrels)
Cabell	2	4	----	----	4
	----	**(31,667)**	----	----	**(54,038)**
Jackson	----	2	1	2	----
	----	----	----	**(3,570,000)**	----
Kanawha	21	17	1	12	6
	(83,321)	**(29,120)**	----	**(13,314,286)**	**(112,503)**
Mason	4	6	2	2	2
	(500,350)	**(21,600)**	----	**(1,975,000)**	**(47,600)**
Putnam	3	6	----	2	1
	(1,800,000)	**(37,500)**	----	**(800,000)**	**(119,000)**
Wayne	6	3	----	----	1
	(113,250)	**(14,500)**	----	----	**(600,000)**
Wood	----	8	----	2	20
	----	**(36,667)**	----	**(47,000)**	**(36,300)**

4.3.3 The Role of Public Ports in Inland Navigation

A number of communities have initiated public port projects that are at varying stages of planning/completion. Jackson County has, in fact, completed such a project and recently transferred ownership of the facility to a private operator.

Generally speaking, public ports are only efficient when one of two economic conditions exist. First, they may be desirable if they provide general benefits to community residents who do not have any direct or indirect commercial relationship to the facility. Economists refer to such an outcome as a “positive externality”. Secondly, public ports may reflect an efficient organizational form if they constitute “public goods” – goods that provide benefits to their users, but which private firms will not provide because of the inability to restrict usage. Phase II of the current study will examine ongoing port projects based on these criteria.[48]

[47] Includes some port/dock facilities that are currently inactive.
[48] For example, consider a large recreational lake with hundreds of miles of shoreline and nearly as many access points. While this lake clearly confers benefits to its users, it would likely never be built by private developers because they would have little ability to limit the lakes use to only those who are willing to pay.

4.4 INFRASTRUCTURE SUPPORTING COMMERCIAL AIR TRAFFIC

Commercial Air traffic relies on two fundamental types of infrastructure – the air traffic control (ATC) system and the airport facilities that originate and terminate commercial flights. The federal government, through the Federal Aviation Administration (FAA), is solely responsible for operation and maintenance of all ATC facilities. Alternatively, airports are generally operated by municipal or regional transportation authorities with construction funding coming from a combination of local, state, and federal sources. In addition to airports that accommodate scheduled passenger and air freight operations, most regions feature a number of airports principally designed for general aviation and charter services. Again, any ATC facilities that may be present at general aviation facilities are under the direct control of the FAA, without regard to who owns or operates the overall airport.

As previously mentioned, there are three airports within the study region that support commercial air services – Yeager Airport in Charleston, Tri-State Airport in Wayne County, and Wood County Airport near Parkersburg. There are also efforts under way to create a new regional airport in Lincoln County. If completed, the new regional facility is intended to be the primary commercial aviation facility for the Charleston and Huntington areas. Finally, eight of the 13 study region counties have at least one general aviation facility. In all, there are 17 such facilities within the study region.[49]

4.4.1 Commercial Aviation Facilities – Yeager Airport

Section 3.3 describes the commercial passenger operations associated with Yeager Airport in Charleston, so that the text within this section will focus on describing actual airport physical facilities.[50] Yeager Airport originally opened in 1947 as Kanawha Airport. It is currently located on 767 acres near State Route 114 and Interstate 64, approximately seven minutes from downtown Charleston. Current airport facilities are summarized in Table 4.10.

4.4.2 Commercial Aviation Facilities – Tri-State Airport

Located on 1,300 acres in Wayne County, West Virginia, Tri-State Airport serves Huntington, West Virginia, Ashland, Kentucky, and Ironton, Ohio, as well as a number of smaller communities in the Tri-State region. Current operations were described in Section 3.3. Actual airport facilities are summarized in Table 4.11.

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[49] The current study considers only those facilities that accommodate fixed-wing aircraft.

[50] Many of the materials in Sections 4.4.1 and 4.4.2 were drawn from the work of the West Virginia Port Authority. Remaining materials were obtained through the FAA.

4.4.3 Aviation Facilities – Wood County Airport

Wood County Airport Facilities are described within Table 4.12.

4.4.4 General Aviation Facilities

The locations and characteristics of fixed-wing general aviation facilities located within the study region are reported in Table 4.13.

Table 4.10
Yeager Airport Facilities

Complex Description		Runways / ATC	
			4,750
Total Complex Size	767 Acres	Runway Length(s)	6,302
Number of Gates	8	Maximum Weight[51]	60,000
			160,000
Highway Access	WV 114, I-64	Runway Orientation	05
			23
Hours of Operation	24		
Passenger Amenities		**General Aviation Support**	
Food and Beverage	Yes	Fuel	100LL A Fuel
Lodging	No	Power Plant Repair	Yes
Public Transit	No	Airframe Repair	Yes
Car Rental	(4)		

[51] All weights are double-wheel weights

Table 4.11
Tri-State Airport Facilities

Complex Description		Runways / ATC	
Total Complex Size	1,300 Acres	Runway Length(s)	6,517 3,007
Number of Gates	3	Maximum Weigh	140,000 ----
Hours of Operation	24	Runway Orientation	12 30
Highway Access	County Road, US 52, I-64		
Passenger Amenities		**General Aviation Support**	
Food and Beverage	Yes	Fuel	100LL A Fuel
Lodging	No	Power Plant Repair	Yes
Public Transit	No	Airframe Repair	Yes
Car Rental	(3)		

Table 4.12
Wood County Airport Facilities

Complex Description		Runways / ATC	
Total Complex Size		Runway Length(s)	6,781 4,000
Number of Gates	3	Maximum Weight	100,000 75,000
Hours of Operation	6:00 a.m. – 11:00 p.m.	Runway Orientation	
Highway Access	WV 31, WV 2, I-77		
Passenger Amenities		**General Aviation Support**	
Food and Beverage	Yes	Fuel	100LL A Fuel
Lodging	No	Power Plant Repair	Yes
Public Transit	No	Airframe Repair	Yes
Car Rental	(2)		

Table 4.13
General Aviation Facilities

County	Name	Associated City	Use	Acreage	Longest Runway
Cabell	Ona Airpark	Milton	Public	120	3,154
	Robert Newlon Field	Huntington	Public	30	2,300
Jackson	Jackson County	Ravenswood	Public	210	4,001
	Ravenswood	Ravenswood	Private	57	5,000
Kanawha	Island	Chesapeake	Private	----	1,800
	Mallory	South Charleston	Private	----	2,000
Logan	Logan County	Logan	Public	200	3,600
	McDonald	Taplin	Public	46	2,750
Mason	Leon	Leon	Public	10	3,100
	Lieving	Letart	Private	5	1,500
	Mason County	Pt. Pleasant	Public	124	4,000
	Pomeroy-Mason	Mason	Private	----	5,000
Mingo	Mingo County	Williamson	Public	150	3,515
Roane	Slate Run	Spencer	Private	79	1,730
Wood	Scott Field	Mineral Wells	Public	5	2,020
	West Parkersburg	Parkersburg	Private	57	5,000

4.5 PIPELINE FACILITIES

As noted in Section 2.5, both petroleum products and natural gas are moved to, from, and within the study region via pipeline. In total, there are more than 15,000 miles of natural gas pipeline within the State, many of which lie within the study region. Regional oil and petroleum product pipelines are far less extensive. Neither the West Virginia Public Service Commission nor the pipeline operators were able to provide additional information describing the nature and location of pipelines within the study region.

5. PHASE I SUMMARY AND CONCLUSIONS

The Phase I study findings described herein reflect both the history of the study region and the continuing changes in commerce that are affecting transportation practices across the United States. The findings clearly demonstrate the rural and dispersed nature of the State's population, its strong link to the production and transportation of coal, and, to a degree, West Virginia's relative economic isolation. At the same time, the results also reflect the tremendous national growth in freight traffic associated with a decade of uninterrupted economic growth, the impacts of airline industry deregulation, and the continuing evolution of increasing international trade.

The infrastructure that accommodates the transportation flows identified by the Phase I analysis is, in most respects, strong. Both the regional rail system and the infrastructures that support commercial navigation yield no serious congestion related delays. Moreover, both the Class I railroads and the US Army Corps of Engineers appear to be poised to make any improvements necessary to accommodate emerging commerce.[52] The region's highway system is also strong. Where highway congestion appears to be severe, it is generally the result of economic growth and the State, like other providers of infrastructure, is actively engaged in roadway improvements in many of the affected areas.

Just as the Phase I analysis identifies many strengths, it also points to a number of transportation challenges that must be addressed if regional commerce is to compete effectively in a global market setting. The remoteness of the study region and relatively small volumes of non-coal freight traffic generate a number of problems for regional shippers, generally translating into higher unit transport costs and less reliable service than is attainable elsewhere. Further, the relatively low number of airline passengers and associated high fare levels (a topic within Phase II) is likely to prove increasingly disadvantageous. As the region's economy becomes more and more oriented toward service sector and tourist-related activities, reliable and competitively priced commercial air transport will be essential.[53] Finally, increasing volumes of pass-through traffic

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[52] Both CSXT and Norfolk Southern have announced plans to improve track structures within the region. Likewise, the Corps is studying potential lock improvements at a number of Ohio River locations.

[53] This study is not the first to observe these problems. Improving commercial airline services to smaller communities like Huntington, Charleston, and Parkersburg was at the center of legislation introduced in the US Senate last year by West Virginia's Jay Rockefeller. For a further description, see "The Air Service Restoration Act", Regional Economic Review, Marshall University, Center for Business and Economic Research, Spring, 1999.

mean that, over time, there is a growing wedge between the demand for regional transportation infrastructure and the level of economic activity within the study region.

As the opening pages of this document suggest, developing policy conclusions based on the information collected thus far would be premature. Nonetheless, it is possible to identify broad patterns that may be used to guide the Phase II research. For instance, the Phase I results point to opportunities for enhanced efficiency through consolidation and coordination. In nearly every setting, shippers lodged complaints that are common when overall volumes are relatively small. These include equipment shortages, unreliable service, higher than average transport rates, and the inability to engage in some transportation practices altogether. In many instances, remedies to these problems lie in improving the level of cooperation between regional shippers, carriers, and the public entities that help to provide transportation infrastructure.

As noted, Phase II of the study is already underway. In the near future, these ongoing study efforts will become much more visible through a series of activities designed to gather additional public input. Phase I efforts have been productive because of the information provided by transportation users within the study region. As the second phase moves forward, this public input will be even more crucial.