SECTION E
ALABAMA HIGHWAYS

As explained in the main Alliance Report, the specific highways determined to comprise the LATTS Strategic Highway System were identified using a series of criteria to help identify a network of highways which had the greatest significance regarding trade with Latin America. The 22,859-mile mainline LATTS Strategic Highway System shown in Exhibit E-1 is the result of this process.

More than 6 percent of the mainline LATTS Strategic Highway System (1,485 miles) is located in Alabama (Exhibit E-2). The Alabama components[1] include the following:

- All of Alabama's 905 miles of interstate highways, including:
  - I-10 through Mobile
  - I-20 east-west through Birmingham
  - I-59 (Birmingham to Chattanooga)
  - I-65, connecting Nashville and Mobile via Montgomery
  - I-85, linking Charlotte, Atlanta, and Montgomery
  - Numerous urban interstates, including routes I-165, I-359, I-459 and I-565
- 580 miles of non-interstate National Highway System (NHS) facilities
  - U.S. 72 across the northern part of the state (123 miles), part of LATTS Corridor 24 (Memphis to Chattanooga) – this is also part of Congressional High Priority Corridor 7. All of U.S. 72 is built to four lanes, with varying levels of access control.
  - U.S. 78 from the Mississippi State Line to Birmingham (68 miles) and U.S. 280 from Birmingham to the Georgia State Line near Columbus (111 miles), part of Corridor 20 (Tampa to Memphis). The U.S. 78 section is also part of Congressional High Priority Corridor 10 (Northeast Mississippi to Birmingham). Most of U.S. 78/280 is built to four lanes, with varying levels of access control.

[1] Mileage, number of lanes, pavement condition and other data reported herein were taken from the HPMS Database, as discussed subsequently, and may differ from information in other databases.

Exhibit E-1
LATTS STRATEGIC HIGHWAY SYSTEM

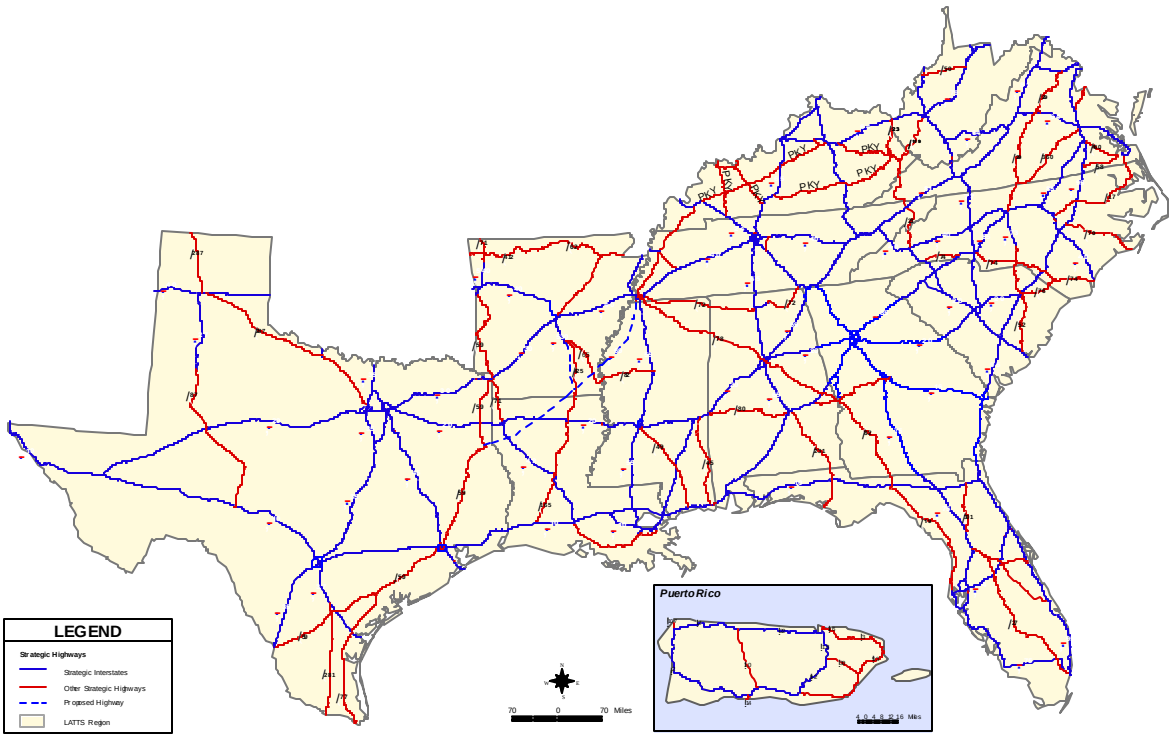
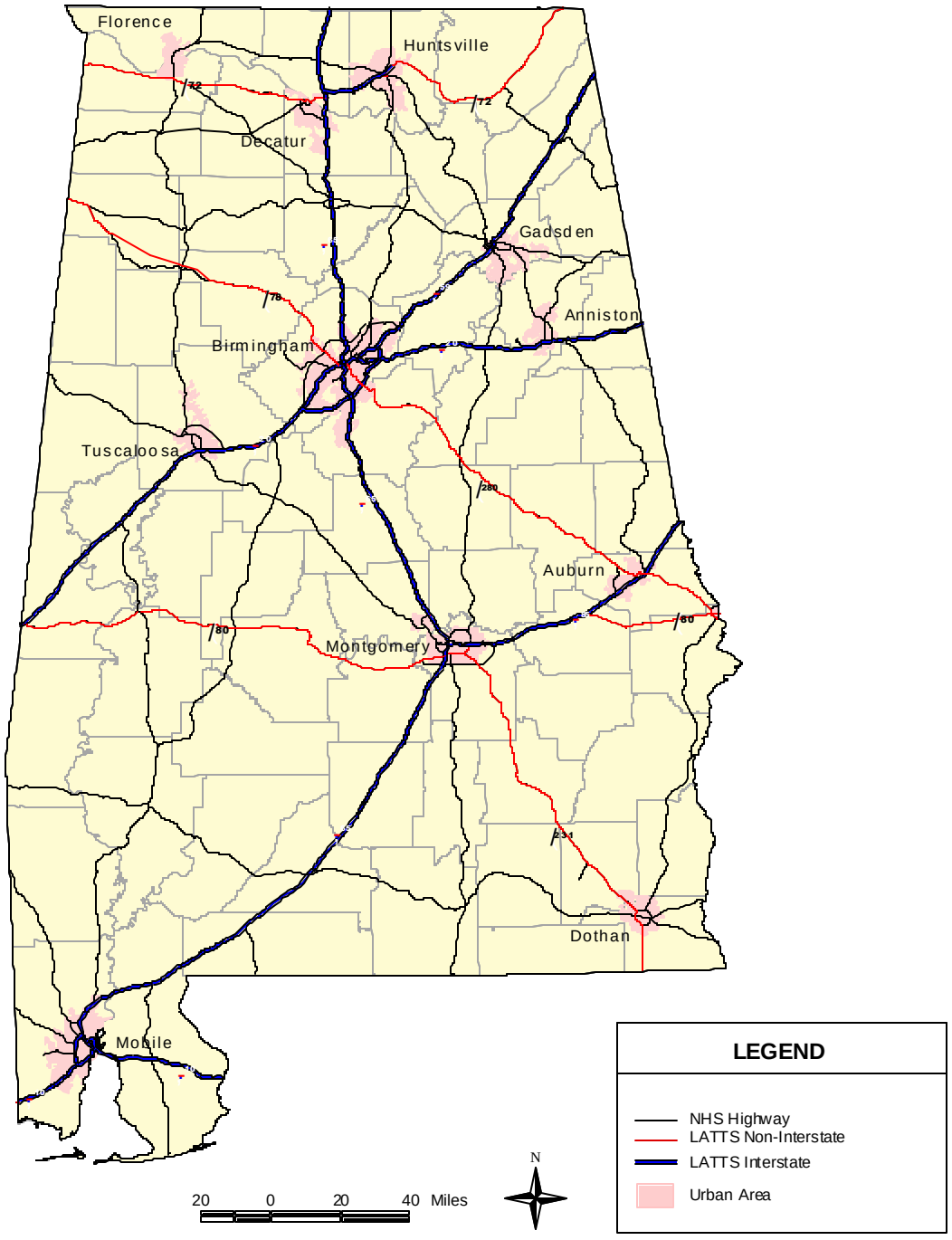


Exhibit E-2
ALABAMA COMPONENTS OF THE LATTS STRATEGIC HIGHWAY SYSTEM

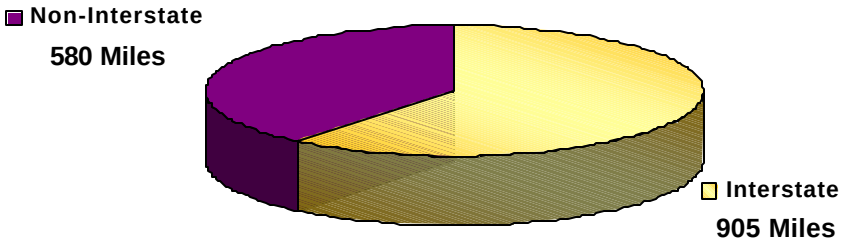


- U.S. 82/231 from Montgomery to the Florida State Line (107 miles), part of Corridor 6 (Mobile to Cincinnati). All of this section is multi-laned, with varying levels of access control.
- U.S. 80 from I-20/59 to I-65 @ Montgomery (133 miles) and from I-85 west of Auburn to U.S. 280 @ Columbus (38 miles), part of LATTS Corridor 2 (W. Alabama to Norfolk), and also part of Congressional High Priority Corridor 6 (Meridian, MS to Savannah). U.S. 80 west of Montgomery is mostly four-laned, with varying levels of access control, while the east section is a two-lane highway.

▶ LATTS connectors linking a LATTS Strategic Highway with a LATTS airport or waterport were included in the Strategic Highway System. However, because of database differences, it was not possible to analyze LATTS connectors in the same manner and to the same level of detail as for mainline highways. LATTS connectors are discussed at the conclusion of Section E.

Exhibit E-3 displays the composition of Alabama's portion of the LATTS highways by system.

Exhibit E-3
LATTS MAINLINE STRATEGIC HIGHWAY SYSTEM – ALABAMA PORTION



1,485 Miles Total **Excludes LATTS Connectors**

LATTS HIGHWAYS VS. LATTS TRADE CORRIDORS

The 22,859 miles of "mainline" LATTS Strategic Highways were grouped into 25 LATTS Trade Corridors (Exhibit E-4). The Trade Corridors were established using logical origins/destinations and assigning each highway to only one corridor. Each corridor was assigned a number (1-25) and was referred to by the primary highway within the corridor (i.e.,
I-40). Portions of seven LATTS Trade Corridors cross Alabama, including:

- Corridor 2 (I-85) – W. Alabama to Norfolk
- Corridor 3 (I-59/81) – New Orleans to Pennsylvania and Washington, D.C.
- Corridor 6 (I-65) – Mobile to Cincinnati
- Corridor 13 ((I-20, U.S. 76) – El Paso to Wilmington
- Corridor 14 (I-10) – W. Texas to Jacksonville
- Corridor 20 (U.S. 19/78/220) – Tampa to Memphis
- Corridor 24 (U.S. 72) – Memphis to Chattanooga

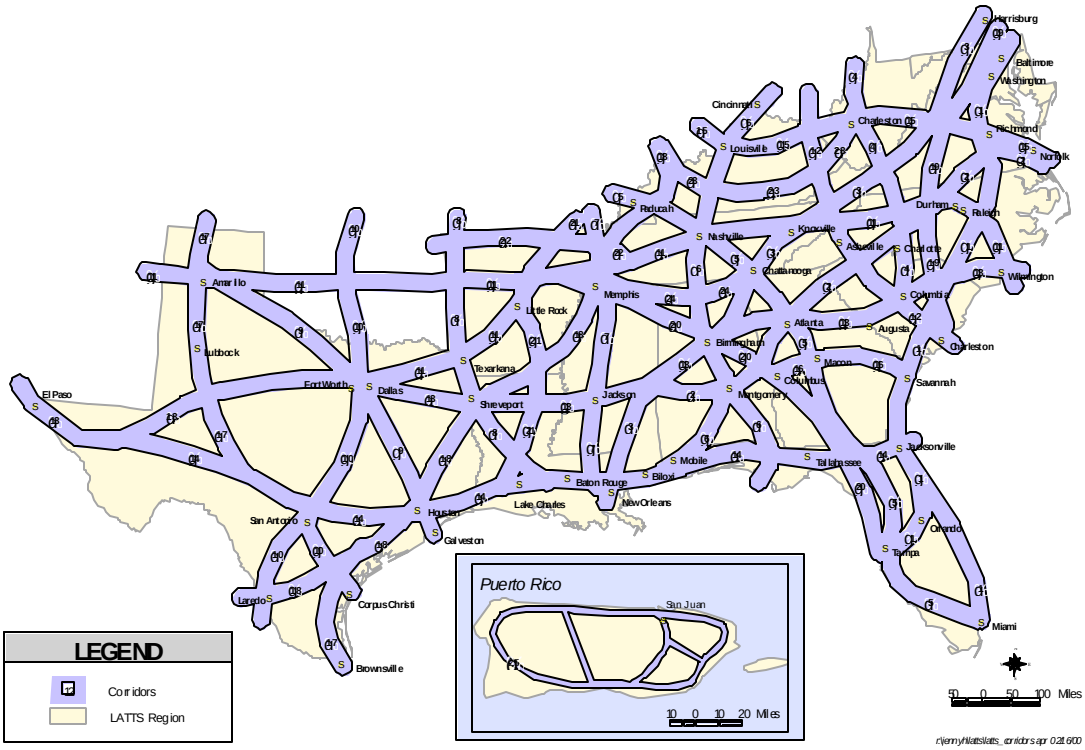
HIGHWAY DATABASES

Two main sources of data were used for the analysis of highway investment. The first one, the Highway Performance Monitoring System (HPMS), includes information about the characteristics and conditions of public highways. The second source of data was the LATTS estimates of current and forecasts of future Latin America trade flows.

HPMS Database

The HPMS database was selected for the LATTS analyses of highway system investment needs because (1) it covered the entire Alliance Region, (2) it employs a consistent format and data definitions and (3) no additional primary data collection was necessary. Nevertheless, it was recognized that (1) the data is time sensitive (i.e., since the latest available information at the time of these analyses was for 1997, it is expected that improvements and additions will have occurred subsequently) (2) the HPMS database may have minor differences relative to other databases that individual Alliance members might use for their own planning and system management purposes and (3) information is not always available for every segment of the LATTS Strategic Highway System.

Exhibit E-4
LATTS TRADE CORRIDORS



For this study, only that portion of the HPMS database corresponding to the selected LATTS Strategic Highway Network was utilized. For Alabama, the LATTS HPMS database consisted of 917 records describing 1,421 miles of highway on the LATTS Strategic Highway Network.

Trade Flows

As explained in the main Alliance report, 1996 and expected 2020 trade volumes with Latin America were estimated and the portion of this trade that would be using highway facilities was translated into truck flows. The truck flows were then assigned to specific highway facilities using GIS generated shortest time paths. The LATTS truck traffic assignment was then merged with the LATTS HPMS database for further analysis.

The LATTS procedure for assigning truck flows is appropriate for a macro-scale study such as LATTS. Nevertheless, it should be noted that the procedure produces approximations which may vary slightly from actual conditions. That is, an all-or-nothing assignment on the basis of shortest time paths favors high speed facilities and likely under estimates flows on facilities with lower speeds. In reality, a modest amount of truck flows could choose a lower speed path for a variety of unique reasons. Also, some LATTS trucks undoubtedly will travel on facilities other than those included in the LATTS Strategic Highway System (e.g., a local road to reach a warehouse or plant). Despite these circumstances, the LATTS procedure is deemed to be sufficiently valid for purposes of a regional transportation study.

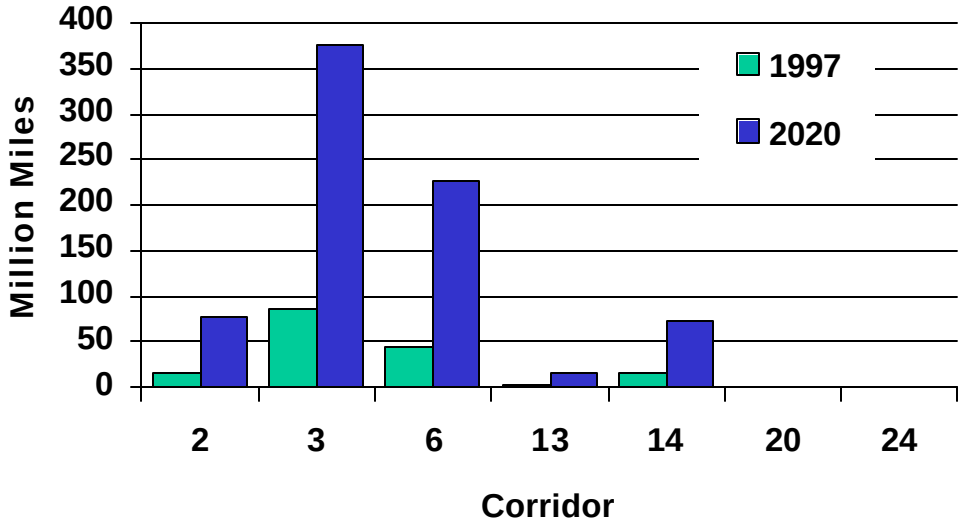
As a result of this assignment methodology, 871 miles of the Strategic Highway Network in Alabama were assigned LATTS truck traffic. All 871 miles are interstate highways.

LATTS TRUCK TRAFFIC IN ALABAMA

The LATTS highway database was used to quantify the LATTS truck traffic in terms of annual Vehicle Miles of Travel (VMT) and to compare LATTS truck traffic to total truck traffic (LATTS and others). Results of this analysis by corridor for 1997 and 2020 are illustrated in Exhibit E-5. More detailed information is presented in Exhibit E-6.

Exhibit E-5
LATTS ANNUAL TRUCK VMT IN ALABAMA

Based upon the study procedures, of the seven LATTS corridors crossing Alabama, only



five were assigned LATTS truck traffic. In fact, the two corridors not assigned LATTS traffic in Alabama, Corridor 20 (U.S.19/U.S.78/U.S.280 from Tampa, FL to Memphis, TN) and Corridor 24 (U.S.72 from Memphis, TN to Chattanooga, TN), were not assigned any LATTS traffic in any Alliance member. They are comprised mostly of U.S. Routes as opposed to interstates.

Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington D.C. and Pennsylvania) and Corridor 6 (I-65 from Mobile, AL to Cincinnati, OH) were assigned the most LATTS traffic in terms of VMT (377 and 227 million miles respectively in 2020). The highest volume of LATTS trucks is on Corridor 3 and Corridor 14 (I-10 from West Texas to Jacksonville, FL) with a 2020 average annual daily truck volume of 3,674 and 3,082, respectively, or 2.6 and 2.1 LATTS trucks every minute.

Of LATTS truck traffic in Alabama, two-thirds is on the rural interstate system and one-third is on the urban interstate system.

Exhibit E-6
ALABAMA LATTS TRUCK TRAFFIC

Corridor/ Functional Class	Length (Miles)	1997 Annual Truck VMT (Million Miles) All Trucks Full Network	1997 Annual Truck VMT (Million Miles) All Trucks Part. Network(1)	1997 Annual Truck VMT (Million Miles) LATTS Trucks Only	1997 Annual Truck VMT (Million Miles) LATTS Percent (2)	2020 Annual Truck VMT (Million Miles) All Trucks Full Network	2020 Annual Truck VMT (Million Miles) All Trucks Part. Network(1)	2020 Annual Truck VMT (Million Miles) LATTS Trucks Only	2020 Annual Truck VMT (Million Miles) LATTS Percent (2)
2	**I-85**		**West Alabama to Norfolk, VA**						
R.Interstate	46.30	121.81	121.81	8.54	7.0%	302.51	302.51	44.57	14.7%
R.Other PA	86.15	26.87	-	-	0.0%	44.24	-	-	0.0%
U.Interstate	33.69	87.30	87.30	6.22	7.1%	198.60	198.60	32.43	16.3%
U.Other Fwy.	3.84	10.24	-	-	0.0%	17.34	-	-	0.0%
U.Other PA	16.61	15.40	-	-	0.0%	27.41	-	-	0.0%
TOTAL	186.60	261.62	209.12	14.76	7.1%	590.11	501.12	77.00	15.4%
3	**I-59, I-81, I-66**		**New Orleans, LA to DC and Pennsylvania**						
R.Interstate	168.55	350.29	350.29	60.67	17.3%	978.14	978.14	263.73	27.0%
U.Interstate	112.45	361.04	353.69	26.07	7.4%	848.85	834.34	113.14	13.6%
TOTAL	281.00	711.32	703.97	86.74	12.3%	1,826.98	1,812.48	376.87	20.8%
6	**I-65**		**Mobile, AL to Cincinnati, OH**						
R.Interstate	272.07	582.04	567.50	36.23	6.4%	1,332.14	1,305.43	178.55	13.7%
R.Other PA	74.77	48.94	-	-	0.0%	81.05	-	-	0.0%
U.Interstate	99.80	385.36	385.36	9.97	2.6%	830.36	830.36	48.59	5.9%
U.Other PA	32.30	24.27	-	-	0.0%	44.51	-	-	0.0%
TOTAL	478.95	1,040.61	952.86	46.20	4.8%	2,288.06	2,135.79	227.15	10.6%
13	**I-20, US 76**		**El Paso, TX to Wilmington, NC**						
R.Interstate	59.19	187.25	187.25	2.13	1.1%	388.81	388.81	10.77	2.8%
U.Interstate	25.40	94.49	94.49	0.79	0.8%	200.60	200.60	3.98	2.0%
TOTAL	84.59	281.74	281.74	2.92	1.0%	589.41	589.41	14.75	2.5%
14	**I-10**		**West Texas to Jacksonville, FL**						
R.Interstate	47.99	108.02	108.02	10.65	9.9%	284.31	284.31	49.54	17.4%
U.Interstate	18.30	73.05	73.05	5.26	7.2%	178.33	178.33	25.02	14.0%
TOTAL	66.29	181.08	181.08	15.91	8.8%	462.63	462.63	74.56	16.1%
20	**US 19, US 78, US 280**		**Tampa, FL to Memphis, TN**						
R.Other PA	111.38	76.03	-	-	0.0%	124.16	-	-	0.0%
U.Other PA	67.89	81.88	-	-	0.0%	138.93	-	-	0.0%
TOTAL	179.28	157.90	-	-	0.0%	263.09	-	-	0.0%
24	**US 72**		**Memphis, TN to Chattanooga, TN**						
R.Interstate	7.00	25.47	-	-	0.0%	51.98	-	-	0.0%
R.Other PA	91.06	62.41	-	-	0.0%	103.42	-	-	0.0%
U.Interstate	14.40	51.65	-	-	0.0%	98.44	-	-	0.0%
U.Other PA	31.52	24.03	-	-	0.0%	40.23	-	-	0.0%
TOTAL	143.97	163.57	-	-	0.0%	294.07	-	-	0.0%
ALL CORRIDORS									
R.Interstate	601.11	1,374.89	1,334.87	118.23	8.9%	3,337.88	3,259.20	547.17	16.8%
R.Other PA	363.36	214.25	-	-	0.0%	352.87	-	-	0.0%
U.Interstate	304.04	1,052.90	993.90	48.30	4.9%	2,355.18	2,242.23	223.16	10.0%
U.Other Fwy.	3.84	10.24	-	-	0.0%	17.34	-	-	0.0%
U.Other PA	148.32	145.57	-	-	0.0%	251.08	-	-	0.0%
TOTAL	1,420.67	2,797.84	2,328.77	166.53	7.2%	6,314.35	5,501.42	770.33	14.0%

Notes: (1) Total truck VMT for highways carrying LATTS traffic only.
(2) Percentage calculated based on Partial Network.

The percentage of LATTS trucks relative to total trucks is expected to grow from 7 percent in 1997 to 14 percent in 2020 on those highways carrying LATTS traffic (from 6 to 12 percent for the entire LATTS strategic network). This growth in LATTS' share of total truck traffic is due to the fact that LATTS truck traffic is expected to increase 4.6 fold between 1997 and 2020 while overall truck traffic would increase by 2 fold only without LATTS trucks and 2.4 fold with LATTS trucks. The LATTS truck share of total trucks varies from corridor to corridor. The highest shares in Alabama are 21 percent on Corridor 3 and 16 percent on Corridor 14.

IMPACT MEASURES

The purpose of the highway analysis portion of this study was to quantify the LATTS Strategic Network total investment needs and the incremental investment needs that could be attributed to LATTS truck traffic specifically. Because of the macro-scale nature of this study, the investment needs analysis focused on capacity and pavement resurfacing needs.

In order to identify needs due to expected traffic (cars and trucks) other than LATTS and needs specifically attributable to LATTS traffic, two sets of capacity and pavement needs were estimated. First, future needs were estimated based on the "normal" traffic as defined by the HPMS database which includes AADT, truck percentages, and growth rate. Future needs were estimated a second time with the same HPMS traffic plus the "additional" LATTS truck traffic above and beyond the traffic that would be estimated using the "normal" growth. The difference in needs between the two was considered the incremental needs due to growth in LATTS traffic.

Minimum tolerable conditions (MTCs) for both congestion (capacity) and pavement conditions were applied uniformly to all segments of the LATTS Strategic Highway System. These MTCs are described in more detail in the main Alliance report and are summarized below.

- Capacity needs were based on Level of Service (LOS) not exceeding:
  - LOS C for rural highways
  - LOS D for urban highways

- Pavement resurfacing needs were based on the following minimum pavement condition rating:
  - Interstate type facilities: PSR 3.0
  - Other facilities: PSR 2.5

The LATTS minimum tolerable conditions are in no way intended to replicate or replace values that individual members of the Alliance might consider to be more appropriate for their circumstances. The LATTS MTCs were established for this study so as to be consistent for all the Alliance members.

To price the identified capacity or pavement needs, the same unit costs were used consistently throughout the Alliance Region. These unit costs were provided by the FHWA and correspond to 1997 national averages. To maintain consistency throughout the Region, no attempt was made to tailor these unit costs to each state beyond the stratification provided by the FHWA.

CAPACITY NEEDS

A needs analysis model was developed to analyze capacity needs for 1997 and 2020. For the year 2020, capacity needs with and without the "additional" LATTS traffic were estimated. The model was then applied to every one of the HPMS records comprising the Alabama LATTS highway database and the results were summarized. This model applied the same methodology, outlined in the main Alliance report, and found in the HPMS Analytical Package, to calculate capacity needs. The results reflect the information contained in the HPMS Database and do not consider any improvements that may have occurred subsequently or any planned improvements.

Detailed results for Alabama are presented in Exhibit E-7. The total number of Alabama LATTS Strategic Highway Network road miles with capacity deficiencies in 1997 and 2020 are shown in columns 4 through 6. For 2020, the amount of capacity deficiencies with and without the "additional" LATTS traffic is shown.

Exhibit E-7
ALABAMA CAPACITY INVESTMENT NEEDS

Corridor/ Functional Class	Length (Miles)	Existing Lane Miles	Capacity Analysis: Deficient Mileage 1997	Deficient Mileage 2020 W/O LATTS Added Traffic	Deficient Mileage 2020 With LATTS Added Traffic	2020 Needed Lane Miles: Base	2020 Needed Lane Miles: With LATTS Added Traffic	2020 Cost in $Million: Base	2020 Cost in $Million: With LATTS Added Traffic	2020 Cost in $Million: % Increase Due to LATTS
2	**I-85**		**West Alabama to Norfolk, VA**							
R.Interstate	46.30	185.22	-	46.30	46.30	116.14	123.66	111	114	2.5%
R.Other PA	86.15	253.12	1.38	13.52	13.52	27.03	27.03	22	22	0.0%
U.Interstate	33.69	147.88	0.84	18.04	18.14	56.77	57.93	197	201	2.0%
U.Other Fwy.	3.84	16.52	0.77	3.84	3.84	9.22	9.22	32	32	0.0%
U.Other PA	16.61	70.61	3.11	10.65	10.65	24.67	24.67	51	51	0.0%
TOTAL	186.60	673.34	6.09	92.35	92.44	233.84	242.51	413	420	1.6%
3	**I-59, I-81, I-66**		**New Orleans, LA to DC and Pennsylvania**							
R.Interstate	168.55	674.19	12.95	117.43	139.45	301.42	361.71	310	365	17.7%
U.Interstate	112.45	569.64	11.57	67.35	71.14	321.78	378.24	1,117	1,313	17.5%
TOTAL	281.00	1,243.83	24.52	184.78	210.58	623.19	739.95	1,427	1,677	17.6%
6	**I-65**		**Mobile, AL to Cincinnati, OH**							
R.Interstate	272.07	1,088.29	10.55	201.15	237.03	547.04	639.29	503	591	17.4%
R.Other PA	74.77	295.02	2.03	2.03	2.03	8.10	8.10	4	4	0.0%
U.Interstate	99.80	476.53	17.92	77.72	79.55	334.04	343.65	1,159	1,193	2.9%
U.Other PA	32.30	129.44	0.47	12.96	12.96	29.56	29.56	62	62	0.0%
TOTAL	478.95	1,989.28	30.96	293.85	331.57	918.75	1,020.60	1,729	1,850	7.0%
13	**I-20, US 76**		**El Paso, TX to Wilmington, NC**							
R.Interstate	59.19	238.96	0.43	59.19	59.19	170.82	170.82	153	153	0.0%
U.Interstate	25.40	112.40	1.75	25.40	25.40	74.49	74.49	259	259	0.0%
TOTAL	84.59	351.36	2.18	84.59	84.59	245.31	245.31	412	412	0.0%
14	**I-10**		**West Texas to Jacksonville, FL**							
R.Interstate	47.99	191.98	10.03	47.99	47.99	186.18	194.27	139	142	2.1%
U.Interstate	18.30	98.09	4.06	18.30	18.30	70.43	82.94	244	288	17.8%
TOTAL	66.29	290.07	14.09	66.29	66.29	256.61	277.21	384	430	12.1%
20	**US 19, US 78, US 28**		**Tampa, FL to Memphis, TN**							
R.Other PA	111.38	343.89	49.07	56.58	56.58	133.32	133.32	104	104	0.0%
U.Other PA	67.89	244.57	11.35	41.63	41.63	93.17	93.17	189	189	0.0%
TOTAL	179.28	588.45	60.42	98.21	98.21	226.48	226.48	292	292	0.0%
24	**US 72**		**Memphis, TN to Chattanooga, TN**							
R.Interstate	7.00	28.01	-	7.00	7.00	28.01	28.01	21	21	
R.Other PA	91.06	353.18	5.52	5.52	5.52	11.04	11.04	9	9	0.0%
U.Interstate	14.40	68.37	2.90	13.20	13.20	54.20	54.20	188	188	0.0%
U.Other PA	31.52	126.07	-	-	-	-	-	-	-	0.0%
TOTAL	143.97	575.64	8.42	25.72	25.72	93.24	93.24	218	218	0.0%
ALL CORRIDORS										
R.Interstate	601.11	2,406.65	33.97	479.07	536.97	1,349.61	1,517.77	1,238	1,386	12.0%
R.Other PA	363.36	1,245.21	57.99	77.64	77.64	179.49	179.49	139	139	0.0%
U.Interstate	304.04	1,472.91	39.04	220.00	225.72	911.70	991.43	3,165	3,441	8.7%
U.Other Fwy.	3.84	16.52	0.77	3.84	3.84	9.22	9.22	32	32	0.0%
U.Other PA	148.32	570.68	14.92	65.24	65.24	147.40	147.40	302	302	0.0%
TOTAL	1,420.67	5,711.97	146.69	845.79	909.41	2,597.42	2,845.31	4,875	5,300	8.7%

These analyses indicate that 147 of the LATTS roadway miles in Alabama, or 10.3 percent of the Alabama portion of the Strategic Network, have existing capacity problems. The analyses also show that the majority of the capacity deficiencies will occur in the next 20 years unless capacity is added.

With the expected "normal" growth (as defined by the HPMS database), a total of 846 road miles or 60 percent of the LATTS network will have congestion problems by 2020. The "additional" LATTS trucks are expected to increase the total to 909 miles or 64 percent of total mileage as noted in Exhibit E-8. In other words, LATTS truck will increase congested miles of roadway by about 7.5 percent and the number of needed

lane miles by 9.5 percent. These percentages are significant but they also indicate that the majority of the congestion problems in Alabama are not due solely to LATTS traffic but expected overall growth in total traffic. However, unless these capacity needs are met, LATTS truck traffic will be affected by these capacity deficiencies regardless of the source of traffic. As congestion increases, LATTS trucks like other traffic, will experience lower operating speeds, frequent speed changes, lower reliability, and increased operating costs.

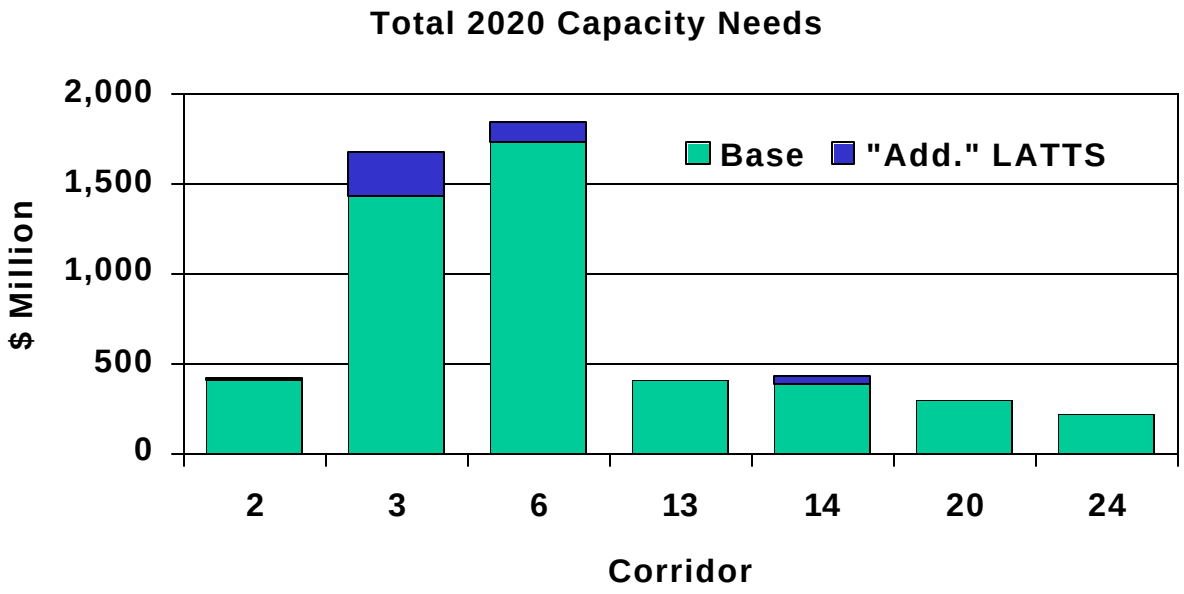
Exhibit E-8
ALABAMA 2020 CAPACITY NEEDS
LATTS Strategic Network

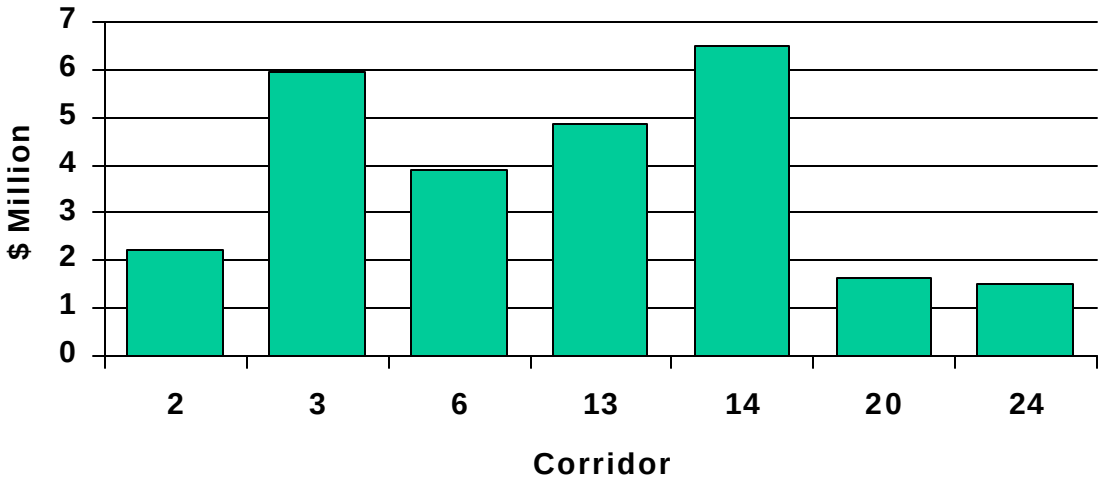
	Deficient Miles	% of Total Miles	Needs (Billion)
"Normal" Growth	846	60%	$4.9
"Additional" LATTS Traffic	73	4%	$0.4
Total	909	64%	$5.3

Based on the HPMS expected growth in traffic, nearly $4.9 billion will be required in the next 20 years to address congestion problems on the Alabama portion of the LATTS Strategic Network. The "additional" LATTS traffic will bring that total to $5.3 billion, a 8.7 percent increase. The dollar increase in capacity needs due to LATTS traffic is lower than the corresponding increase in terms of needed lane miles because a majority of LATTS truck traffic occurs on rural highways which are less expensive to improve than urban highways.

Capacity needs by corridor are illustrated in Exhibit E-9. Total capacity needs by corridor are related to the total length of the corridor: i.e., the longer the corridor, the higher the needs. Corridor 6 (I-65 from Mobile, AL to Cincinnati, OH), which is the longest in Alabama, has the highest capacity needs ($1.8 billion by 2020). However, in terms of average capacity needs per roadway mile, Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington D.C. and Pennsylvania) and Corridor 14 (I-10 from West Texas to Jacksonville, FL) have proportionally higher capacity needs: i.e., $6 and $6.5 million per roadway mile versus $ 3.7 million average for the state.

Exhibit E-9
ALABAMA STRATEGIC HIGHWAY NETWORK CAPACITY NEEDS
BY CORRIDOR





It should be noted that by 2020, 75 percent of Corridor 3 and 100 percent of Corridor 14 in Alabama will require capacity improvements. Proportionally, these two corridors will also experience the highest incremental needs due to LATTS "additional" traffic, 17.6 percent, and 12.1 percent increase in capacity needs respectively. This is in line with the volumes of LATTS trucks on these two corridors.

PAVEMENT NEEDS

For purposes of this study, average annual pavement needs in 2020 were estimated. The number of years it would take for the pavement to deteriorate from new in 2020 to a deficient PSR rating (as defined by the minimum tolerable conditions presented earlier) was calculated for each highway segment. As an indicator of the existing condition of the network, pavement deficiencies were identified for 1997.

Pavements typically are designed to last for a fairly long time. However, as they age and are subjected to traffic loads, they deteriorate. The pavement life measure used in these analyses is dependent on the amount of traffic using the highway and, more specifically, truck traffic (car traffic is a factor in the pavement deterioration rate but it has far less impact). The type of pavement (for example high flexible versus high rigid) is also an important factor affecting pavement deterioration rates. The pavement type on each highway segment, as indicated by the 1997 HPMS database, was used in the estimation of the deterioration rates. The number of lanes indicated for 1997 was used in the calculation of pavement deterioration rate and resurfacing costs. No attempt was made to measure the impact on pavement needs of adding lanes to address the congestion problems identified earlier. Finally, the HPMS-AP methodology for deteriorating pavement was applied in this study. It is based on the concept of 18Kip Equivalent Single Axle Loads. Weather condition or type of subsoil can also influence pavement deterioration rates but, for this study, no other factors beyond traffic and pavement type were used to differentiate pavement deterioration rates between sections.

Each highway segment pavement life was calculated twice. An initial calculation was made using the "base" car and truck traffic from the Alabama HPMS database. The second calculation was made with the "additional" LATTS traffic added to it. The difference in the two pavement lives is a measure of the impact of LATTS traffic.
Results of the analysis of Alabama pavement needs for the LATTS Strategic Highway Network are presented in Exhibit E-10. Based on the HPMS data, 10 percent or 142 miles of the Alabama overall LATTS Strategic Highway Network have existing (1997) pavement deficiencies. All pavement deficiencies are concentrated on the Interstate System used by LATTS trucks. Nearly 9.7 percent of the rural Interstate System and 27.6 percent of the urban Interstate System have existing pavement deficiencies. With nearly 33 percent of its length deficient, Corridor 13 (I-20/U.S. 76 from El Paso, TX to Wilmington, NC) has the highest percentage of existing pavement deficiencies.

Exhibit E-10
ALABAMA PAVEMENT RESURFACING INVESTMENT NEEDS

Corridor/ Functional Class	Length (Miles)	Existing Lane Miles	Pavement Analysis					
			1997	2020 Pavement Life (Years)		2020 Average Annual Cost ($1,000)		
			Deficient Mileage	W/O LATTS Added Traffic	With LATTS Added Traffic	W/O LATTS Added Traffic	With LATTS Added Traffic	% Increase Due to LATTS
2	**I-85**		**West Alabama to Norfolk, VA**					
R.Interstate	46.30	185.22	-	5.2	5.0	4,375	4,457	1.9%
R.Other PA	86.15	253.12	-	5.9	5.9	2,993	2,993	0.0%
U.Interstate	33.69	147.88	1.45	3.6	3.6	8,213	8,333	1.5%
U.Other Fwy.	3.84	16.52	-	3.5	3.5	949	949	0.0%
U.Other PA	16.61	70.61	-	5.6	5.6	1,761	1,761	0.0%
TOTAL	186.60	673.34	1.45	5.1	5.1	18,291	18,493	1.1%
3	**I-59, I-81, I-66**		**New Orleans, LA to DC and Pennsylvania**					
R.Interstate	168.55	674.19	10.13	6.6	5.5	13,428	15,623	16.3%
U.Interstate	112.45	569.64	41.15	4.2	3.8	29,728	31,286	5.2%
TOTAL	281.00	1,243.83	51.28	5.5	4.7	43,156	46,909	8.7%
6	**I-65**		**Mobile, AL to Cincinnati, OH**					
R.Interstate	272.07	1,088.29	21.49	4.9	4.5	25,607	27,613	7.8%
R.Other PA	74.77	295.02	-	5.7	5.7	3,640	3,640	0.0%
U.Interstate	99.80	476.53	31.83	3.8	3.7	25,891	26,213	1.2%
U.Other PA	32.30	129.44	-	5.7	5.7	3,106	3,106	0.0%
TOTAL	478.95	1,989.28	53.32	4.8	4.6	58,243	60,572	4.0%
13	**I-20, US 76**		**El Paso, TX to Wilmington, NC**					
R.Interstate	59.19	238.96	20.20	4.3	4.3	6,323	6,335	0.2%
U.Interstate	25.40	112.40	7.52	3.8	3.8	6,181	6,200	0.3%
TOTAL	84.59	351.36	27.72	4.2	4.1	12,504	12,536	0.3%
14	**I-10**		**West Texas to Jacksonville, FL**					
R.Interstate	47.99	191.98	6.46	5.4	5.0	4,225	4,524	7.1%
U.Interstate	18.30	98.09	1.90	3.5	3.4	5,706	5,760	0.9%
TOTAL	66.29	290.07	8.36	4.8	4.5	9,931	10,285	3.6%
20	**US 19, US 78, US 28(**		**Tampa, FL to Memphis, TN**					
R.Other PA	111.38	343.89	-	5.7	5.7	4,246	4,246	0.0%
U.Other PA	67.89	244.57	-	5.5	5.5	6,219	6,219	0.0%
TOTAL	179.28	588.45	-	5.6	5.6	10,465	10,465	0.0%
24	**US 72**		**Memphis, TN to Chattanooga, TN**					
R.Interstate	7.00	28.01	-	3.7	3.7	797	797	0.0%
R.Other PA	91.06	353.18	-	6.0	6.0	4,335	4,335	0.0%
U.Interstate	14.40	68.37	-	3.6	3.6	3,889	3,889	0.0%
U.Other PA	31.52	126.07	-	6.6	6.6	2,774	2,774	0.0%
TOTAL	143.97	575.64	-	5.7	5.7	11,795	11,795	0.0%
ALL CORRIDORS								
R.Interstate	601.11	2,406.65	58.27	5.4	4.8	54,756	59,350	8.4%
R.Other PA	363.36	1,245.21	-	5.8	5.8	15,214	15,214	0.0%
U.Interstate	304.04	1,472.91	83.86	3.9	3.7	79,607	81,682	2.6%
U.Other Fwy.	3.84	16.52	-	3.5	3.5	949	949	0.0%
U.Other PA	148.32	570.68	-	5.8	5.8	13,860	13,860	0.0%
TOTAL	1,420.67	5,711.97	142.13	5.1	4.9	164,385	171,054	4.1%

As expected, the corridors with the highest concentration of LATTS truck traffic show the largest impact from LATTS traffic.

- Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington, D.C. and Pennsylvania) has the highest concentration of LATTS trucks in terms of daily traffic and the highest reduction in pavement life from 5.5 years to 4.7 years.

- Corridor 14 (I-10 from West Texas to Jacksonville, FL) is second both in terms of daily LATTS truck volume and reduction in 2020 pavement life, from 4.8 years to 4.5 years.

Total resurfacing costs are a function of the average pavement life and the length of the highways. Corridor 6 (I-65 from Mobile, AL to Cincinnati, OH), the longest LATTS corridor in Alabama, has the highest average annual resurfacing needs, nearly $ 61 million with LATTS traffic. With the largest reduction in average pavement life due to LATTS, Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington, D.C. and Pennsylvania) has the largest incremental resurfacing needs due to LATTS trucks, $ 3.8 million annually or 8.7 percent.

Future (2020) pavement needs are summarized in Exhibit E-11. Pavement life for the Alabama portion of the LATTS Strategic Highway Network will average 5.1 years in 2020 without the "additional" LATTS truck traffic and 4.9 years with it. The annual resurfacing costs for the Alabama portion of the LATTS Strategic Highway Network is estimated to exceed $164 million without LATTS "additional" truck traffic and $171 million with it, an increase of 4.1 percent.

Exhibit E-11
ALABAMA 2020 PAVEMENT NEEDS
LATTS Strategic Network

	Pavement Life (Years)	Annual Resurfacing Cost ($Million)
"Normal" Growth	5.1	$164
With "Additional" LATTS Traffic	4.9	$171

OPERATING SPEEDS

Truck operating speed was chosen as a key study performance measure for the LATTS Strategic Highway Network. Truck operating speeds were estimated for each LATTS roadway segment based on the conditions of the roadway, including roadway geometry and alignment, pavement condition, speed limit and traffic volumes. The operating speed calculation for each sample segment or link was based on the methodology of the HPMS Analytical Package used by FHWA to estimate highway needs.

Two types of operating speeds were calculated. One was the average daily operating speed and the other was the peak hour operating speed as defined by the peak hour factor or "K" factor for each road segment. Because it is not known when a truck would travel over a specific highway section during the peak hour, the peak hour operating speed assumed that every section was traveled during peak hour. As a result, the calculated peak hour speed and travel time for an entire corridor is probably somewhat overstated, as it is unlikely that a truck would travel every section during peak hour conditions.

Truck operating speeds were calculated for each LATTS roadway section. Operating speeds over a combination of segments were then calculated by adding travel time and distance for each segment and calculating the new speed.

Truck operating speeds on the Alabama portion of the LATTS Strategic Highway Network are presented on Exhibit E-12. In this exhibit, Alabama truck operating speeds estimates are presented by functional class. The total lengths of all the segments, which were used in the analysis of the corridor, are listed first. This is followed by items describing the characteristics of the segments, including average number of lanes, speed limit, and AADT. The purpose of listing these items is to facilitate better understanding of the calculated operating speeds. For example, two/three-lane highways have lower operating speeds than equivalent four-lane highways because of passing difficulties. Similarly, low speed limits will result in low operating speeds on facilities no matter what the road conditions are.

Exhibit E-12
ALABAMA TRUCK OPERATING SPEEDS

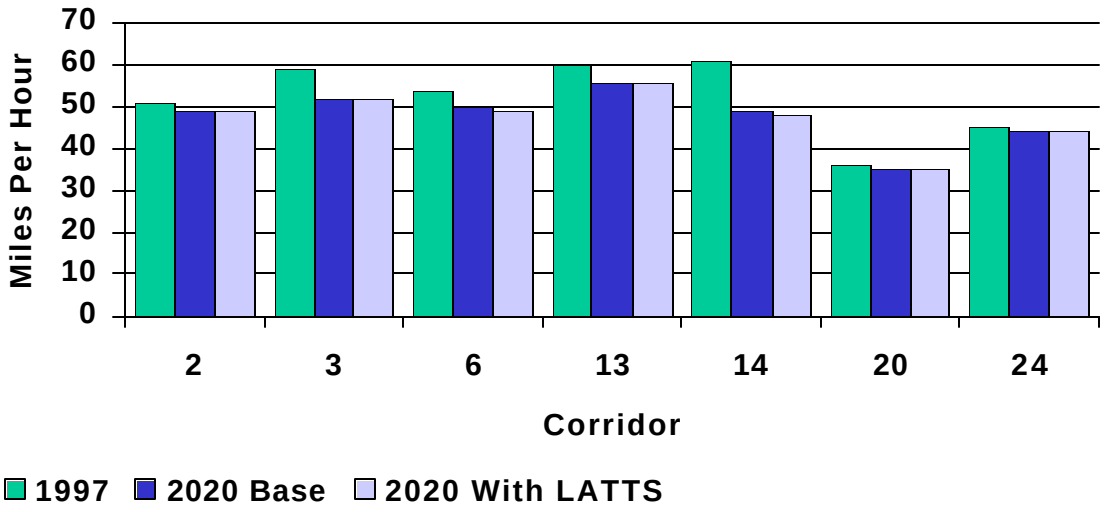
Corridor/ Functional Class	Length (Miles)	Average No. Lane	Speed Limit (MPH)	Average 1997 AADT	1997 Truck Speed (MPH)		2020 Truck Speed (MPH) W/O Added LATTS Traffic		2020 Truck Speed (MPH) With Added LATTS Traffic	
					Daily Average	Peak Hour	Daily Average	Peak Hour	Daily Average	Peak Hour
2	**I-85**		**West Alabama to Norfolk, VA**							
R.Interstate	46.30	4.0	70.0	24,853	59.3	59.1	59.1	32.7	59.0	31.2
R.Other PA	86.10	2.9	61.6	5,696	50.7	47.7	50.0	46.7	50.0	46.7
U.Interstate	33.70	4.4	68.0	39,439	59.4	49.7	51.9	27.0	51.6	23.4
U.Other Fwy.	3.80	4.3	55.0	42,958	57.4	36.5	48.3	15.6	48.3	15.6
U.Other PA	16.60	4.3	51.0	26,951	30.0	23.2	28.8	16.0	28.8	16.0
TOTAL	**186.60**	**3.6**	**63.2**	**19,202**	**50.9**	**45.6**	**49.0**	**32.2**	**48.9**	**30.8**
Time (HR)					**3.7**	**4.1**	**3.8**	**5.8**	**3.8**	**6.1**
3	**I-59, I-81, I-66**		**New Orleans, LA to DC and Pennsylvania**							
R.Interstate	168.50	4.0	69.9	19,868	59.3	56.9	57.8	41.0	57.3	36.2
U.Interstate	112.50	5.1	67.3	47,236	57.9	42.6	45.8	22.2	45.0	22.0
TOTAL	**281.00**	**4.4**	**68.8**	**30,820**	**58.7**	**50.2**	**52.3**	**30.6**	**51.7**	**28.8**
Time (HR)					**4.8**	**5.6**	**5.4**	**9.2**	**5.4**	**9.8**
6	**I-65**		**Mobile, AL to Cincinnati, OH**							
R.Interstate	272.10	4.0	70.0	25,492	59.2	57.4	58.0	34.3	57.9	33.4
R.Other PA	74.80	3.9	64.1	14,906	51.5	50.1	50.8	49.9	50.8	49.9
U.Interstate	99.80	4.8	67.0	52,893	58.7	38.8	42.5	19.0	42.0	18.8
U.Other PA	32.30	4.0	52.5	23,746	29.2	28.3	28.0	18.9	28.0	18.9
TOTAL	**478.90**	**4.2**	**66.9**	**29,431**	**54.1**	**48.1**	**49.6**	**29.2**	**49.4**	**28.7**
Time (HR)					**8.9**	**10.0**	**9.7**	**16.4**	**9.7**	**16.7**
13	**I-20, US 76**		**El Paso, TX to Wilmington, NC**							
R.Interstate	59.20	4.0	70.0	33,336	61.0	60.2	59.2	29.8	59.1	28.8
U.Interstate	25.40	4.4	70.0	42,465	59.2	46.8	49.0	15.6	49.0	15.6
TOTAL	**84.60**	**4.2**	**70.0**	**36,077**	**60.4**	**55.4**	**55.7**	**23.4**	**55.6**	**22.9**
Time (HR)					**1.4**	**1.5**	**1.5**	**3.6**	**1.5**	**3.7**
14	**I-10**		**West Texas to Jacksonville, FL**							
R.Interstate	48.00	4.0	70.0	32,583	60.2	47.0	51.5	27.3	50.7	27.0
U.Interstate	18.30	5.4	65.8	60,111	62.2	38.4	44.2	15.6	42.6	15.6
TOTAL	**66.30**	**4.4**	**68.8**	**40,181**	**60.7**	**44.2**	**49.3**	**22.6**	**48.2**	**22.5**
Time (HR)					**1.1**	**1.5**	**1.3**	**2.9**	**1.4**	**3.0**
20	**US 19, US 78, US 280**		**Tampa, FL to Memphis, TN**							
R.Other PA	111.40	3.1	60.3	13,448	42.5	38.5	40.9	31.8	40.9	31.8
U.Other PA	67.90	3.6	51.1	28,296	28.6	24.4	27.4	16.1	27.4	16.1
TOTAL	**179.30**	**3.3**	**56.5**	**19,071**	**35.9**	**31.6**	**34.5**	**23.2**	**34.5**	**23.2**
Time (HR)					**5.0**	**5.7**	**5.2**	**7.7**	**5.2**	**7.7**
24	**US 72**		**Memphis, TN to Chattanooga, TN**							
R.Interstate	7.00	4.0	70.0	34,367	64.7	62.8	61.0	26.3	61.0	26.3
R.Other PA	91.10	3.9	65.0	10,443	50.8	50.3	50.5	47.9	50.5	47.9
U.Interstate	14.40	4.7	65.0	51,254	63.0	37.8	47.6	16.6	47.6	16.6
U.Other PA	31.50	4.0	55.7	17,625	29.9	29.9	29.9	29.6	29.9	29.6
TOTAL	**144.00**	**4.0**	**62.9**	**17,260**	**45.2**	**42.9**	**43.9**	**35.1**	**43.9**	**35.1**
Time (HR)					**3.2**	**3.4**	**3.3**	**4.1**	**3.3**	**4.1**

Average daily and peak period speeds/travel times for trucks also are presented for the base year (1997). Further, truck operating speeds are listed twice for year 2020. The

first time, truck operating speeds were calculated assuming the base growth rate, i.e. the growth rate indicated by the HPMS database. The second time, truck operating speeds were calculated with the LATTS "additional" traffic. Overall results for the entire corridor within Alabama are then listed, as well as the overall time required to travel the entire corridor. By comparing these speed and travel time values (based on present conditions), it is possible to determine which facilities are most efficient today, which facilities are going to experience deteriorating conditions due to traffic growth regardless of LATTS impact, and finally which facilities are going to be most affected by LATTS traffic.

Average daily truck operating speeds on Alabama LATTS corridors are summarized in Exhibit E-13.

Exhibit E-13
ALABAMA STRATEGIC HIGHWAY NETWORK
Average Daily Truck Operating Speeds



All corridors with a majority of interstate facilities (Corridors 2, 3, 6, 13 and 14) have average daily operating speeds above 50 MPH in 1997. Corridors 20 and 24 have lower average daily speeds in the 35 to 45 MPH ranges because they are comprised of lower type facilities.

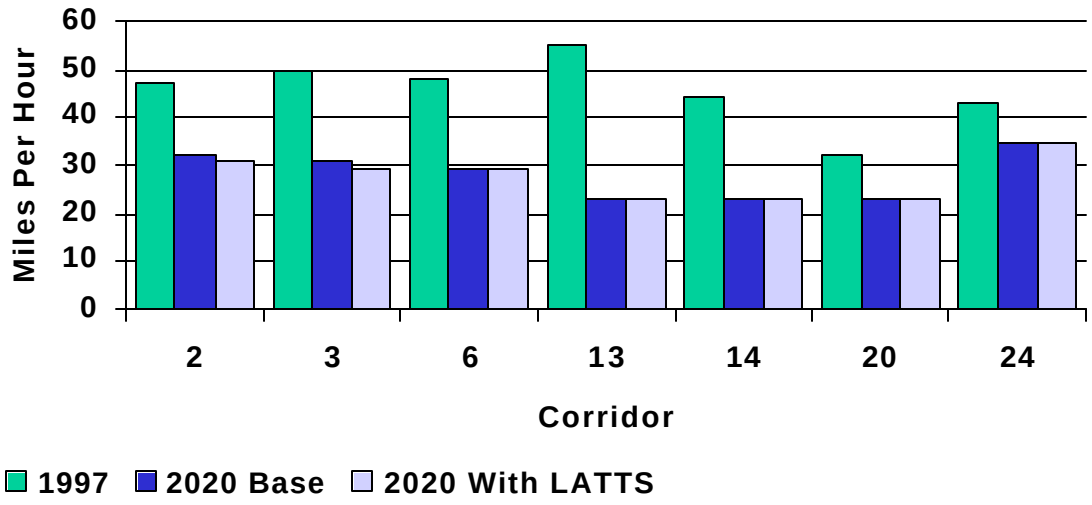
The projected growth in traffic between 1997 and 2020 will affect this measure of performance significantly. Unless additional capacity is provided, the average daily speed in many of Alabama LATTS corridors will be reduced by 5 MPH or more. Corridor 14 (I-10 from West Texas to Jacksonville, FL) will experience the most deterioration in average daily travel speeds, close to 9 MPH reduction, unless new capacity enhancement measures are undertaken. Corridor 3 (I-59/I-81,I-66 from New Orleans, LA

to Washington, D.C. and Pennsylvania), Corridor 6 (I-65 from Mobile, AL to Cincinnati, OH) and Corridor 13 (I-20/U.S.76 from El Paso, TX to Wilmington, NC) could experience a reduction in average travel speed close to 5 MPH.

Compared to the impact of the expected traffic growth between 1997 and 2020, the impact of the "additional" LATTS traffic on average daily truck travel speed appears minor. Even the worse case, Corridor 14, will only experience an additional reduction in average daily speed of 1.1 MPH. One may wonder why there would be such an apparent small impact on average speeds when the impact of LATTS traffic on capacity appeared much more significant. The reason is due to the selected minimum tolerable standards used to identify capacity needs. The capacity needs are based on not exceeding LOS C on rural highways and LOS D on urban highways during peak hour. However, traveling speeds are most affected (change rapidly) when the LOS reaches E and F. In other words, capacity needs are based on explicit standards that are higher than those used implicitly in the LATTS speed calculation.

The expected traffic growth in Alabama's LATTS corridors will affect "peak hour" speeds more significantly, up to 32 MPH for Corridor 13 (I-20/U.S.76 from El Paso, TX to Wilmington, NC) as illustrated in Exhibit E-14.

Exhibit E-14
ALABAMA STRATEGIC HIGHWAY NETWORK
"Peak-Hour" Truck Operating Speeds



The impact of LATTS "additional traffic" is slightly more pronounced with "peak hour" speeds than with average daily speeds but still very mild compared to the impact of overall traffic growth.

CONCLUSIONS FOR LATTS MAINLINE HIGHWAYS

(1) LATTS truck traffic in Alabama is expected to grow at a much higher rate than the rest of the traffic in the state. From 1997 to 2020, LATTS truck traffic will increase by 363 percent while all other traffic is expected to increase by 99 percent.

(2) About 64 percent of the LATTS Strategic Highway Network in Alabama will require additional capacity by 2020 at a cost of $ 5.3 billion. More than 90 percent of these capacity needs are for the interstate system (65 percent for the urban interstate system alone). The majority of these needs are due to expected growth in total traffic and not to LATTS trucks only.

(3) However, LATTS truck traffic will have an increasing impact on the state highway investment needs for the Strategic Highway Network. By 2020, LATTS "additional" truck traffic will have resulted in:

- 7.5% more highway miles needing capacity improvements.
- 8.7% additional costs to address these capacity needs.
- 4.1% increase in annual pavement resurfacing costs.

(4) In Alabama, Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington D.C. and Pennsylvania) and Corridor 14 (I-10 from West Texas to Jacksonville, FL) will be proportionally most affected by LATTS trucks because of the higher volume of LATTS trucks using these corridors.

(5) If these investment needs are not met, Alabama's portion of the LATTS Strategic Highway Network will experience significant deterioration in operating speeds, especially during "peak hour."

WATERPORT AND AIRPORT INTERMODAL CONNECTORS

The focus of the highway analysis was, appropriately, on the mainline portion of the LATTS Strategic Highway System. This is the portion of the highway network carrying the vast majority of truck travel (vehicle miles) and has "needs" that could be quantified using existing databases. Additionally, the portion of the highway system connecting the LATTS mainline system with the LATTS waterports and airports also were assessed. While these highway intermodal connectors sometimes are overlooked, their deficiencies can significantly impact the efficient movement of vehicles, especially large trucks.

LATTS intermodal connectors are the highways that link the mainline LATTS Strategic System with LATTS intermodal facilities (waterports and airports). To avoid costly new data collection activities, a recently compiled database was used to conduct the connectors analysis. This database, the *NHS Connectors*, was populated by the state DOTs and compiled by the Federal Highway Administration. It includes a high quality sample of the LATTS intermodal connectors. However, it does not contain information for every LATTS intermodal connector. These analyses utilized information for those LATTS intermodal connectors for which information was available in the NHS connectors database at the time the analyzes were performed.

As noted in Exhibit E-15, Alabama has two connectors (1.8 miles) for which information was available in the *NHS Connectors Inventory Database*. Both connectors are under municipal highway jurisdiction.

Exhibit E-15
LATTS INTERMODAL CONNECTORS

Facility Id	Facility Name	Link Miles	Rural/Urban Designation	Ownership	Agency
Al1a	Birmingham International Airport	1.3	Urbanized (50k To 200k)	Municipal Highway	Brpc
Al7p	Alabama State Docks (Freight Docks)	0.5	Urbanized (50k To 200k)	Municipal Highway	Sarpc

The following are the Alabama facilities that have connectors for which information was not available in the inventory database:

- Huntsville International Airport; AL6A
- Birmingham Regional Airport

Pavement Problems

Alabama's connectors were reported to have very minor pavement condition deficiencies. Only 5% of connector AL1A has pavement problems, whereas 39% of the other locally-owned and maintained airport connectors in the Alliance had pavement condition deficiencies.

Geometric/Physical Problems

Connector AL1A is reported to have shoulder problems. Shoulder problems were the most frequently reported connector geometric/physical deficiency in the Alliance Region.

At-Grade Railroad Crossing Problems

Connector AL7P was reported to have one deficiency in this category, a rough at-grade rail crossing. The airport connector (AL1A) had no at-grade rail crossings.

Traffic Operations and Safety Problems

Connector AL7P was reported to have queues throughout the day, while AL1A was cited to have inadequate signing. This category fared well for Alabama connectors, as the Alliance averaged 4.3 deficiencies per connector while Alabama averaged only two deficiencies per connector.

State Summary

Based upon available information, Alabama's connectors are in overall good physical condition and operate with no significant safety deficiencies.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

While it is clear that improvements in highway infrastructure are required to achieve an economically efficient transportation system, truck operations also can be improved by the implementation of ITS. Transportation technologies help freight transport become more productive and more responsive to the needs of business enterprises, including those which are engaged in Latin American trade. Fortunately, a large portion of current work in the ITS arena is with commercial vehicle operations (CVO). Of significant relevance to LATTS is the Commercial Vehicle Information Systems and Networks (CVISN) that embodies a collection of information systems and communications networks that provide support to CVO.

The national ITS/CVO program encompasses numerous projects undertaken by the individual states. The national program is designed to encourage the development and implementation of technology to enhance the safe movement of commercial vehicles across the United States. There are four main areas within the national program and each of the individual states are striving to meet these goals:

- Safety Assurance – Programs and projects that are designed to assure the safety of commercial drivers, vehicles, and cargo.
- Credentials Administration – Programs and projects that are designed to improve the procedures and systems for managing motor carrier regulation.
- Electronic Screening – Programs and projects that are designed to facilitate the verification of size, weight, safety, and credentials information.
- Carrier Operations – Programs and projects that are designed to reduce congestion and manage the flow of commercial vehicle traffic.

Most of the Alliance member states have completed some type of ITS/CVO Business Plan. Many of these documents are living documents and are continually being updated and revised. Since state's ITS/CVO plans are changing frequently, the information contained below is only a snapshot of ITS information available in early 2001.

Alabama ITS/CVO Plan

As of the time of this review, Alabama did not have an ITS/CVO Business Plan. The DOT is currently in the process of preparing a CVISN Business Plan that could possibly be completed within the next one to two years. However, it is in the preliminary development phase.

Current CVO activities include one permanent weigh station equipped with PrePass, an electronic pre-clearance system located along I-20 at the Alabama-Georgia border. This is not a shared station, it is solely operated by the State of Alabama. In addition, Alabama has several portable WIM sites that are used throughout the State.