SECTION D
INVESTMENT NEEDS

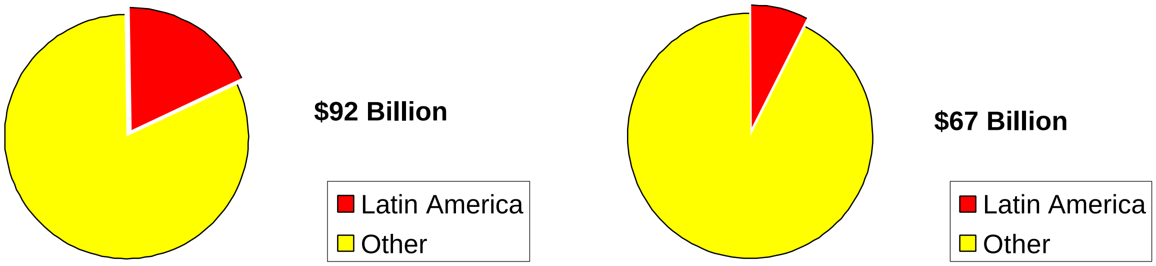
The analysis of investment needs as reported in this section provides a perspective for the adoption of investment strategies that will achieve the LATTS goal and its seven supporting objectives that are discussed in Section E. The overview and perspective which follows indicates the magnitude of the challenge that lies ahead as well as various characteristics of the total investment needs. These features, in turn, influenced the particular strategies which were adopted by the study.

TOTAL INVESTMENT NEEDS

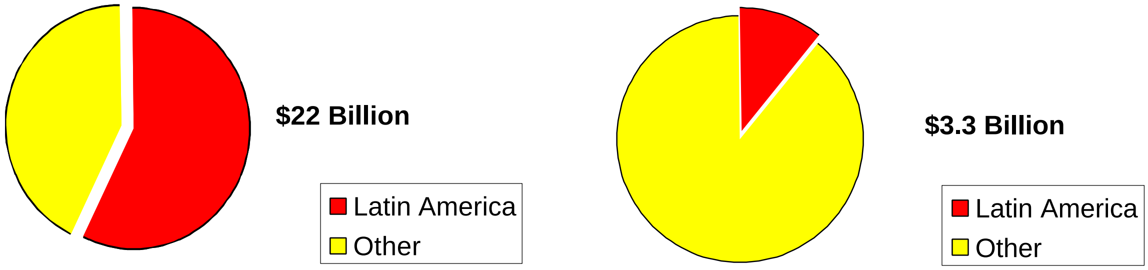
Depicted in **Exhibit D-1** are various characteristics of public sector investment needs on an overall basis. These needs encompass the LATTS Strategic Port, Airport and Highway Systems. No needs are included for the LATTS Strategic Rail System because they are almost exclusively the domain of the private sector and are not directly germane to public investment strategies. Nevertheless, the rail system and its freight transportation role and performance characteristics does influence, to a degree, public sector investment strategies for other modes, particularly highways.

Exhibit D-1
20 YEAR NEEDS ESTIMATES

TOTAL 20-YR NEEDS ESTIMATE **20-YR HIGHWAY NEEDS ESTIMATE**



20-YR PORT NEEDS ESTIMATE **20-YR AIR CARGO NEEDS ESTIMATE**



Public sector investment needs on the LATTS Strategic Transportation System were found to be as follows:

- Total needs amount to $92 billion over the 20-year period.
    - Of this amount, $18 billion, or 20 percent of the total, are the direct result of Latin American traffic.
    - The vast majority of total needs (80 percent) are required to serve personal travel and non-Latin American freight flows.
    - Given this relationship and the nature of the LATTS Strategic Transportation System, investments aimed at serving growing trade flows with Latin America will also have a very substantial impact upon serving overall transportation needs within the Alliance Region.

- Twenty-year port needs amount to $22 billion.
    - This represents 24 percent of the total for all needs on the LATTS Strategic Transportation System.
    - Of the port total, the majority (57 percent) is related to trade with Latin America. This reflects the importance of Latin America trade flows to the Alliance Region's ports.

- Air cargo needs of the LATTS Strategic Airport System amount to $3.3 billion.
    - This is the smallest of the three modal components, constituting only 4 percent of the total.
    - Of the air cargo total, only 12 percent is directly related to Latin American trade flows.
    - The vast majority of total needs (88 percent) are a result of air cargo needs associated with other international and domestic flows.

- Needs for the LATTS Strategic Highway System total $67 billion over the 20-year analysis period.
    - Highway needs are the largest component of total needs of the three modes at 72 percent.
    - Nevertheless, only 8 percent of the total needs of the LATTS Strategic Highway System is directly related to trade with Latin America.
    - On the other hand, some 92 percent of the needs of the LATTS Strategic Highway System are attributable to traffic flows which are not directly associated with Latin American trade flows.

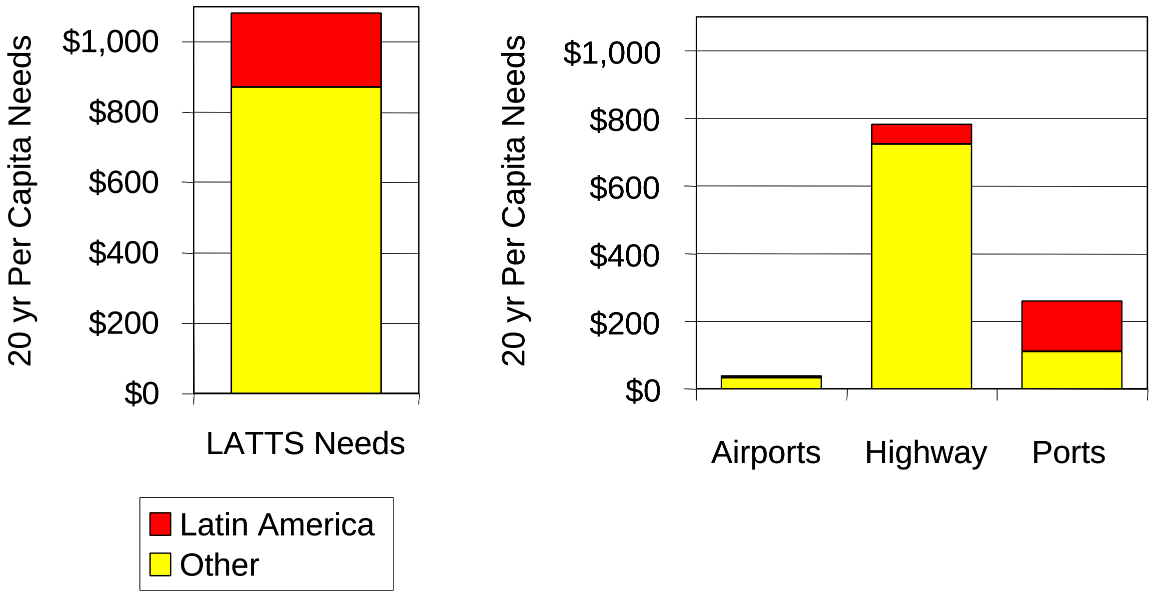
Investment Needs Per Capita

The $92 billion in needs for the LATTS Strategic Transportation System clearly is a hefty amount. However, when viewed in terms of per capita investment needs, it takes on a different perspective, as depicted in **Exhibit D-2**. For this presentation, per capita estimates were based on regionwide population (1998).

- Total needs of $92 billion equates to $1,082 per person over 20-years.
- The Latin American component of total needs amount to $211 per capita, or only 20 percent of the total.
- Per capita needs are significantly higher for the highway component, amounting to $783 over 20-years.

- Port per capita needs for the 20-years amount to $260.
- By far the smallest per capita needs by mode is for airport cargo facilities at $39.

Exhibit D-2
PER CAPITA LATTS NEEDS ESTIMATES
20 YEAR TOTAL



The total 20-year need values are converted to annual amounts in **Exhibit D-3**.

- On an annual basis, per capita needs of the LATTS Strategic Transportation System amount to $54.

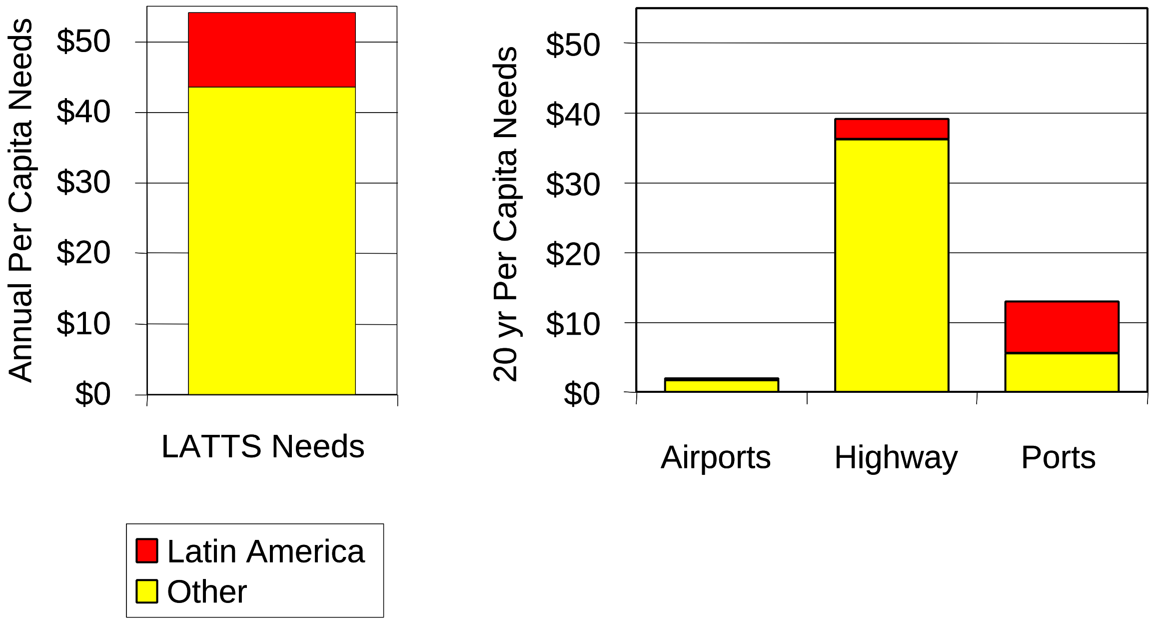
- Of this total, only $11 is related to Latin America trade flows.

- Annual highway needs amount to $39 per capita.

- Ports have annual needs of $13 per person.

- Only $2 per person per year is needed for air cargo flows.

Exhibit D-3
PER CAPITA LATTS NEEDS ESTIMATES
Annual per Capital Average



Comparison with Industrial Capital Investments

Industry clearly has a major dependence upon the transportation system to transport raw materials, intermediate and finished goods. Despite this heavy dependence, industrial capital investments are far greater than transportation investment needs.

As noted in **Exhibit D-4**, in 1998 investment by private industry (in South Carolina) equated to more than $1,500 per capita. As already emphasized, only $52 per capita is required annually for the LATTS Strategic Transportation System.

LATTS Strategic Port System Needs

The needs of the ports included in the LATTS Strategic Transportation System, as previously noted, amount to $22 billion over 20-years. Translation of this value into per capita values is depicted in **Exhibit D-5**.

- On a 20-year basis, port needs equate to $260 per person.
- The Latin American trade component of these needs amounts to $148 per capita, or 57 percent of the total.
- On an annual basis, total per capita needs amount to just $13, of which $7 constitutes the portion attributable to Latin American trade.

Exhibit D-4
LATTS NEEDS vs INDUSTRIAL CAPITAL INVESTMENT (South Carolina)
Annual per Capita Average

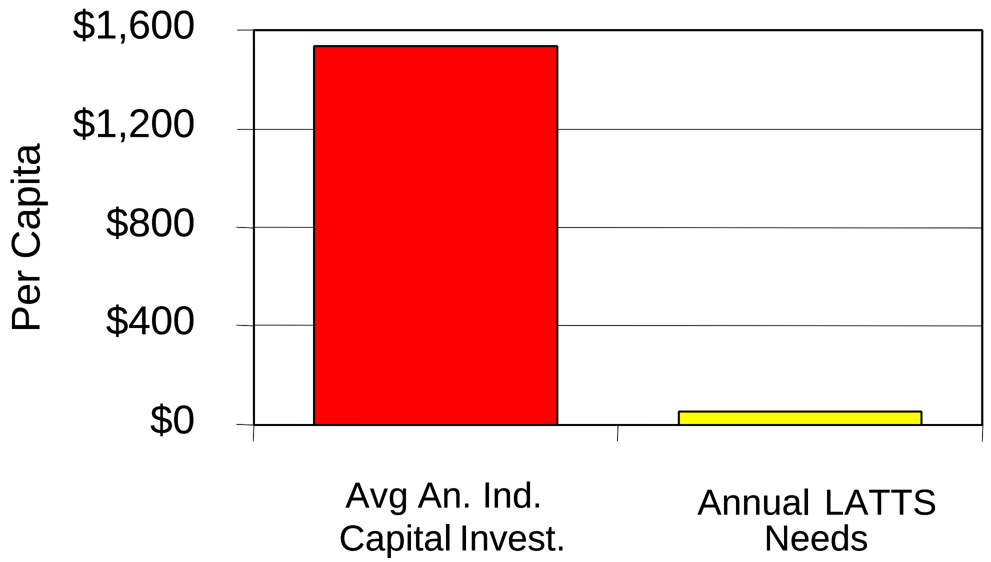
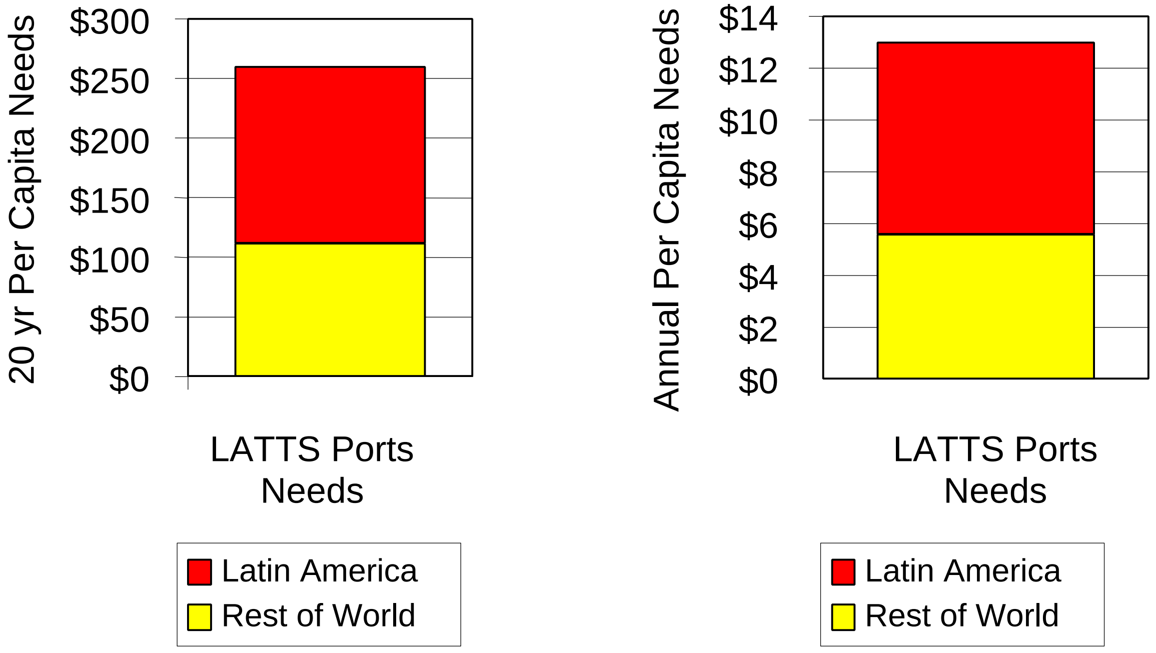


Exhibit D-5
LATTS PORTS NEEDS ESTIMATES

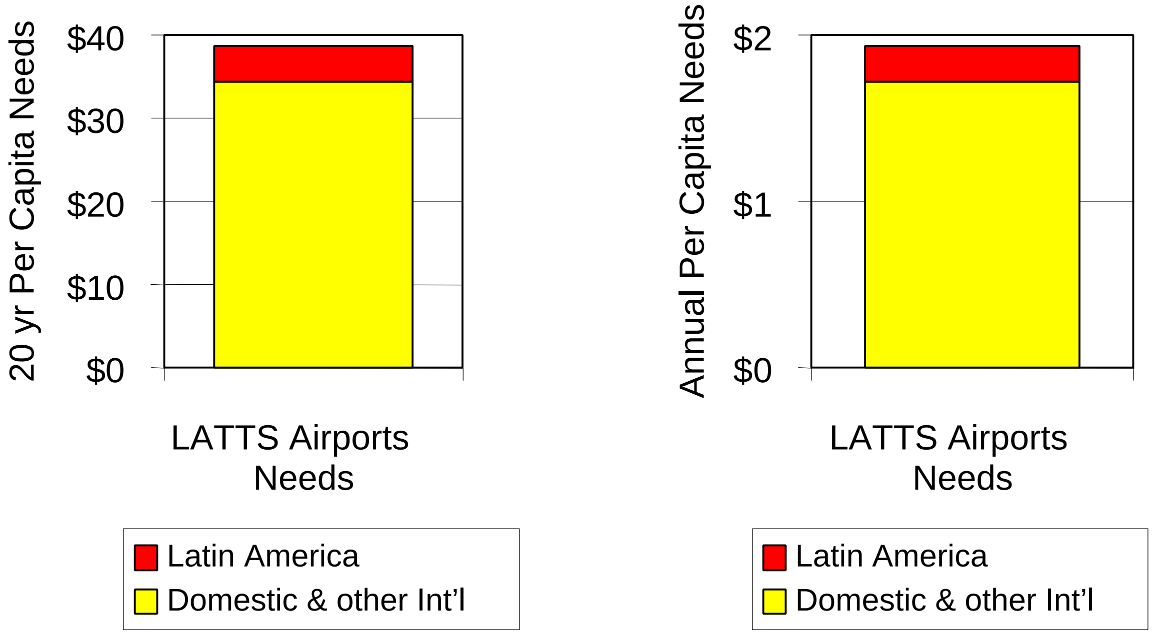


LATTS Strategic Airport System Needs

Total 20-year needs for air cargo at LATTS airports amounts to some $3.3 billion. Based upon this amount, **Exhibit D-6** presents per capita values.

- Per capita public sector needs over the 20-years total $39.
- Of this total, only $4 is due to Latin American trade flows.
- On an annual basis, per capita needs amount to only $2, of which only 12 percent is due to Latin American trade.

Exhibit D-6
LATTS AIRPORTS NEEDS ESTIMATES



As noted, public sector air cargo needs at LATTS airports are only a small component of total needs of the LATTS Strategic Transportation System. Further, they are dwarfed by the amount of investment by the private sector for air cargo. **Exhibit D-7** compares the 20-year LATTS air cargo needs of $3.3 billion to the $75 billion[1] forecast for Boeing freighter sales over a like span of years. The huge disparity is readily apparent.

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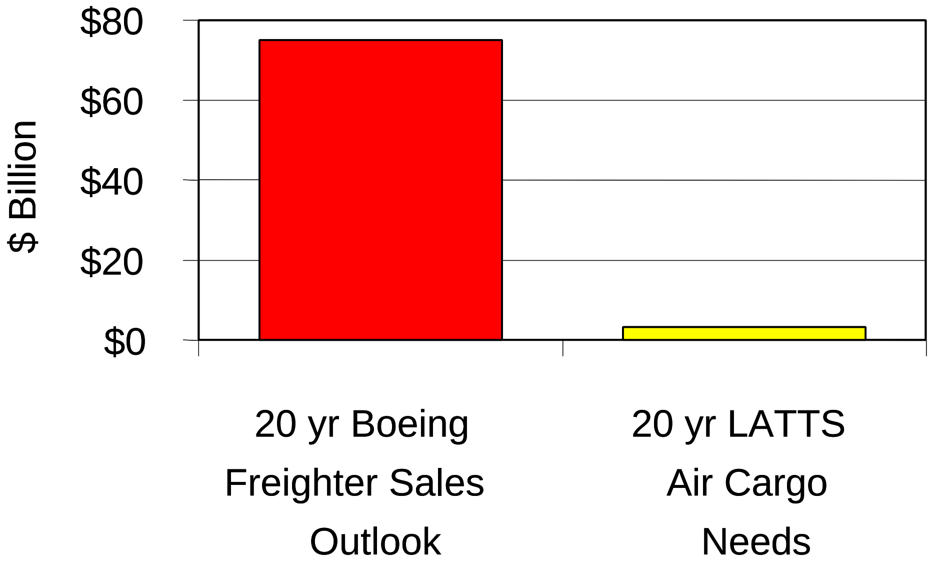
[1] Boeing World Air Cargo Forecast 2000/2001.

Exhibit D-7
LATTS AIRPORTS NEEDS vs BOEING FREIGHTER SALES
20 Year Outlook



LATTS Strategic Highway System Needs

Discussed earlier was the total of $67 billion in 20-year needs for the highways included in the LATTS Strategic Transportation System. **Exhibit D-8** translates these needs into per capita values.

- Over 20-years, per capita needs amount to $783.
- Only 7.5 percent of this total, or $59, is directly due to Latin American trade flows.
- On an average annual basis, highway needs amount to $39 per person but only $3 is required by the incremental Latin American component of total traffic.

On a per capita basis, **Exhibit D-9** compares the LATTS annual highway needs estimate to historical highway expenditures.

- On a national basis, public outlays amounted to some $36.2 billion in 1998, an amount 7.5 times the annual LATTS highway needs value of $4.6 billion.
- The Alliance had higher 1998 outlays per capita than for the nation as a whole.
- Alliance expenditures averaged $147 per person, a value 3.8 times the LATTS annual highway per capita needs value.

Exhibit D-8
LATTS HIGHWAY NEEDS ESTIMATES

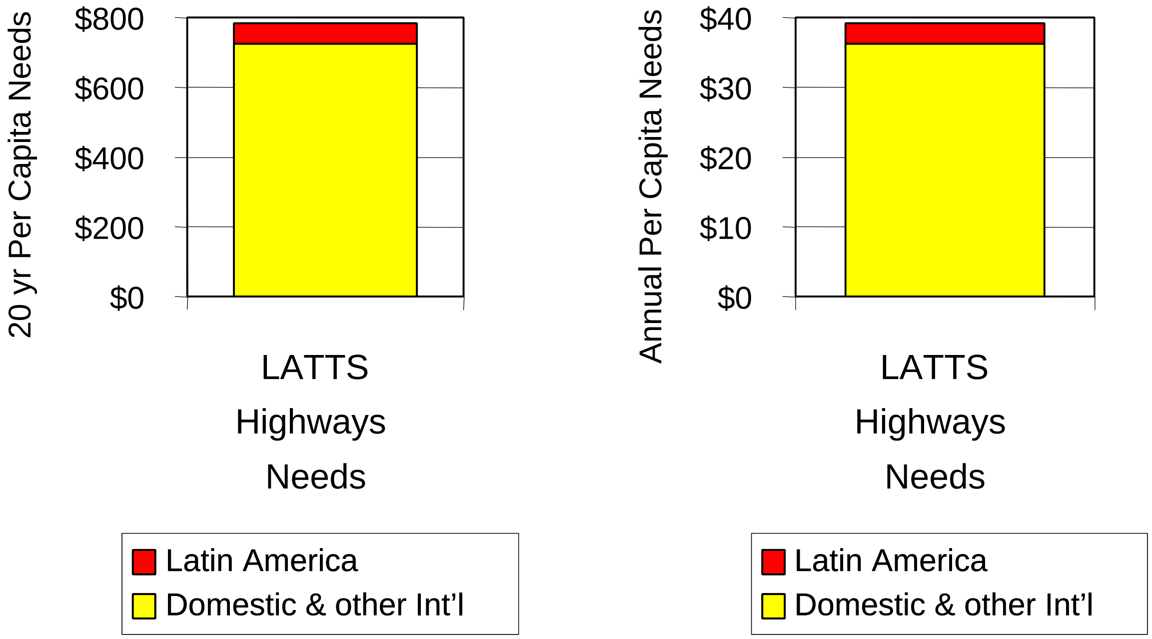
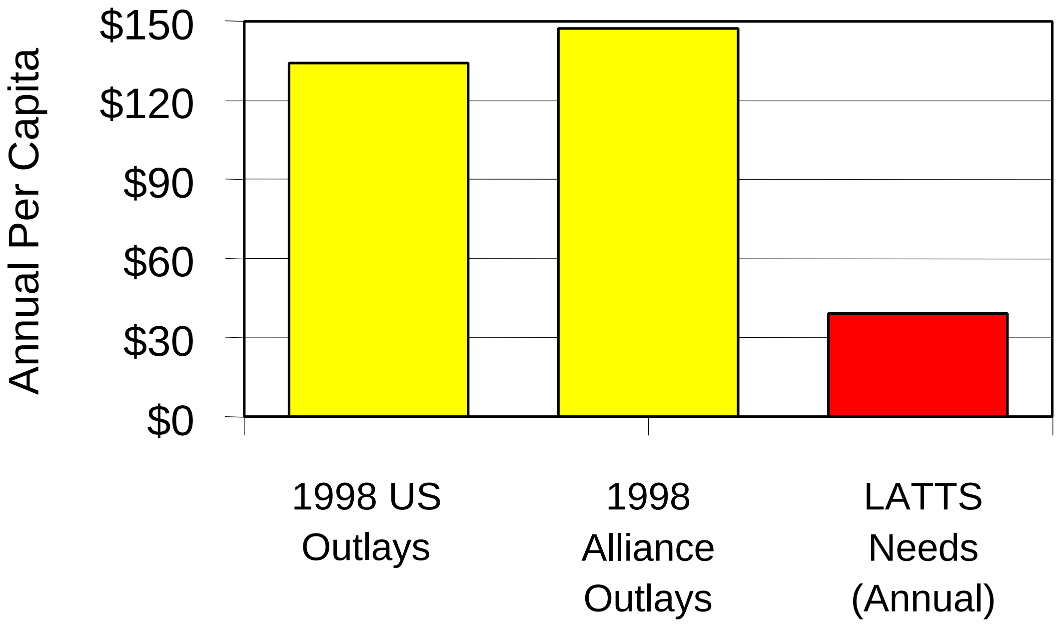


Exhibit D-9
LATTS HIGHWAY NEEDS vs HISTORICAL EXPENDITURES
Annual Expenditures



SECTION D1
INVESTMENT NEEDS FOR THE LATTS STRATEGIC PORT SYSTEM

As noted in Section C, a total of 35 coastal ports and17 inland ports were included in the LATTS Strategic Port System. Analyses were then undertaken to estimate the investment needs associated with this system of ports. The analyses identified some $22 billion in 20-year port needs. The process which developed this estimate is described below.

DATABASE

The data collection process addressed the following categories:

- Terminal Cargo Type
- Terminal Acres
- Number of Berths
- Public or Private Facility
- Published Terminal(s) Throughput Capacity
- Published Terminal(s) Throughput (most recent year)
- Other General Data Pertinent to the Study

While 1999 data was preferred, 1998 data was also accepted, and in some cases fiscal Year 1998-1999 was obtained.

Data were represented in short ton units for consistency with all of the various types of commodities. These commodities included:

- Containerized Cargo
- Break-Bulk
- Neo-bulk
- Dry Bulk
- Liquid Bulk

In some cases, certain commodities required conversion into short tons, such as in the case of containers. Containerized cargo is typically represented in industry standard format by Twenty-foot Equivalent Units (TEU). For example, one 40-foot container would then be equal to two TEUs. Other commodities, such as auto (neo-bulk) are often reported in units, which are equivalent to approximately 2,000 pounds, or approximately one-short ton per auto.

Information for the ports database was collected through a series of efforts. Basic information was initially developed during discussions between the consultant and the LATTS Working Committee. Then, using that base information as a starting point, telephone interviews were conducted with a representative of each port. The raw data thus acquired was entered into the study database, after which the initial results were then returned to each port representative by fax for verification. As an additional means of data verification, several maritime data periodical and reporting agencies were utilized to verify and validate the input data. These agencies consisted of the following:

- American Association of Port Authorities (AAPA)
- Containerization International - 1999 Edition
- U.S. Maritime Administration
- Maritime Services Directory

Yearly port throughputs were obtained for most of the major container ports in the Containerization International Yearbook – 1999 Edition. However, specific data, such as terminal acres, number of berths, etc., were not readily available through these sources. That information could only be obtained or provided by a specific port and validated by the port representative. In addition, many of the smaller ports, particularly the inland waterway ports, are not represented or mentioned in most periodicals, and therefore, information was limited. In those cases, only the individual port representative could validate or verify the actual data.

PERFORMANCE MEASURES AND METHODOLOGY

Once the data for each port terminal was entered into the computerized database spreadsheet, the capacities and throughputs of each port terminal was then quantified and compared based on each of the individual categories described earlier. The database takes into account all of the active individual terminals at each of the identified ports, based on cargo type. Therefore, the summary reports in the database not only identified the throughput and capacity of each state's marine cargo terminals, but they also revealed the throughputs and capacities by cargo type in each state.

The database not only organized the actual throughputs and estimated capacities for each of the terminals, but it also provided estimates of the throughput capacities for the identified terminals for which information was lacking. Terminal capacity can often be a very subjective issue that cannot always be easily quantified, or is often misrepresented. Therefore, in the event that terminal capacity was not known or available, the database utilized industry standard defaults that can estimate terminal's estimated throughput capacity based on criteria such as terminal acreage, number of berths and storage mode.

It is important to note that the LATTS analyses were not intended to develop a detailed estimate of current throughput and maximum throughput potential for each port. However, it represents a reasonable indication of capabilities within the maritime industry as a whole for the ports in the 13 States and Puerto Rico (the Alliance Region) that were considered. Also, there are some small privately owned terminals within the Alliance Region that are not reported in maritime data sources and do not keep accurate information. Therefore, the state- by-state throughput summaries were calibrated to the throughput projections created in the Future Facility Needs Assessment portion of this study. This calibration increased the accuracy of the study's analyses.

In summary, the database not only organized the actual throughputs and estimated capacities for each of the terminals, but it also provided estimates of the throughput capacities for the identified terminals for which information is lacking.

Specifically, the database estimated the throughput capacity by calculating the estimated capacity for each of the two key terminal components (storage area and wharf). The resulting estimated capacity is governed by the limiting component of the two.

Throughout this study, the estimated capacity was defined as the Maximum Practical Capacity (MPC). MPC typically represents the high end of a reasonable operating scenario, and is discussed in greater detail later in this report section.

Input Data

The following list of input data types illustrates the minimum data input required by the database to summarize and estimate the throughput and capacities of each port terminal, based on cargo type:

- Terminal acres
- Storage mode
- Number of berths available
- Berth type (dedicated or public)
- Published maximum capacity (tons/yr.)
- Published throughput (tons/yr.)

Each type of data served a specific function in the database assessment. The following provides a brief summary of each type of the input data and their functions.

Terminal Acres

The reported acreage of each terminal and terminal type was identified and input. Generally, the acreage includes the wharf area, storage and circulation areas, as well as the gate areas.

Storage Mode

The known mode of storage in each terminal was crucial for properly defining the terminal's capacities for each cargo type. The possible entry symbol used in the database for each of the storage modes and a brief description for each cargo type are as follows:

- Cw = Container wheeled: containers stored on chassis
- Cg = Container grounded: containers stacked by utilizing rubber tire gantries, top picks, or straddle carriers to access boxes.
- Cm = Container mixed: a combination of wheeled and grounded containers.
- NBo = Neo-Bulk outside: Bulk cargo such as automobiles, steel shapes and steel coil, etc., stored in open or uncovered areas.

- NBw = Neo-Bulk warehouse: Bulk cargo such as steel shapes, steel coil, etc., that require storage in warehouses or covered storage areas.
- NBm = Neo-Bulk mixed: A mixture of open/outside storage and warehoused or covered neo-bulk cargo.
- BBo = Break-Bulk outside: Break-bulk cargo, palletized or boxed cargo stored in open or uncovered areas.
- BBw = Break-Bulk warehouse: Break-bulk cargo, palletized or boxed cargo stored in warehouses or covered storage areas.
- BBm = Break-Bulk mixed: A mixture of open storage and warehouse/covered break-bulk cargo.
- DBo = Dry Bulk outside: Dry bulk cargo such as coal, scrap metal, sand or other dry commodity that can be stored in open or uncovered areas.
- DBs = Dry Bulk silo: Bulk cargo such as grain, cement, sugar, or other dry bulk cargoes that typically requires storage in protected silos, warehouses, or covered storage areas.
- DBm = Dry Bulk mixed: A mixture of open/outside storage, silo, warehouse or covered dry bulk cargoes.
- LBt = Liquid Bulk tank – Liquid bulk commodities such as petroleum products, chemicals, molasses, or other liquid products that are typically piped via manifolds to or from the berth area to a remote or nearby tank storage farm.

Numbers Of Berths Available

The reported number of berths were input into the model. Lay berths also were included. Berth lengths were determined by lookup tables within the database that consider the type of cargo and average berth length for that cargo based on industry standards.

Berth Type (Dedicated or Public)

Another piece of key input data was the rate of utilization for the available berths. A dedicated berth or private terminal was assumed to have a higher utilization factor for a particular commodity or cargo type. In addition, vessel calls are likely to be scheduled and therefore throughput capability will tend to be higher given the higher utilization factors for this type of berth. Public berths, on the other hand, are assumed to accommodate unscheduled vessel calls, and are therefore not always available for a particular commodity. This tends to produce lower throughput capacities. Public berths can also sometimes serve as lay berths if necessary.

Published Maximum Capacity

This input, given in tons per year, represents the documented maximum capacity generally found in terminal master plans, annual reports, or through other documentation. As previously mentioned, such data is not always readily available and is typically not found in public records.

Published Throughput

The published throughput for a respective terminal is the amount of cargo in tons that a terminal handles per year. Most ports document this information in their publications. In addition, there are many services and periodicals that publish this data.

Throughput Capacity Calculations

Given that each of the above data entry criteria are met, the database was capable of estimating the output data for the following:

- Storage Throughput Capacity (tons/yr.)
- Berth Throughput Capacity (tons/yr.)
- Calculated Practical Capacity
- Maximum Practical Capacity, MPC (tons/yr.)

Once the output data was assessed, it was then organized for reporting. The following represents a brief summary of each of the output data and their functions.

Storage Throughput Capacity

The storage throughput capacity was essentially calculated by taking the available acres for a particular cargo storage mode and comparing it to industry standards based on look-up tables in the database. For example, the look-up tables assumed the following storage capacities for the three different container storage modes:

- Wheeled Storage Capacity (TEU/acre) = 90
- Grounded Storage Capacity (TEU/acre) = 200-250
- Other/Mixed Storage Capacity (TEU/acre) = 150

Additional look-up data for the various types of cargoes included:

- The percentage of the total available acres for storage

- The dwell time, in days for outside storage, silo storage, warehouse storage and mixed storage

- Tons per TEU for containerized cargo (including empties)

- Peaking factors

For this study, all storage throughput capacity results were represented in tons per year.

Berth Throughput Capacity

The berth throughput capacity was based on the number of available berths and the status of that particular berth, dedicated or public. Based on that input, and employing look-up tables for typical berth utilization, the berth throughput capacity was calculated based on industry standards. The look-up tables considered the following berthing factors:

- Dedicated berth occupancy factor
- Public berth occupancy factor
- Cranes, conveyors or pipe manifolds per berth/ship
- Lifts or tons, per hour, per crane, conveyor or pipe manifold
- Tons (or TEU) per lift, per conveyor or per pipe manifold
- Peaking factors
- Berth down time percentages
- Berth operating hours per day

The look-up tables essentially consider the number of berths, type of cargo, and the average times to load/unload a vessel utilizing conventional loading and unloading equipment (cranes, conveyors, pipelines, etc.). The berth throughput capacity was represented in tons per year.

CALCULATED PRACTICAL CAPACITY

The calculated practical capacity was determined by considering the minimum value represented for the storage throughput capacity versus the berth throughput capacity. The lesser of the two values was considered to be the limiting component for that terminal, and thus represented the practical capacity of that terminal. In other words, the minimum value governs, or limits the ability of that terminal to produce additional throughput.

Because berths are traditionally major capital improvements, and also require available waterfront access, they can effectively govern a port’s ability to increase throughput. It was assumed that equipment can always be added in order to increase loading and unloading productivity and operations, whereas new berths are expensive and require significant design, dredging and sometimes environmental mitigation. Similarly, storage is governed by the availability of backlands. Land not immediately adjacent to the berth is generally considered to be less efficient, due to additional drayage costs and other operational issues. Therefore, storage can simply be limited by too little land.

MAXIMUM PRACTICAL CAPACITY (MPC)

The database was used to assess the minimum value between the storage throughput capacity, berth throughput capacity, and the published throughput capacity, in tons per year. This quantity represents the maximum practical capacity of a given terminal. Maximum Practical Capacity (MPC) is defined as the high end of a realistic operating scenario. For containerized cargoes, this throughput is measured in either lifts or 20-foot equivalency units (TEU). However, for the purpose of this study, TEUs were converted into short tons, or approximately 7.5 tons per TEU. For break-bulk/neo bulk, liquid bulk and dry bulk, the units of measurement are also in short tons. Automobiles are measured in number of vehicles per year. For the purpose of this study, automobiles were converted to approximately one-short ton per automobile unit.

Although the MPC of a terminal is defined as the high end of a realistic operating scenario, this represents the peak operation of a terminal and sustained operation at this level for a significant period of time is generally uneconomical, impractical and unsafe.

An analogy associated with this characteristic is the speed capacity of a car. Although a car may be capable of traveling at speeds of 120 mph, this is not the safest, practical, or most economical speed at which to drive the car.

In reality, during peak times, a terminal can operate at, or close to MPC. However, a terminal operating at MPC (very high TEUs or Tons/acre/year) for a sustained period is stretching the envelope with respect to their respective capacity. For practical planning purposes, operations at MPC are not sustainable over prolonged periods. It should also be noted that prolonged operations at MPC tend to drive up operating and maintenance costs and is considered unrealistic for long durations.

For this reason, a sustainable capacity for each terminal was estimated and used as a particular terminal's capacity. This capacity is known as the Sustainable Practical Capacity (SPC). Past experience in applying capacity models suggests that the sustainable practical capacity of a terminal is generally 75 percent of a terminal's Maximum Practical Capacity (MPC). For throughput to exceed the SPC, a port would have to operate at uneconomical or unsafe levels, build additional terminals, or expand the existing ones. This threshold generally may vary between terminals, but past experience has shown that the breaking point generally is near 75 percent.

For planning and estimating purposes, Sustainable Practical Capacity (SPC) was used as the basis for the Future Facility Needs Assessment. In essence, this equates to a throughput capacity that is estimated to be approximately 75% to 85% of the terminal's MPC.

The estimated SPC per each planning module was adjusted (between 75% and 80% MPC) over each approximate ten to fifteen-year interval. This was done to reflect the likelihood that there will be throughput increases due to improvements to cargo handling equipment and higher productivity levels, as well as the addition of other types of technological advancements in automated improvements. It can be safely assumed that these technological improvements and productivity increases are likely to occur within the Alliance Region over the next few decades.

CAPACITY AND THROUGHPUT ESTIMATES - CURRENT

A state-by-state (and Puerto Rico) summary was compiled from the results of the terminal throughput capacity spreadsheets. **Exhibit D1-1** contains the current total published capacities and throughputs, in tons per year, for the entire LATTS Region. In addition, **Exhibit D1-2** represents a summary of the LATTS Region for each Alliance member's current total published capacities and throughputs, in tons per year, for each of the following cargo types:

Exhibit D1-1
CURRENT (1996) LATTS REGION PORT CAPACITY AND THROUGHPUT ESTIMATES
(in Short Tons/Year)

CARGO TYPE	CURRENT THROUGHPUT ESTIMATE	CURRENT CAPACITY ESTIMATE
Containerized Cargo	80,139,147	104,025,351
Break-Bulk	50,255,428	50,683,819
Neo-Bulk	6,954,929	11,152,395
Dry Bulk	179,669,037	245,894,604
Liquid Bulk	259,917,296	312,151,999
Total	**576,935,837**	**723,908,168**

Exhibit D1-2
CURRENT PORT CAPACITY AND INTERNATIONAL THROUGHPUT ESTIMATES BY STATE
(in short tons/year)

CARGO TYPE	CURRENT THROUGHPUT ESTIMATE	CURRENT CAPACITY ESTIMATE
ALABAMA		
Containerized Cargo	508,408	1,500,000
Break-Bulk	4,315,105	5,025,000
Neo-Bulk	442,899	1,725,000
Dry Bulk	16,067,802	29,100,000
Liquid Bulk	590,532	825,000
TOTAL STATE	21,924,746	38,175,000
ARKANSAS		
Containerized Cargo	67,916	61,124
Break-Bulk	595,246	571,295
Neo-Bulk	0	0
Dry Bulk	512,257	757,944
Liquid Bulk	3,587	239,135
TOTAL STATE	1,179,006	1,629,498
FLORIDA		
Containerized Cargo	8,316,742	25,054,866
Break-Bulk	4,815,814	6,763,304
Neo-Bulk	1,168,917	4,490,095
Dry Bulk	10,287,399	13,461,180
Liquid Bulk	18,001,632	36,706,982
TOTAL STATE	42,590,504	86,476,427

Exhibit D1-2 (cont'd)
CURRENT PORT CAPACITY AND INTERNATIONAL THROUGHPUT ESTIMATES BY STATE
(in short tons/year)

CARGO TYPE	CURRENT THROUGHPUT ESTIMATE	CURRENT CAPACITY ESTIMATE
GEORGIA		
Containerized Cargo	6,188,571	7,535,272
Break-Bulk	2,693,952	2,332,884
Neo-Bulk	247,958	204,565
Dry Bulk	1,373,445	5,117,949
Liquid Bulk	1,410,155	7,893,581
TOTAL STATE	11,914,081	23,084,251
KENTUCKY		
Containerized Cargo	0	0
Break-Bulk	0	0
Neo-Bulk	658,614	974,546
Dry Bulk	1,589,757	4,059,533
Liquid Bulk	22,711	191,308
TOTAL STATE	2,271,082	5,225,387
LOUISIANA		
Containerized Cargo	7,568,194	7,248,823
Break-Bulk	30,150,172	26,740,004
Neo-Bulk	2,128,962	1,830,644
Dry Bulk	73,780,859	72,993,000
Liquid Bulk	83,811,353	122,185,962
TOTAL STATE	197,439,540	230,998,433
MISSISSIPPI		
Containerized Cargo	1,263,040	1,377,844
Break-Bulk	2,164,020	2,306,289
Neo-Bulk	0	0
Dry Bulk	754,370	1,290,841
Liquid Bulk	0	0
TOTAL STATE	4,181,430	4,974,974
NORTH CAROLINA		
Containerized Cargo	694,950	1,303,963
Break-Bulk	922,815	1,043,382
Neo-Bulk	0	0
Dry Bulk	3,296,025	5,439,762
Liquid Bulk	0	0
TOTAL STATE	4,913,790	7,787,107
PUERTO RICO		
Containerized Cargo	8,963,715	11,839,934
Break-Bulk	785,309	1,553,969
Neo-Bulk	72,226	279,596
Dry Bulk	1,089,112	1,462,500
Liquid Bulk	3,485,159	6,011,690
TOTAL STATE	14,395,521	21,147,689

Exhibit D1-2 (cont'd)
CURRENT PORT CAPACITY AND INTERNATIONAL THROUGHPUT ESTIMATES BY STATE
(in short tons/year)

CARGO TYPE	CURRENT THROUGHPUT ESTIMATE	CURRENT CAPACITY ESTIMATE
SOUTH CAROLINA		
Containerized Cargo	9,516,673	10,745,711
Break-Bulk	508,883	490,295
Neo-Bulk	0	0
Dry Bulk	1,888,746	3,367,798
Liquid Bulk	0	0
TOTAL STATE	11,914,302	14,603,804
TENNESSEE		
Containerized Cargo	1,528,874	3,301,172
Break-Bulk	61,498	140,940
Neo-Bulk	0	0
Dry Bulk	2,292,953	4,991,625
Liquid Bulk	2,270,428	5,564,194
TOTAL STATE	6,153,753	13,997,931
TEXAS		
Containerized Cargo	26,259,005	23,593,870
Break-Bulk	2,464,419	2,589,776
Neo-Bulk	2,235,353	1,647,949
Dry Bulk	32,771,877	40,166,677
Liquid Bulk	150,321,739	132,534,147
TOTAL STATE	214,052,393	200,532,419
VIRGINIA		
Containerized Cargo	9,263,059	10,462,772
Break-Bulk	778,195	1,126,681
Neo-Bulk	0	0
Dry Bulk	33,392,000	55,500,000
Liquid Bulk	0	0
TOTAL STATE	43,433,254	67,089,453
WEST VIRGINIA		
Containerized Cargo	0	0
Break-Bulk	0	0
Neo-Bulk	0	0
Dry Bulk	572,435	8,185,795
Liquid Bulk	0	0
TOTAL STATE	572,435	8,185,795

- Containerized Cargo
- Break-Bulk
- Neo-Bulk
- Dry Bulk
- Liquid Bulk

In addition to the state-by-state summaries, the database provided the opportunity to compile the throughputs or capacities for any combination of state and/or cargo type.

THROUGHPUT ESTIMATES - FUTURE

PIERS data were used to properly assess the future market expectations and subsequent annual growth rates for each Alliance member. PIERS is an acronym for Port Import/Export Reporting Services and is a publishing branch of the Journal of Commerce, a highly respected daily periodical of trade logistics. The PIERS data represents the latest cargo projections by cargo type as well as modal type (i.e. highway, rail, etc.) for the years 2000, 2005, 2010, 2015, and 2020.

In total, the throughput and capacity of the Alliance Region assessed for current activity as well as projected activity. In corresponding PIERS data, based upon actual shipping manifests for United States Customs districts, to port-provided data, an actual accounting of current private activity not measured by public ports was performed. In discussions with relevant port representatives, the designation and location of private terminals importing or exporting commodities were determined. Typically, these private enterprises were contacted and cargo / terminal data was obtained. The port's information was compared to the PIERS data and future projections were developed in the Projection Model which is a part of the database

LATTS PROJECTION MODEL

The LATTS projection model tied the PIERS data with the port-provided data. A process of correlating port reported tonnage and PIERS data required a significant analysis. To perform this analysis, several assumptions were made, as follows.

- In comparing PIERS related data to port-provided data, it was noticed that a direct correlation was not possible. If PIERS data was greater than port-provided data, it was assumed that the cargo that could not be specifically accounted was attributable to private terminals. The Mississippi River system, inclusive of its tributaries, as well as the Gulf and Atlantic coast, consists of private terminals not managed by the typical public port entities. For example, located near Virginia Port Authority terminals are privately managed bulk terminals. Specific accountability of these private terminals was included only if the terminal information was provided.

- If the PIERS related data was less than the port-provided data, it was assumed that transshipment and over-the-road (OTR) cargo was a factor. In other words, cargo which enters a port may be counted as it exits the port via a different mode of transportation as well as being counted by another port within the same state as an entry. PIERS data is based upon United States Customs data and therefore is only counted as it enters or exits the United States. U.S. Customs data is based upon the origin or destination of the commodity or cargo, noted by the “bill of lading”. It is important to note this factor because cargo that is counted at least twice could suggest that the sustained or maximum practical capacity has been reached contemporarily when that may not actually be the case.

- The description and assumptions of each port should be noted, as described under the noted projection cargo for each state. Each terminal surveyed has different “characteristics-of-operation.” For example, some ports manage their terminals on a daily basis while other “public” port operations managed private facilities. Private port operations complicated data collection.

Therefore, if the port-provided number was greater than the PIERS number, the PIERS data - current and projected - was considered the relevant cargo throughput to be used and the surplus port registered cargo was assumed to be transshipment and/or OTR cargo. Since all facilities, notably private bulk terminals, could not be specifically researched or determined, it was considered more appropriate to work with data that was known. If the PIERS data was greater than the port-provided number, then the port-provided number was utilized for the same reason yet grown at the rates noted by PIERS.

Data for inland (non-coastal) states were not available to any significant level of detail such as transportation mode or cargo type. Additionally, inland state PIERS data was only available for current (1996) and 2020. Growth rates, in order to determine projected cargo amounts for 2000, 2005, 2010, and 2015, were taken from the coastal state that was most likely to affect the relevant inland state. For example, while West Virginia is located adjacent or closer to Virginia, the more appropriate growth rate would be Louisiana; West Virginia is not connected to Virginia via waterway while it is connected to Louisiana. The mix of cargo for the inland states was again taken from port-provided data, a known factor.

GENERAL METHODOLOGY

In general, port data was compared to PIERS data. As noted, port cargo descriptions by port complicated matters. PIERS data breaks out cargo transportation by mode which has some provision of cargo type (i.e., containerized, break-bulk, neo-bulk, dry bulk and liquid bulk cargo). PIERS transportation modes consist of:

- Truck container
- Rail Intermodal (container)
- Truck non-container
- Rail non-container

- Water
- Other (pipeline, water)

These modes provided a hint regarding cargo type, but in performing the capacity analysis for the Alliance ports, the following five types of cargo were used:

- Container
- Break-bulk
- Dry bulk
- Liquid bulk
- Neo-bulk

The PIERS transportation modes were converted into the above five cargo types. The steps for performing this conversion included analyzing and disseminating cargo types between PIERS and port-provided data. The following steps were used:

1. Determine, at the state level, the current mix of the five cargo types (as noted above).

2. Compare the total port cargo tonnage provided at the state level for the terminals included in this analysis to the total PIERS-based data,

3. Allocate the containerized cargo amount provided by the ports to that provided by PIERS.

4. Determine the breakdown of cargo types (i.e., percentage at the state level).

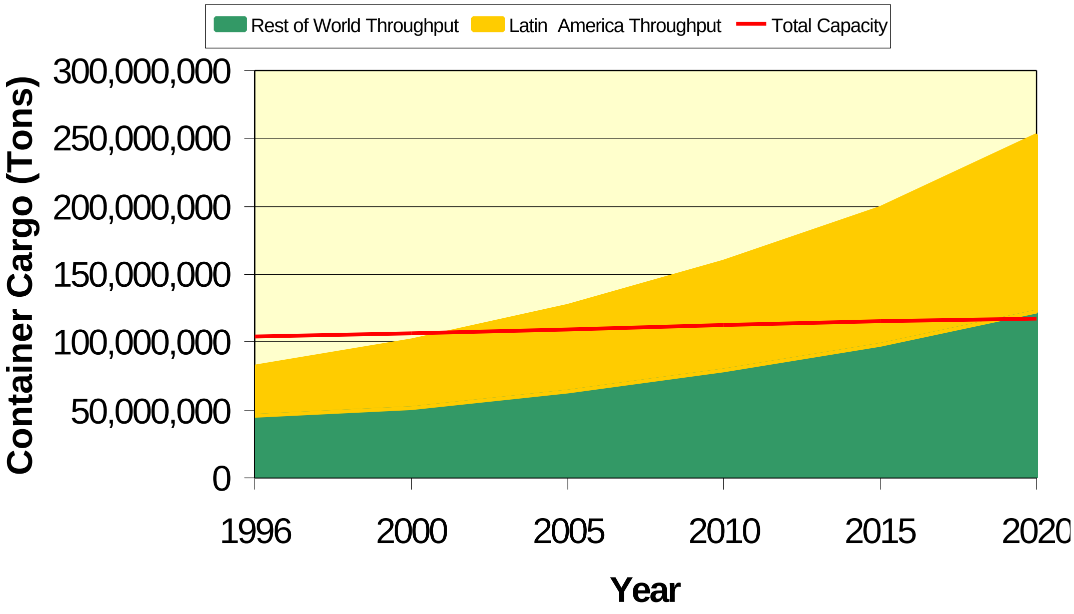
5. Consider the amount of PIERS containerized cargoes that are provided by each source and are dependant upon the breakdown of cargo that is provided by the ports (matching the mix in the PIERS data to the mix in port data).

In effect, the allocation of cargo carried by the PIERS-based modes of transportation was correlated with the five basic types of cargo. Thus, it was noted how much of each of the five cargo types were “carried” by each PIERS-based mode of transportation. The result was real numbers of cargo tonnage for each type of cargo – allocated from PIERS – for the 20-year outlook in five-year increments after 1996 – 2000, 2005, 2010, 2015 and 2020.

FUTURE NEEDS ESTIMATES

Exhibit D1-3 compares cargo throughput with capacity for each of the cargo types. The graphs show that for each cargo type, throughput in the Alliance will exceed capacity. The deficiency in capacity is the basis for estimating marine terminal needs.

Exhibit D1-3
LATTS REGION CONTAINER THROUGHPUT vs CAPACITY



LATTS REGION BREAK-BULK THROUGHPUT vs CAPACITY

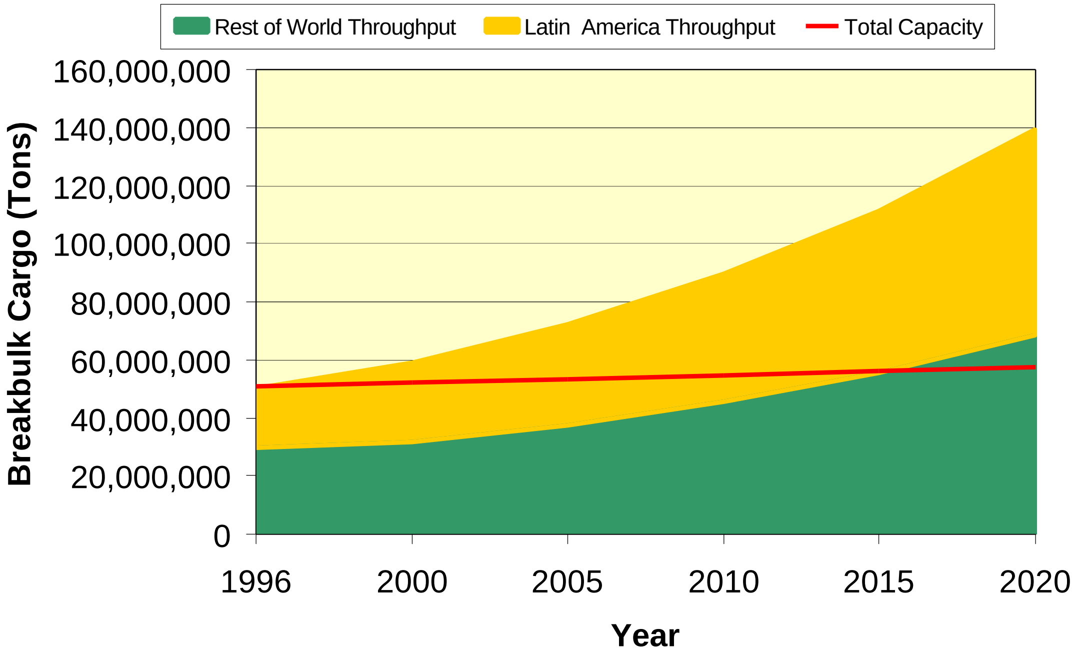
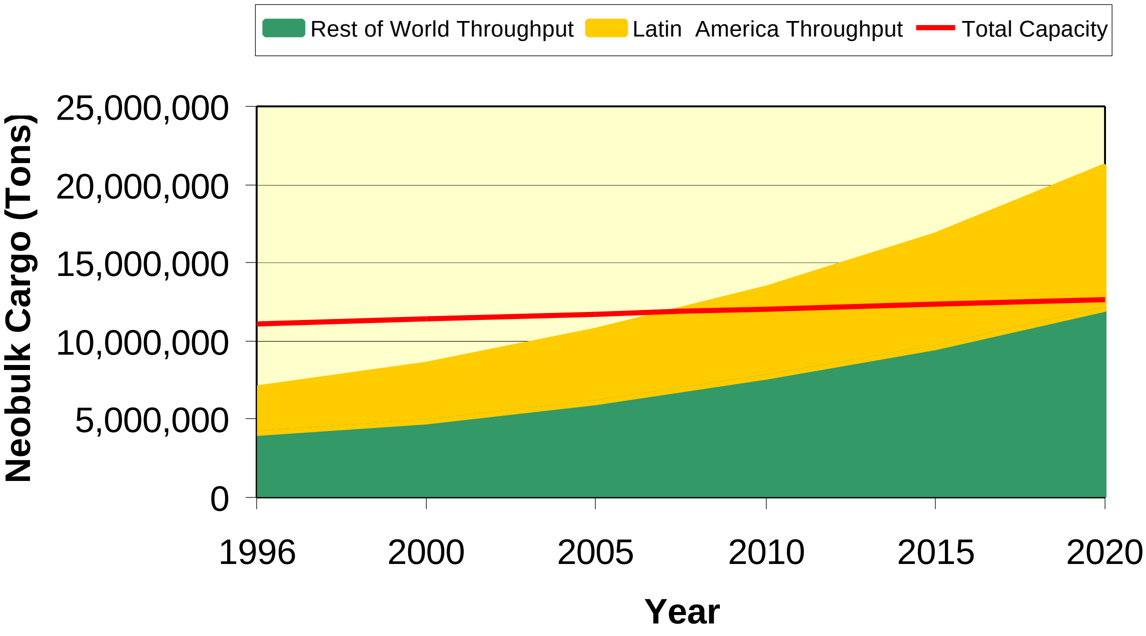


Exhibit D1-3 (cont'd)
LATTS REGION NEO-BULK THROUGHPUT vs CAPACITY



LATTS REGION DRY BULK THROUGHPUT vs CAPACITY

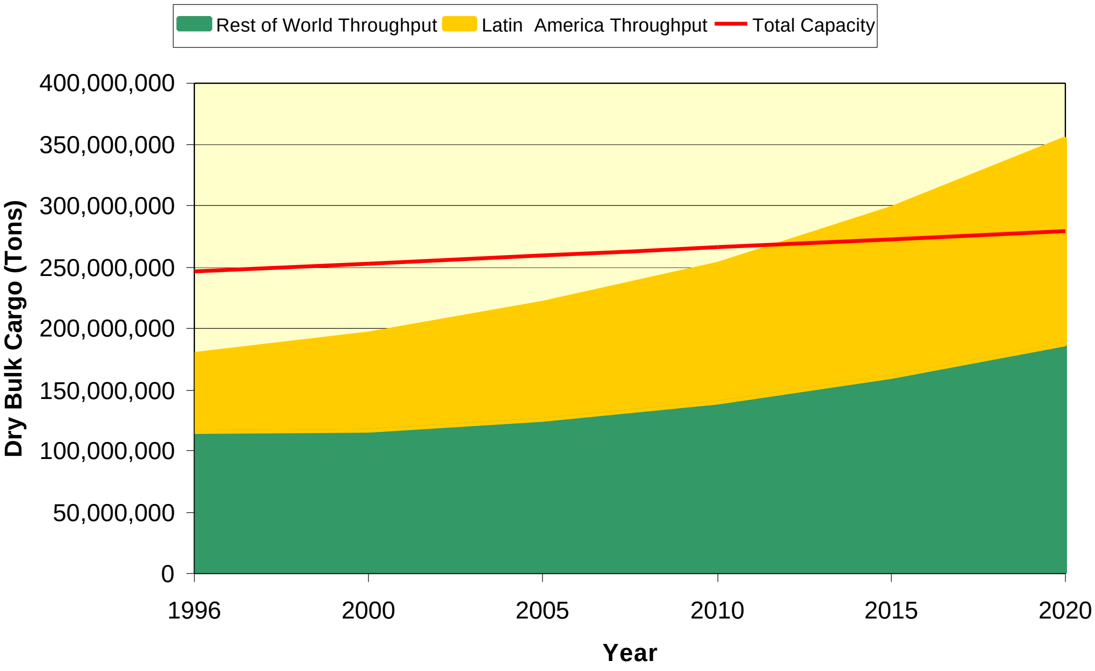
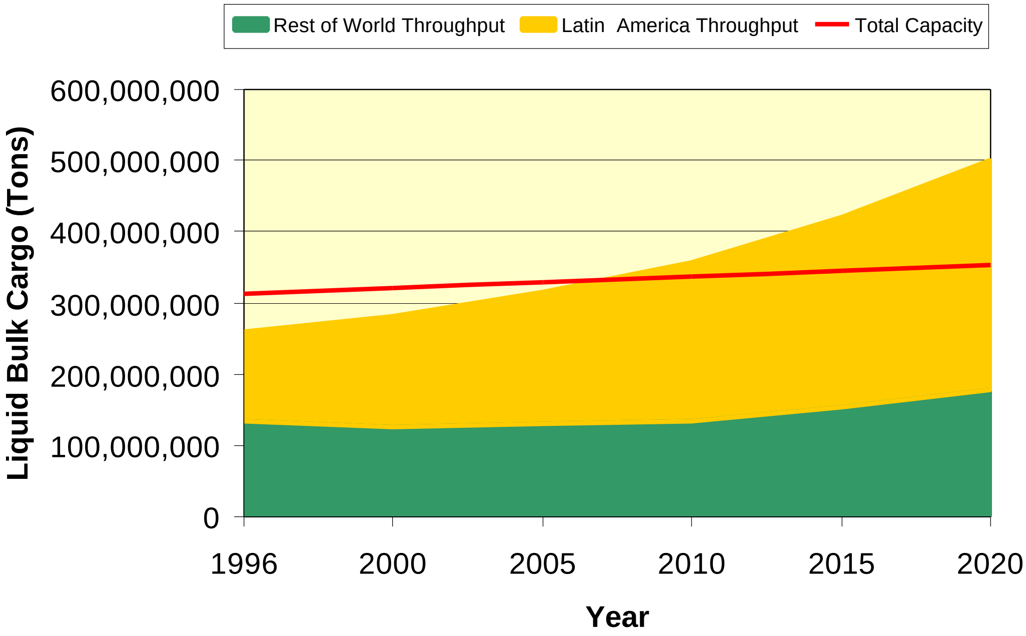
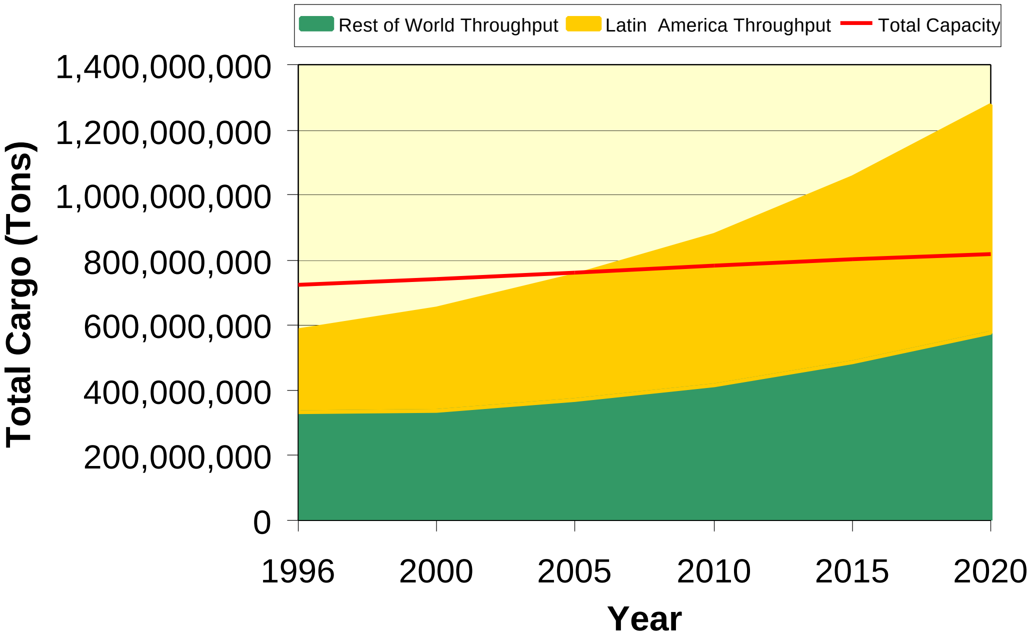


Exhibit D1-3 (cont'd)
LATTS REGION LIQUID BULK THROUGHPUT vs CAPACITY



LATTS REGION ALL CARGOES THROUGHPUT vs CAPACITY



Working from the current and future throughput modeling data, the future facility needs assessment for the LATTS Region was performed. The SPCs of existing facilities, for each cargo type were subtracted from the medium cargo forecasts provided by the PIERS data. This process enabled the identification of possible future shortfalls or over-capacities of any given cargo type. If a shortfall was identified, the estimated tonnage of the capacity shortfall was divided by the appropriate capacity of the associated terminal planning module. Terminal planning modules describe the characteristics and capacity of cargo terminals typically associated with the LATTS Region. Typical terminal modules were developed for five types of facilities, viz. Containers, Neo-Bulk, Break-Bulk, Dry-Bulk and Liquid-Bulk. (Planning modules are described in greater detail in the Appendix.) The capacity shortfall for a particular cargo type was translated into the number of planning modules which would be required to serve that particular volume of cargo.

Exhibit D1-4 summarizes the estimated module throughput capacities and conceptual development costs for the five types of LATTS marine terminal modules (refer to the Appendix for more detail on the cost estimates). All modules except for the liquid bulk terminal have three estimated throughput capacities for the different storage modes that were described earlier in this report section. The database considered the current storage mode split by terminal acreage to determine the average module throughput. For example, if the container terminals in a given state consist of wheeled storage (50%) and grounded storage (50%), then the average container module throughput capacity for that state was considered to be approximately 1,467,000 short tons/year. This procedure was used for all cargo types to estimate the future amount of modules needed in each state/commonwealth from the calculated tonnage needs.

CONCLUSIONS

Because the LATTS Region includes a number of ports with widely varying characteristics, it was necessary to conduct these analyses on a generalized basis. Therefore, since the analysis was performed from such this type of perspective, the conclusions for the infrastructure needs are shown in a general summary format.

The needs assessment was summarized on the basis of cargo type by state. In addition, a summary of all states and all cargo types is provided to show the future needs for the entire Region.

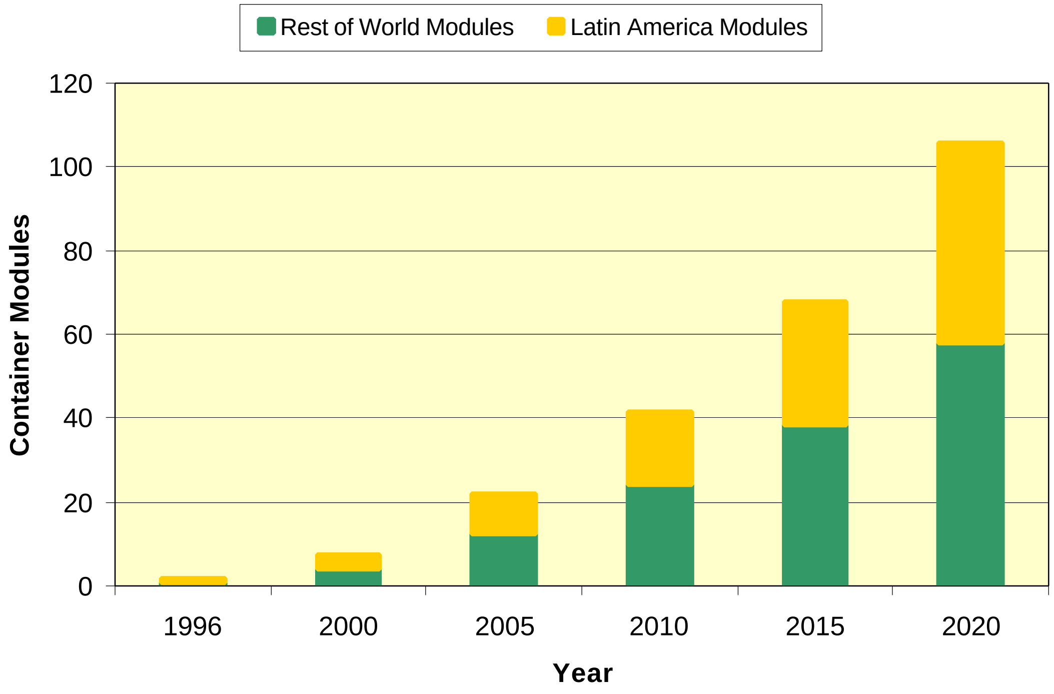
Container

In accordance with the capacity analysis methodology as described earlier, the sum of all container terminal modules needed for accommodating the future throughput projections for the entire LATTS Region was developed (refer to **Exhibit D1-5**). The Region's needed container modules are shown in five-year increments throughout the planning life and their association with Latin American Cargo or World Cargo. The graph depicts cumulative module needs during the five-year increments.

Exhibit D1-4
ESTIMATED MODULE CAPACITIES

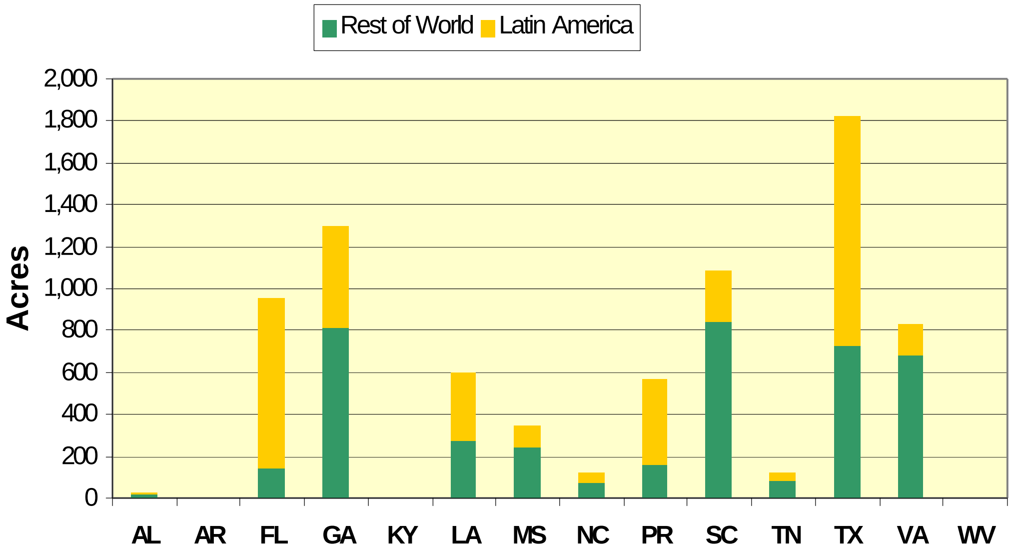
CARGO TYPE/ESTIMATED COST	STORAGE MODE	ESTIMATED CAPACITY (TONS/YR)
CONTAINER $32,000,000	Wheeled – Cw Grounded - Cg Other/Mixed - Co	880,000 1,739,000 1,467,000
BREAK-BULK $20,600,000	Outside – BBo Warehouse – BBw Mixed - BBm	148,000 187,000 142,000
NEO-BULK $14,600,000	Outside – NBo Warehouse – NBw Mixed - NBm	202,000 140,000 178,000
DRY BULK $17,600,000	Outside – DBo Silo – DBs Mixed - DBm	2,218,000 2,218,000 1,684,000
LIQUID BULK $19,300,000	Tank - LBt	2,048,000

Exhibit D1-5
NEEDED CONTAINER MODULES - LATTS REGION



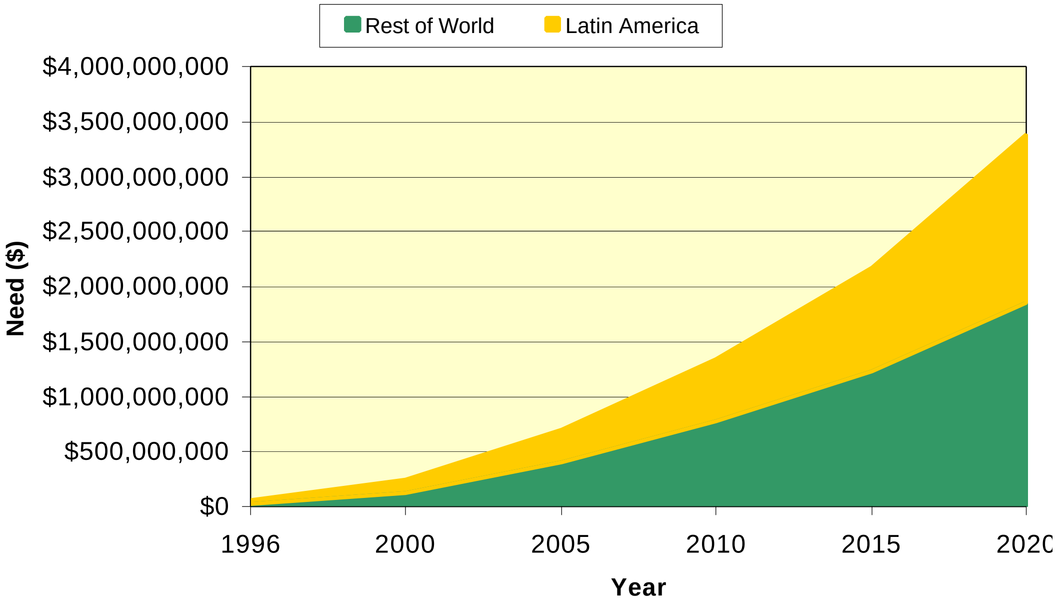
To better understand the future infrastructure needs, a state distributed acreage summary for the LATTS region is presented in **Exhibit D1-6**. The infrastructure need in this graph is shown for Latin America Cargo as well as Rest of World Cargo similar to the module need graph.

Exhibit D1-6
NEEDED CONTAINER TERMINAL ACREAGE - LATTS REGION



Total container needs for the Region through 2020 are equivalent to $3.4 billion. The graph in **Exhibit D1-7** shows the distribution of these needs over the 20-year forecast period.

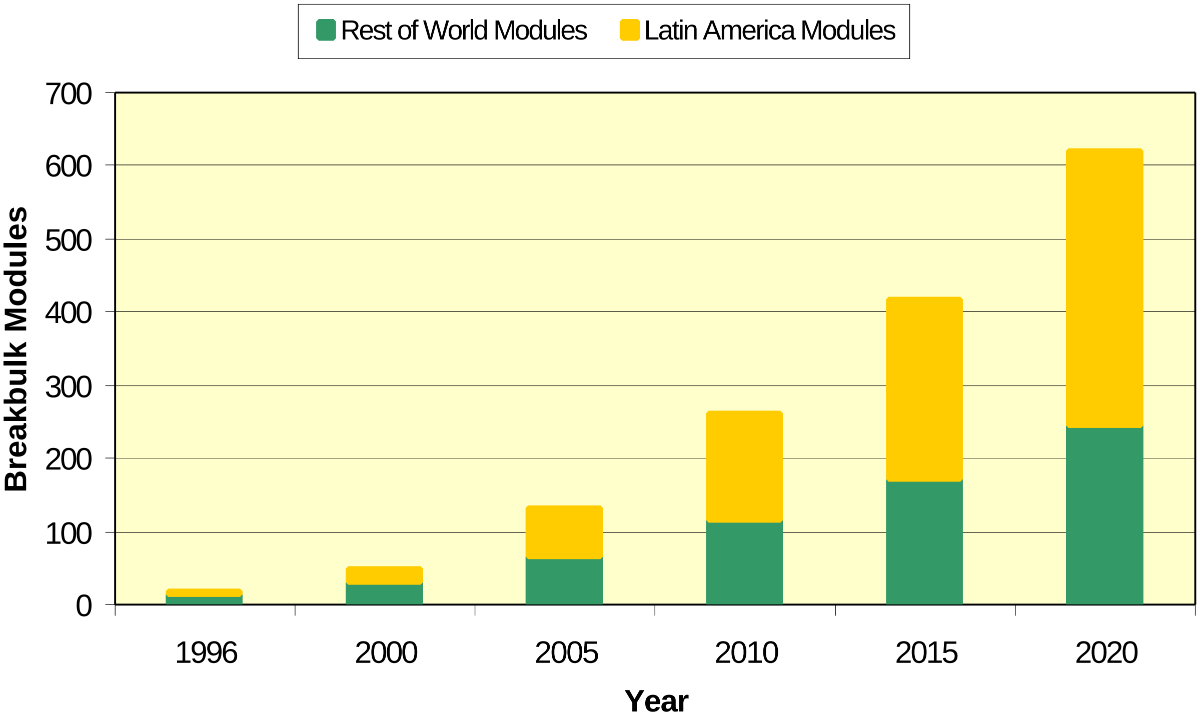
Exhibit D1-7
LATTS REGION ESTIMATED CONTAINER INFRASTRUCTURE NEED



Break-Bulk

A summary of all break-bulk terminal modules needed for accommodating the future throughput projections for the entire LATTS Region was developed (refer to **Exhibit D1-8**). The Region's needed break-bulk modules are shown in five-year increments throughout the planning life and their association with Latin American Cargo or Rest of World Cargo. The graph depicts cumulative module needs during the five-year increments. The number of future required ten-acre break-bulk modules exceeds 600.

Exhibit D1-8
NEEDED BREAK-BULK MODULES - LATTS REGION



To better understand the future break-bulk infrastructure needs, a state distributed acreage summary for the LATTS Region is presented in **Exhibit D1-9**. The infrastructure need in this graph is shown for Latin America Cargo as well as Rest of World Cargo similar to the module need graph.

Total 20-year break-bulk infrastructure needs for the Region approximate $12.8 billion. **Exhibit D1-10** shows the ramp-up of these needs through 2020.

Exhibit D1-9
NEEDED BREAK-BULK TERMINAL ACREAGE - LATTS REGION

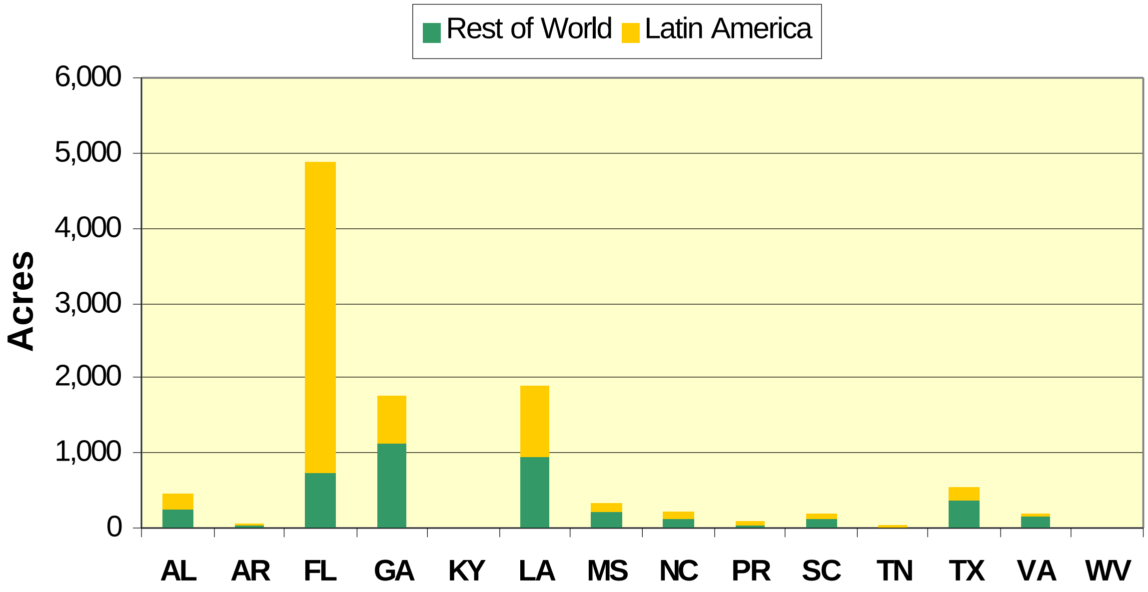
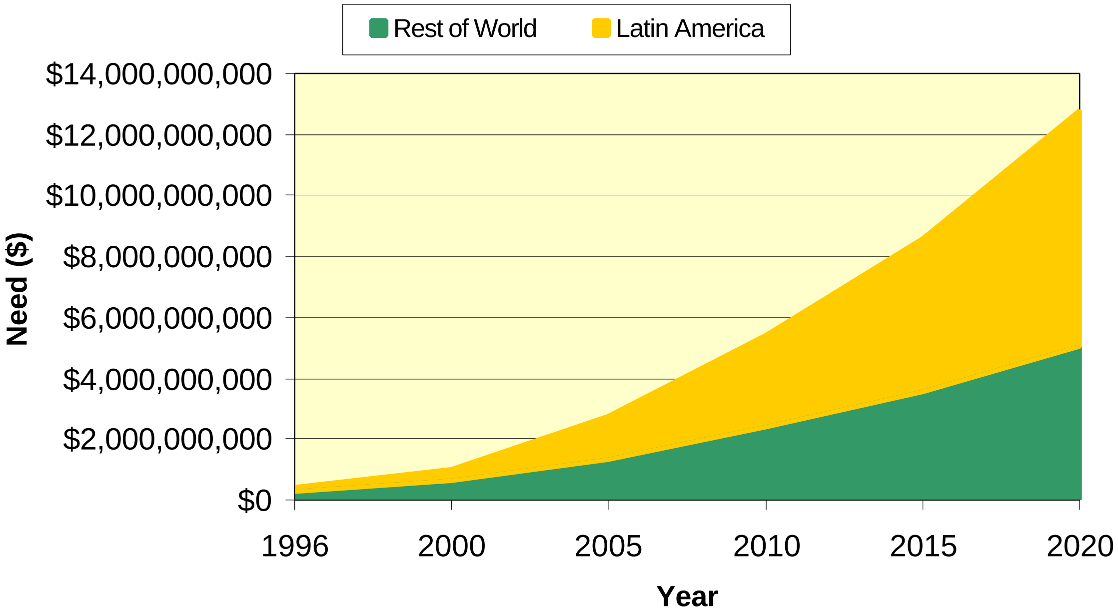


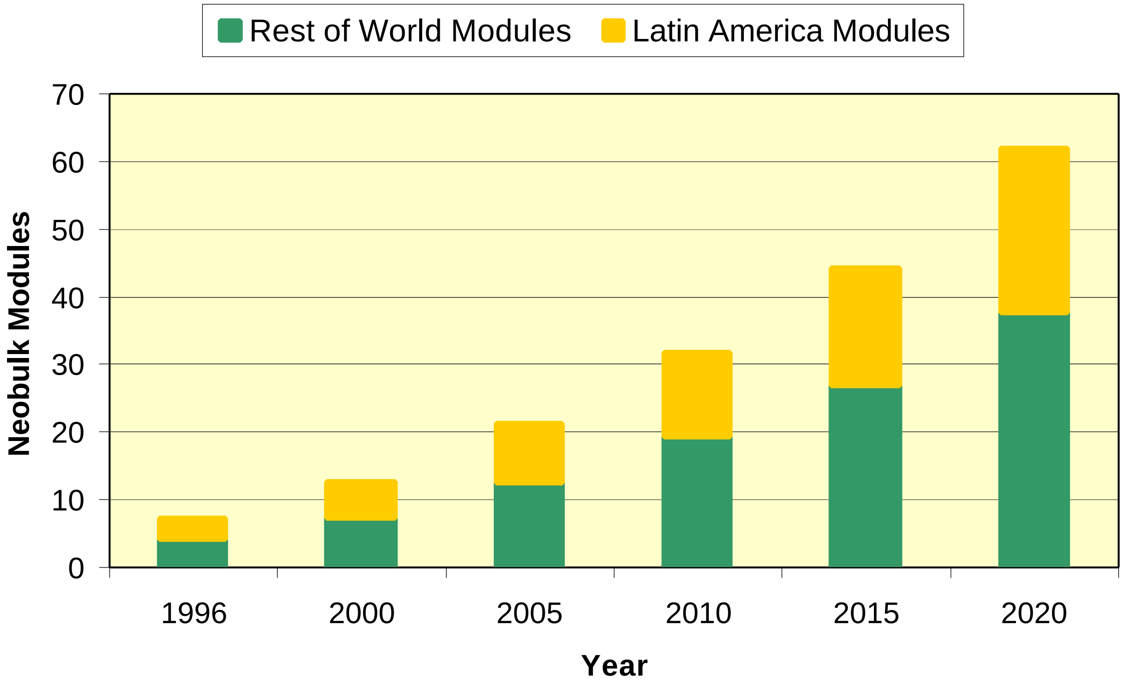
Exhibit D1-10
LATTS REGION ESTIMATED BREAK-BULK INFRASTRUCTURE NEED



Neo-Bulk

From the capacity analysis described in the needs assessment, the sum of all neo-bulk terminal modules needed for accommodating the future throughput projections for the entire LATTS Region was developed (refer to **Exhibit D1-11**). The Region's needed neo-bulk modules are shown in five-year increments throughout the planning life and their association with Latin American Cargo or Rest of World Cargo. The graph depicts cumulative module needs during the five-year increments.

Exhibit D1-11
NEEDED NEO-BULK MODULES - LATTS REGION



In addition, the future infrastructure needs are shown as a state distributed acreage summary for the LATTS Region (refer to **Exhibit D1-12**). The infrastructure need in this graph is shown for Latin America Cargo as well as Rest of World Cargo similar to the module need graph.

The total estimated Neo-Bulk infrastructure needs equivalent is $904 million through 2020. **Exhibit D1-13** shows the ramp-up of these needs estimates.

Exhibit D1-12
NEEDED NEO-BULK TERMINAL ACREAGE - LATTS REGION

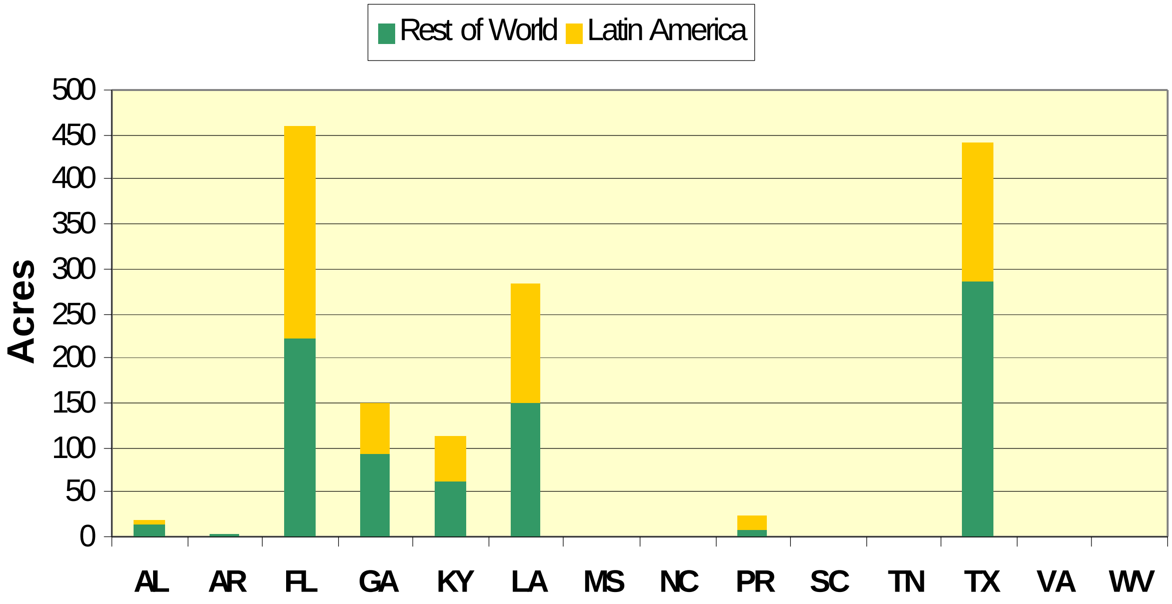
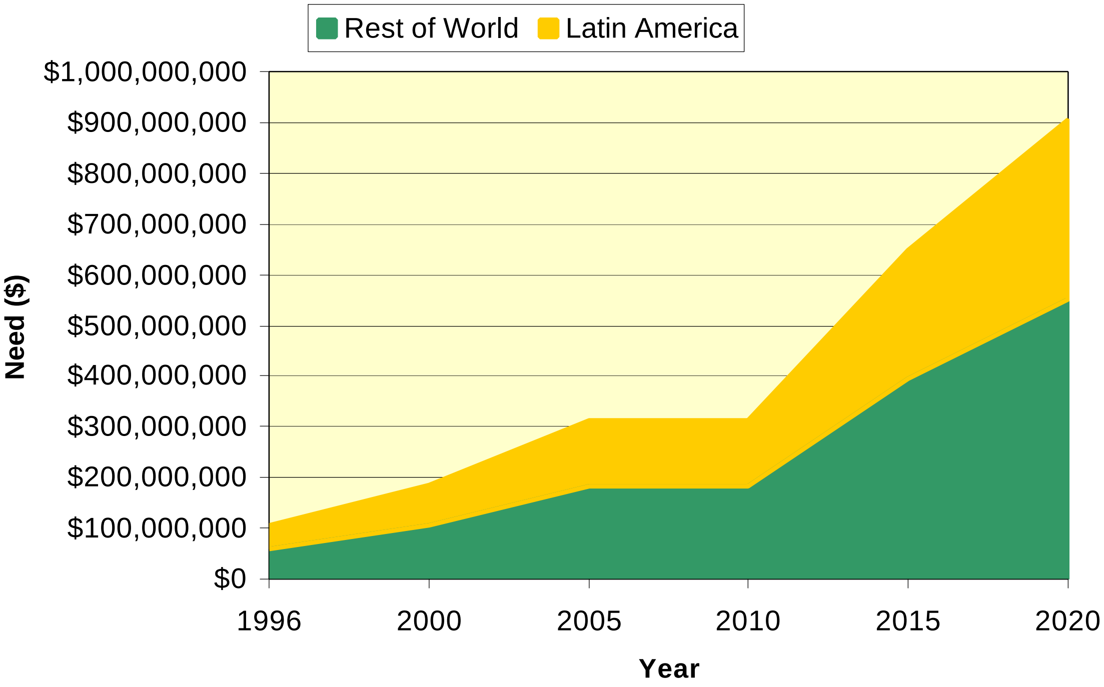


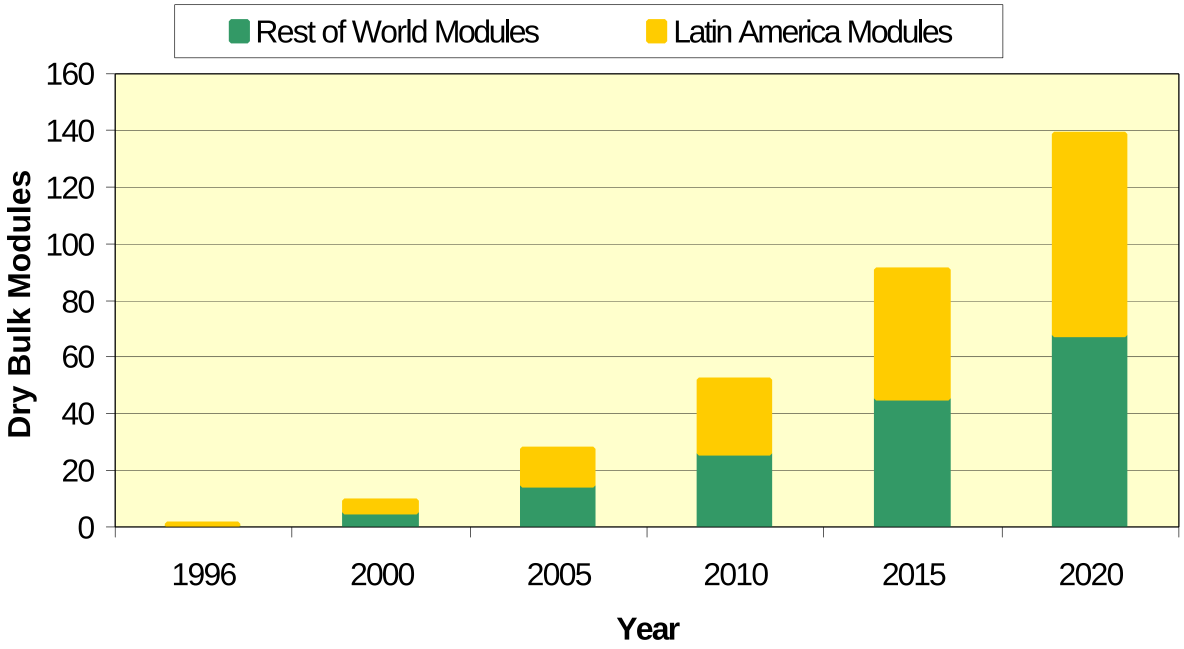
Exhibit D1-13
LATTS REGION ESTIMATED NEO-BULK INFRASTRUCTURE NEED



Dry Bulk

The sum of all dry bulk terminal modules needed to accommodate the future throughput projections for the entire LATTS is presented in **Exhibit D1-14**. The Region's needed container modules are shown in five-year increments throughout the planning life and their association with Latin American Cargo or rest of World Cargo. The graph depicts cumulative module needs during the five-year increments.

Exhibit D1-14
NEEDED DRY BULK MODULES - LATTS REGION



To better understand the dry bulk needs, a state distributed acreage summary for the LATTS Region is shown in **Exhibit D1-15** The infrastructure need in this graph is shown for Latin America Cargo as well as Rest of World Cargo and is similar to the module need graph.

Total dry bulk needs for the region is an equivalent of $2.4 billion through 2020. **Exhibit D1-16** shows the accumulation of these costs over the 20-year period.

Exhibit D1-15
NEEDED DRY BULK TERMINAL ACREAGE - LATTS REGION

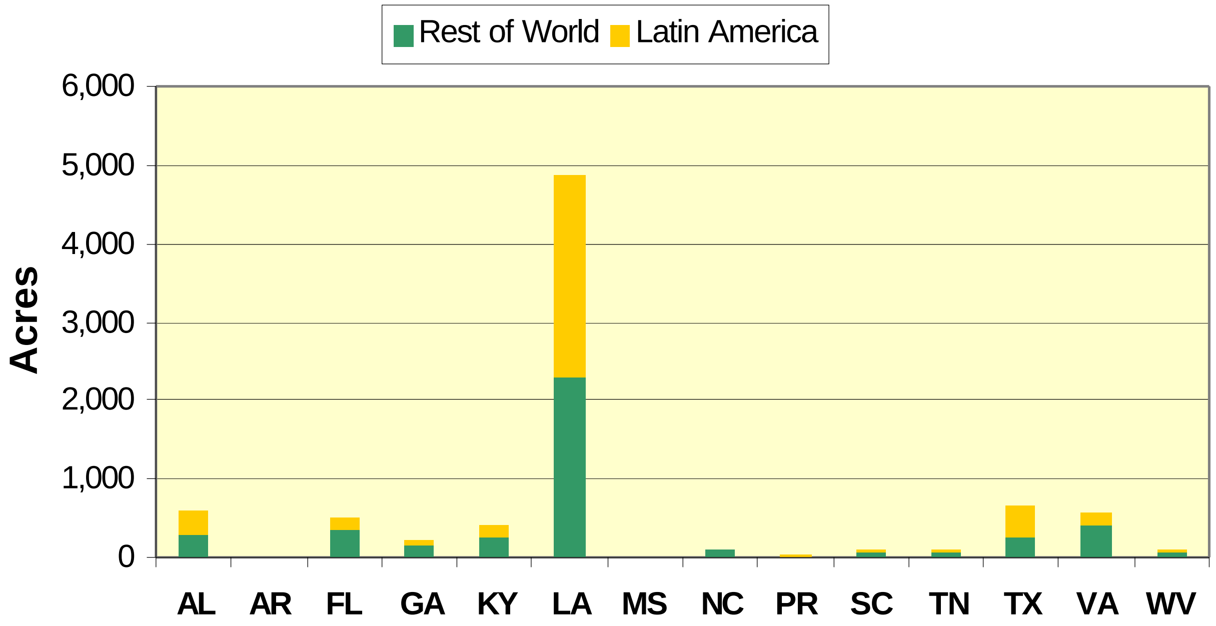
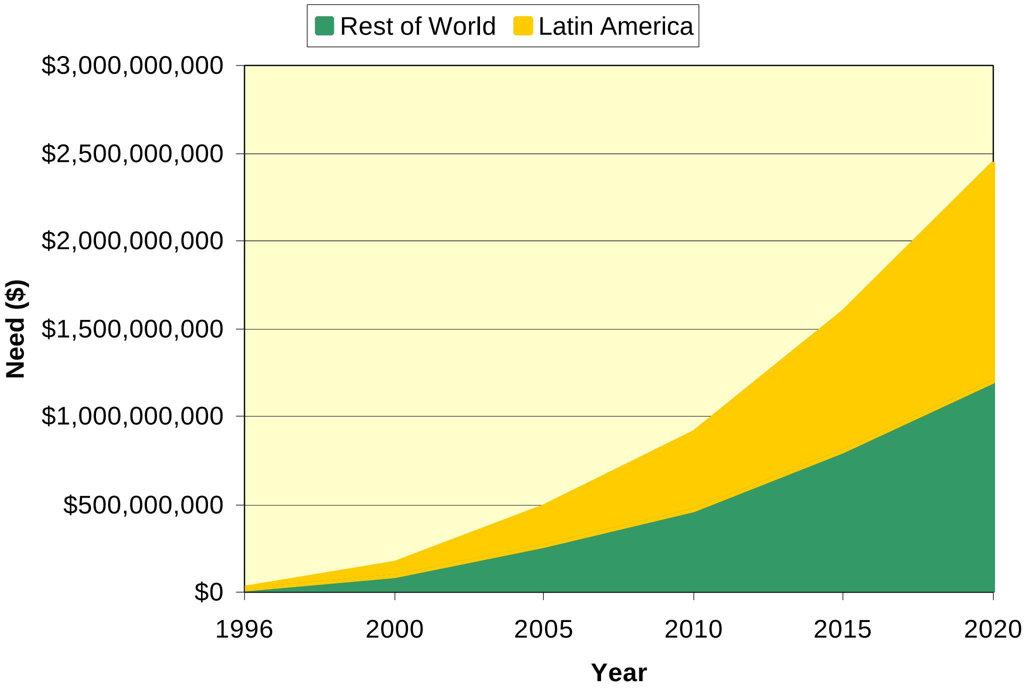


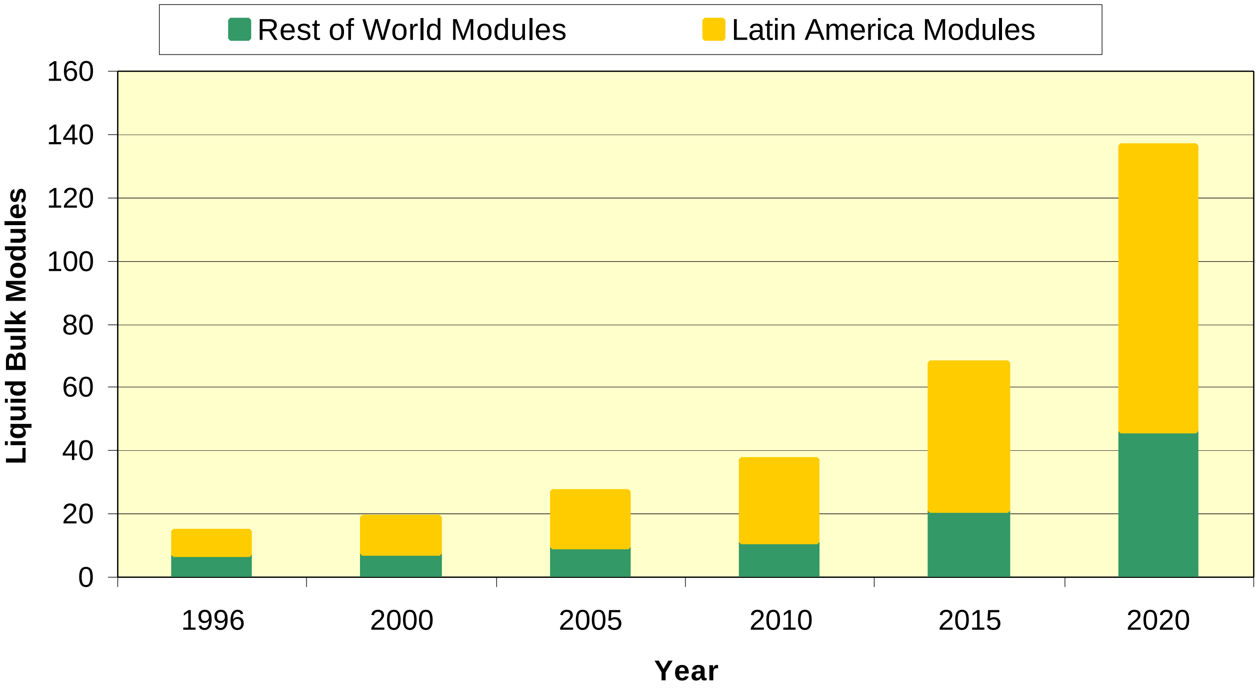
Exhibit D1-16
LATTS REGION ESTIMATED DRY BULK INFRASTRUCTURE NEED



Liquid Bulk

In accordance with the capacity analysis methodology as described earlier, the sum of all liquid bulk terminal modules needed for accommodating the future throughput projections for the entire LATTS Region was developed (refer to **Exhibit D1-17**). The needed liquid bulk modules are shown in five-year increments throughout the planning life and their association with Latin American Cargo or Rest of World Cargo. The graph depicts cumulative module needs during the five-year increments.

Exhibit D1-17
NEEDED LIQUID BULK MODULES - LATTS REGION



A state distributed acreage summary for the LATTS Region is provided in **Exhibit D1-18**. The infrastructure need in this graph is shown for Latin America Cargo as well as Rest of World Cargo similar to the module need graph.

The 20-year liquid bulk infrastructure needs for the Region is an estimated $2.6 billion. **Exhibit D1-19** shows the ramp-up of these needs.

Exhibit D1-18
NEEDED LIQUID BULK TERMINAL ACREAGE - LATTS REGION

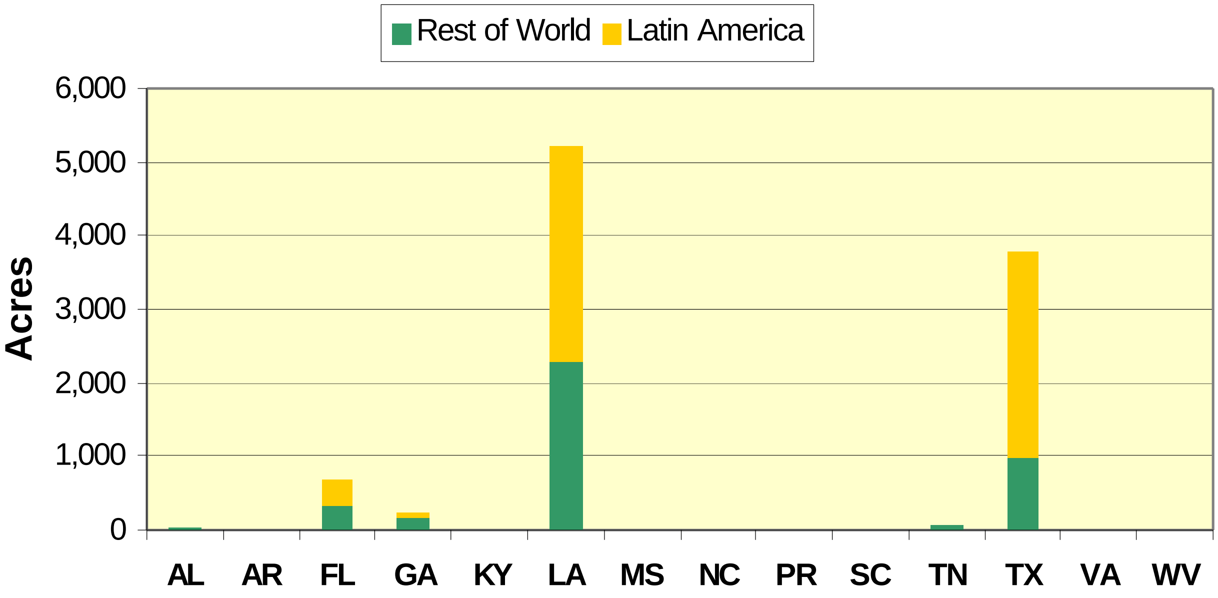
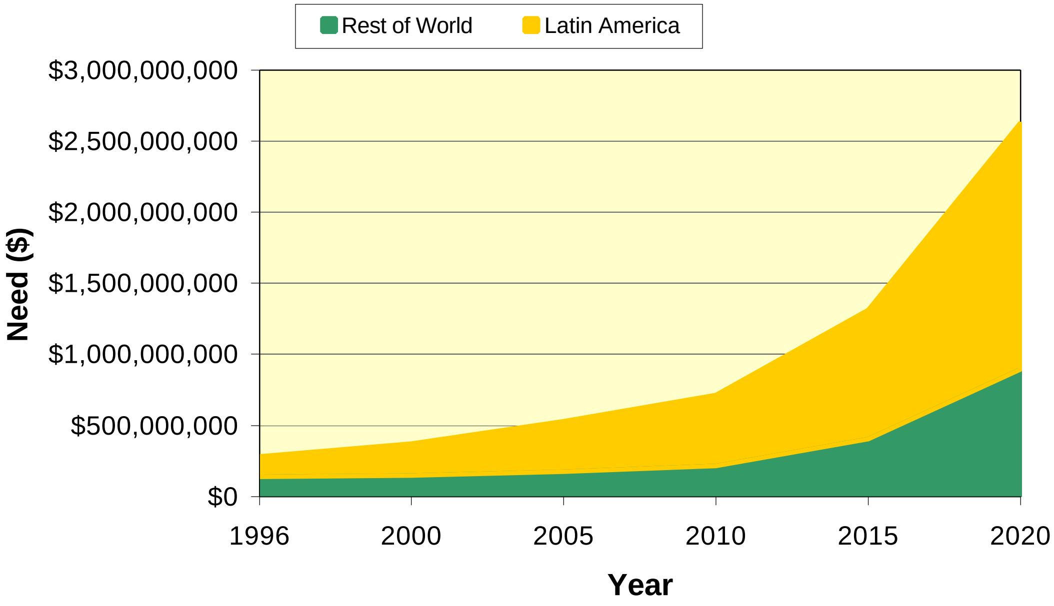


Exhibit D1-19
LATTS REGION ESTIMATED LIQUID BULK INFRASTRUCTURE NEED



All Cargo Types

The 2020 infrastructure needs are summarized by acreage and by 1999 U.S. dollars for all cargo types in **Exhibit D1-20**. The most significant increase in terminal acreage and required infrastructure development funding is due to the estimated break-bulk cargo growth projections. Container cargo needs are second to break-bulk needs in acreage increase and estimated development cost. Although neo-bulk acreage needs are increasing at a higher rate than dry bulk and liquid bulk, the two bulk cargo needs are more demanding from an infrastructure investment perspective.

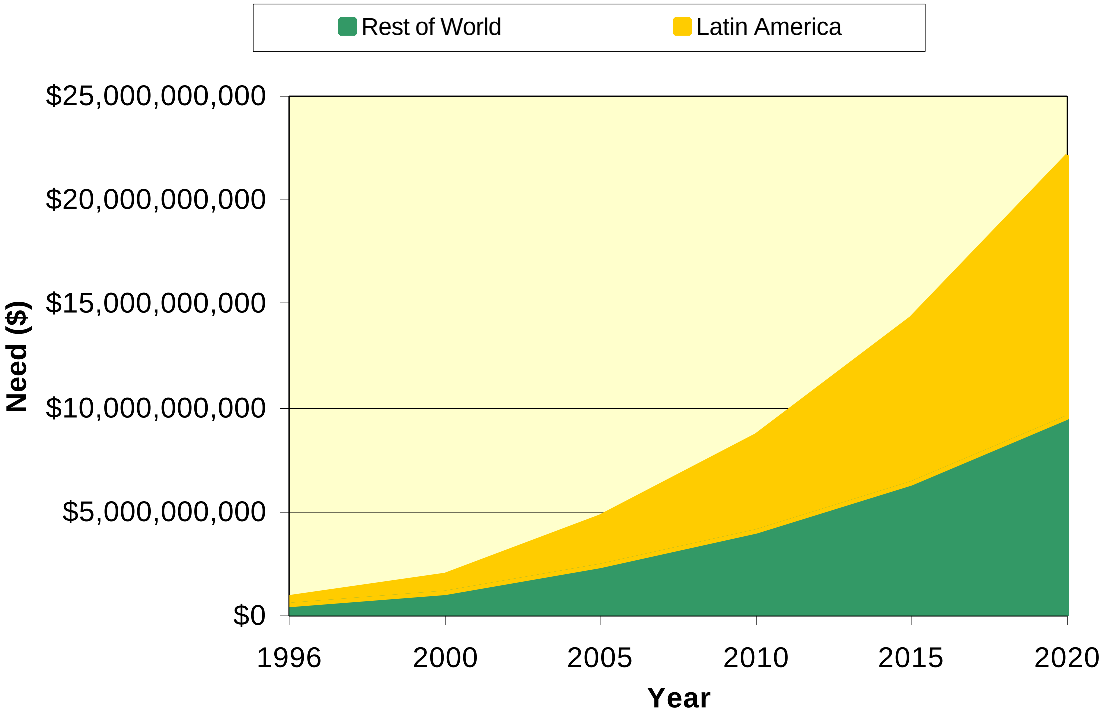
Exhibit D1-20
TOTAL LATTS REGION PORT NEEDS SUMMARY

Cargo Type	Additional Acres			Infrastructure Improvement Needs (000)		
	Current	2020 Need	% Increase	Latin America	Rest of World	World
Container	3,548	7,776	119	$1,525,522	$1,854,871	$3,380,393
Break-Bulk	4,400	10,594	141	$7,727,284	$5,032,655	$12,759,939
Neo-Bulk	877	1,496	71	$353,266	$551,149	$904,415
Dry Bulk	5,476	8,256	51	$1,249,544	$1,195,247	$2,444,791
Liquid Bulk	7,327	10,051	37	$1,739,491	$890,385	$2,629,877
	TOTAL			$12,595,108	$9,524,307	$22,119,415

The cumulative Latin America cargo investment needs are higher than the cumulative Rest of World cargo investment needs for all cargo types. However, this difference is due to the large demand from future Latin American liquid bulk, dry bulk and break-bulk cargo growth. Container cargo and neo-bulk cargo growth indicate a greater demand from other international sources than from the Latin American trade.

The following graph (**Figure D1-21**) shows the ramp-up of total marine terminal infrastructure needs for the Region.

Exhibit D1-21
LATTS REGION ESTIMATED ALL CARGOES INFRASTRUCTURE NEEDS



SECTION D2
INVESTMENT NEEDS FOR THE LATTS STRATEGIC AIRPORT SYSTEM

The Alliance Region is the dominant air gateway to Latin America, and accommodates over 80 percent of Latin American air cargo trade (export and import) for the U.S. Much of this is due to the proximity of the Region to Latin America and the existence of major international gateway facilities.

Investment needs for the LATTS Strategic Airports were based on the estimated forecast increase in air cargo tonnage for LATTS Strategic Airports, with specific emphasis on the need for facilities to accommodate Latin American air cargo.

BASELINE FREIGHT VOLUMES

The initial element of the investment needs analysis was the establishment of the baseline year (1996) cargo tonnage and facilities usage for the LATTS Strategic Airports. A determination of total air cargo tonnage (international, Latin American, domestic, and mail) by state was developed. Domestic cargo and mail tonnage was obtained from Airports Council International. Total international air cargo tonnage was derived by using ACI or DRI International data, whichever was larger. Since the DRI data is for freight only and excludes mail and express, this approach was used to derive an international estimate that is more inclusive of other freight sectors.

Latin American air cargo tonnage was derived by determining the ratio between DRI Latin American tonnages versus DRI International flows, and applying that ratio to the derived total international air cargo tonnage. This approach resulted in a Latin American estimate that is inclusive of all freight sectors (even those not reported by DRI). LATTS Strategic Airports System 1996 air cargo tonnage by state for derived international and derived Latin American air cargo are shown in **Exhibit D2-1**.

These data clearly show that Florida is the dominant Latin American (and U.S.) state gateway. Florida handles over 90 percent of the Southeast Alliance Region's airborne gateway Latin American trade. Much of this is due to Miami-Dade County's cultural and socioeconomic ties with Latin America and the proximity of Miami International Airport to Latin American markets.

BASELINE CARGO BUILDINGS

An inventory of baseline year cargo building facilities in the Alliance Region and a determination of baseline year international and Latin American air cargo building utilization was undertaken as part of these analyses. This included a survey of the forty-six existing airports included in LATTS Strategic Airport System. The survey documented existing cargo building area as reported by the airport or as

Exhibit D2-1
BASE YEAR INTERNATIONAL AND LATIN AMERICA AIR CARGO DATA

Alliance Member	1996 International Tonnage	1996 Latin American Tonnage
Alabama	14,358	297
Arkansas	216	1
Florida	1,383,214	1,218,345
Georgia	163,917	8,030
Kentucky	15,980	270
Louisiana	2,539	0
Mississippi	0	0
North Carolina	52,266	7,382
Puerto Rico	36,515	20,311
South Carolina	11,292	905
Tennessee	124,585	15,144
Texas	191,396	23,089
Virginia	34,629	835
West Virginia	10,305	1,206
Totals	**2,041,211**	**1,295,814**

SOURCE: DRI-McGraw Hill and ACI.

identified in airport master plans. A cargo building utilization rate was determined for each state's air cargo facilities by dividing reported cargo building area by estimated annual airfreight tonnage.

Exhibit D2-2 depicts 1996 cargo building area and utilization rates by state. For planning study purposes, a rate of 1.5 square feet of building area per ton of annual airfreight is generally used to assess adequacy of air cargo facilities. This utilization rate is based on an average utilization rate at major U.S. airports. Graphic depictions by state of total baseline cargo building square feet and estimated domestic and international cargo building utilization are shown in **Exhibits D2-3** and **D2-4**.

Air cargo forecasts for the Alliance Region for the forecast year 2020 were developed using the DRI forecasts produced as part of the LATTS study. In addition, a control total for total (international and domestic) 2020 air cargo traffic through the Alliance was derived by applying a growth rate to the I996 ACI estimate. An average annual growth rate of 5.9% was used. This is based on published air cargo industry forecasts such as the Airbus Global Market Forecast (1999). Based on this, air cargo is expected to grow from a 1996 base of 9.4 million tons to over 35 million tons in 2020, an increase of 26 million tons. Of that, approximately 6 million tons is expected to be international air cargo, over half (3.7 million) of which is expected to be Latin American air cargo.

Exhibits D2-5 and **D2-6** depict the international and Latin American air cargo tonnage forecast by state for 2020. **Exhibits D2-7** and **D2-8** graphically illustrate the significant increase in air cargo for the Alliance by 2020 for both domestic and international air cargo tonnage.

Exhibit D2-2
CARGO BUILDING AREA UTILIZATION RATE BY STATE

ALLIANCE Member	1996 Cargo Building Area	1996 Cargo Utilization Rate
Alabama	302,145	4.2
Arkansas	38,280	1.9
Florida	5,090,805	2.2
Georgia	1,500,000	1.9
Kentucky	2,387,901	1.4
Louisiana	311,875	3.9
Mississippi	47,000	0.7
North Carolina	818,763	1.9
Puerto Rico	693,850	1.9
South Carolina	142,106	0.9
Tennessee	4,635,046	2.3
Texas	2,582,320	1.9
Virginia	197,475	1.5
West Virginia	N/A	N/A
Totals	**18,747,568**	**2.0**

Exhibit D2-3
AIR CARGO BUILDING SPACE, BY STATE

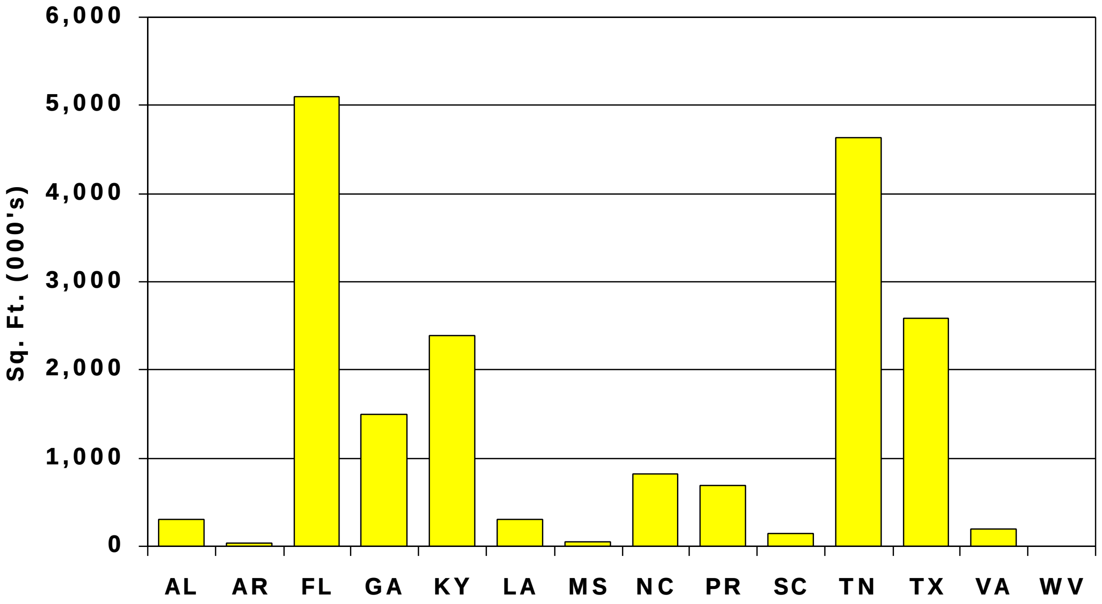


Exhibit D2-4
UTILIZATION OF EXISTING AIR CARGO BUILDING SPACE, BY STATE

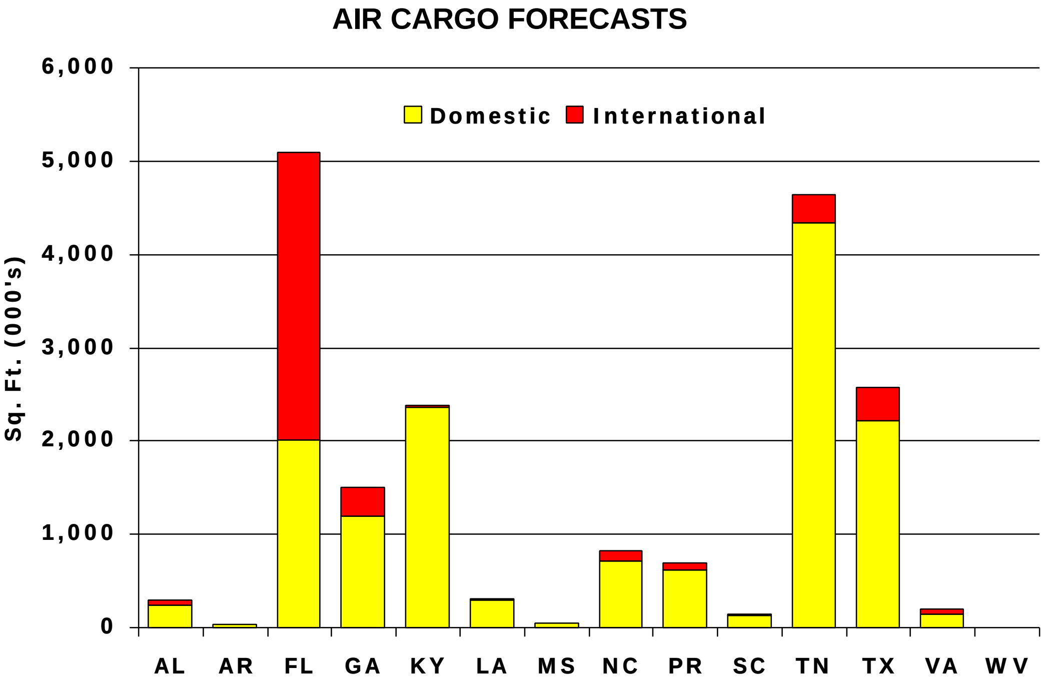


Exhibit D2-5
INTERNATIONAL AND LATIN AMERICAN AIR CARGO FORECAST FOR THE ALLIANCE REGION

Alliance Member	2020 International Tonnage	2020 Latin American Tonnage
Alabama	44,828	1,079
Arkansas	1,069	2
Florida	3,781,959	3,404,615
Georgia	672,713	36,626
Kentucky	11,908	424
Louisiana	0	0
Mississippi	0	0
North Carolina	259,621	43,334
Puerto Rico	140,492	75,977
South Carolina	55,323	4,120
Tennessee	532,044	78,655
Texas	568,347	75,742
Virginia	130,942	4,136
West Virginia	52,008	7,806
Totals	**6,251,253**	**3,732,515**

SOURCE: Derived from DRI-McGraw Hill and ACI data.

Exhibit D2-6
2020 TONNAGE BY STATE, DOMESTIC AND INTERNATIONAL

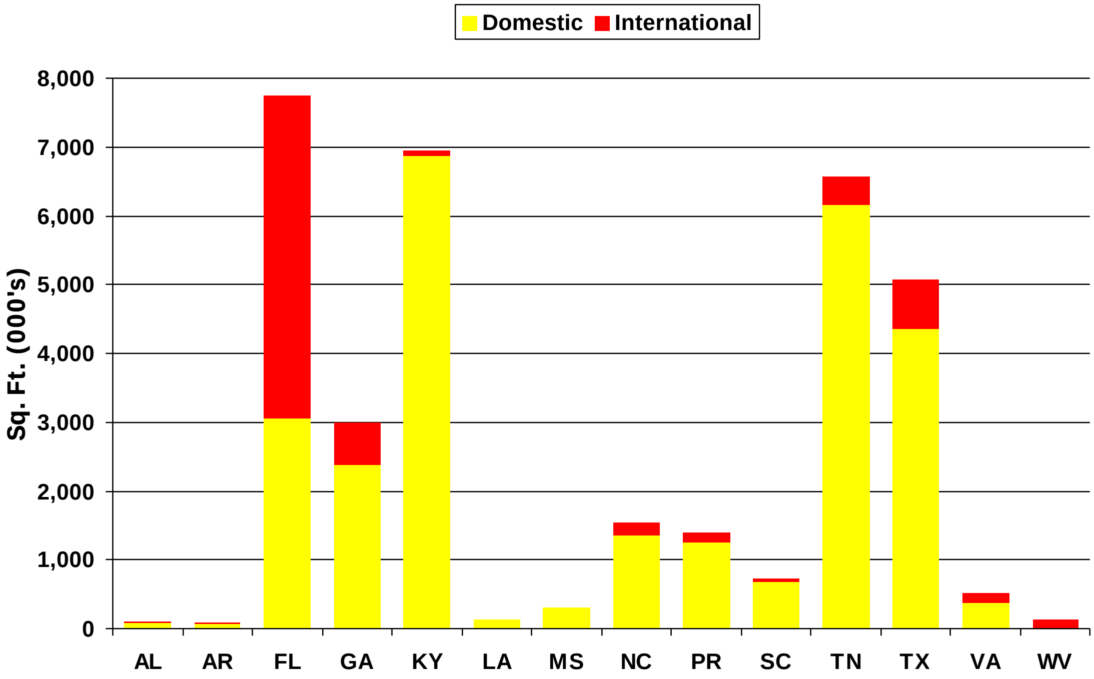


Exhibit D2-7
EXPECTED INCREASE IN TOTAL AIR CARGO TONNAGE THROUGH THE ALLIANCE

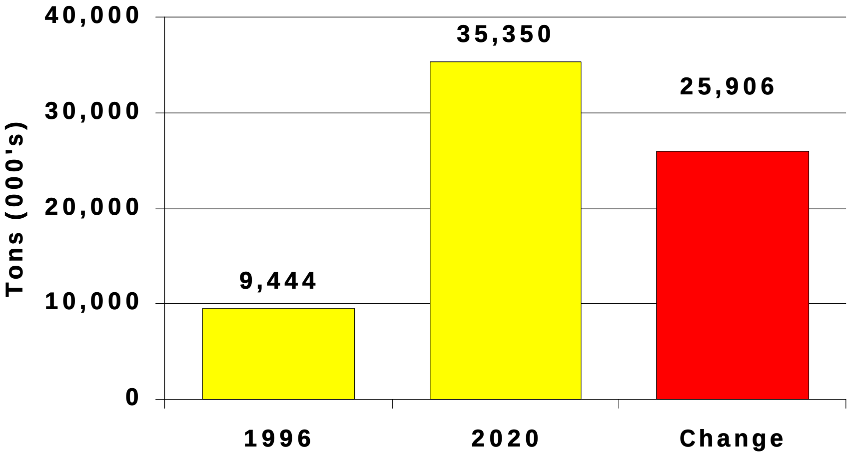
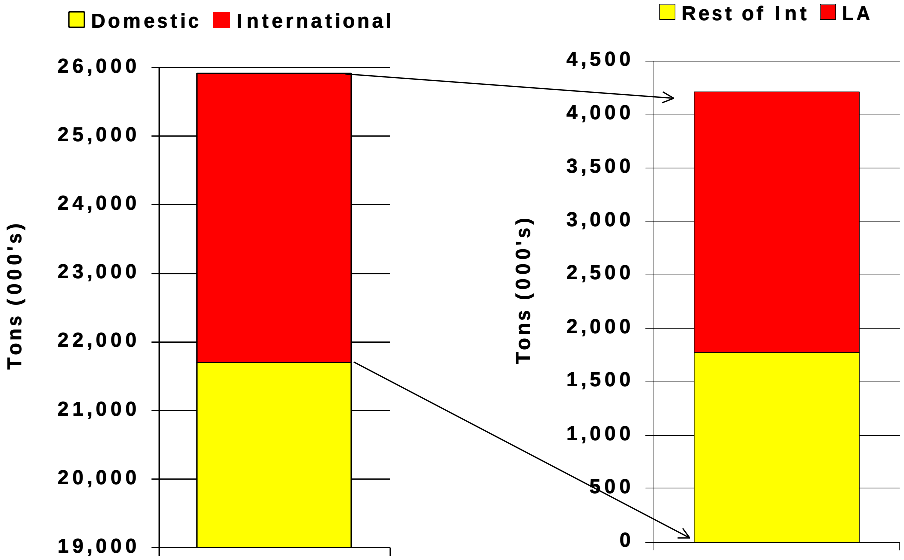


Exhibit D2-8
LATIN AMERICAN PORTION OF ALLIANCE AIR CARGO TRAFFIC GROWTH



It is important to note that the individual state forecasts are based on 1996 shares among the member states. Moreover, the forecasts do not reflect any future constraints that may develop. Therefore, these forecasts do not account for potential shifts among states due to market changes, capacity constraints, or any other reason. These forecasts were used as a basis to compute future capacity needs for the Region as a whole. Actual apportionment of future capacity investment among the member states is dependent on individual state efforts to capture a share of future capacity improvements and market.

ADDITIONAL CARGO BUILDING REQUIREMENTS

The investment needs assessment analysis determined 2020 cargo building area requirements by state. As previously noted, a cargo building utilization of 1.5 square feet per ton of annual airfreight was used for general planning purposes. Total cargo tonnage forecast for 2020 was multiplied by 1.5 to arrive at the amount of cargo building area needed. Existing 1996 cargo building area was then subtracted from this amount to determine the need for new cargo building square footage. The 2020-need analysis for new cargo building area for the Alliance Region and by state is presented in **Exhibits D2-9**, **D2-10** and **D2-11**.

Exhibit D2-9
2020 ESTIMATED CARGO BUILDING AREA NEEDS

Alliance Member	2020 Total Cargo Building Area	2020 New Cargo Building Area Needed
Alabama	405,687	103,542
Arkansas	115,172	76,892
Florida	12,837,581	7,746,776
Georgia	4,490,313	2,990,313
Kentucky	9,334,480	6,946,579
Louisiana	446,520	134,645
Mississippi	352,458	305,458
North Carolina	2,374,196	1,555,433
Puerto Rico	2,082,095	1,388,245
South Carolina	870,246	728,140
Tennessee	11,205,448	6,570,402
Texas	7,659,132	5,076,812
Virginia	716,165	518,690
West Virginia	135,802	135,802
Totals	**53,025,294**	**34,277,726**

Exhibit D2-10
CHANGE IN CARGO BUILDING NEEDS FOR THE ALLIANCE REGION

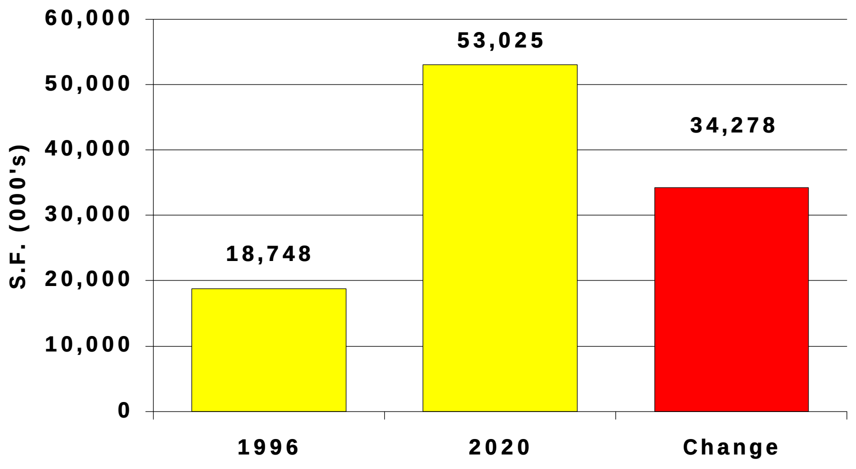
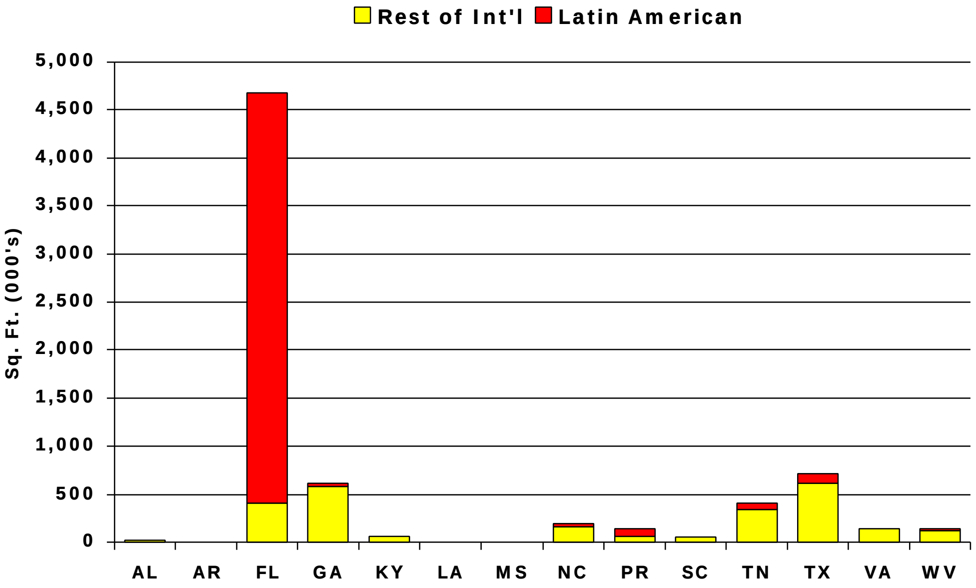


Exhibit D2-11
2020 BUILDING NEEDS BY STATE, INTERNATIONAL AND LATIN AMERICA



CARGO RAMP AND APRON AREA REQUIREMENTS

New air cargo ramp/apron area that would be needed also was estimated. This estimate was based on new building square footage and aircraft parking/maneuvering requirements. One aircraft parking position per 45,000 square feet of new cargo building area was used to estimate new air cargo ramp/apron areas. Ramp/apron area determinations were based on an adequate parking position/maneuvering area for a Boeing 767-300 freighter, which equates to 8,000 square yards of apron/ramp area. This aircraft parking position area would provide sufficient apron/ramp area for a mix of smaller or larger cargo aircraft. **Exhibit D2-12** depicts the amount of new apron/ramp area required by state by the year 2020.

INFRASTRUCTURE NEEDS COST ESTIMATE

As a final component of the needs analyses, an estimate of infrastructure costs for new cargo building and ramp area was developed. New cargo building costs were based on $80 per square foot. New ramp/apron area was based on $90 per square yard. New cargo building costs for the Alliance Region were estimated to be approximately $2.74 billion dollars. New ramp/apron area costs for the Alliance Region were estimated to be approximately $548 million dollars. **Exhibits D2-13**, **D2-14**, and **D2-15** portray 2020 air cargo infrastructure costs for each state.

In summary, overall total air cargo building square footage in the Alliance will need to increase by an approximate factor of 3 to accommodate projected total 2020 air cargo tonnage. A conservative estimate of $3.2 billion dollars will be needed to fund this infrastructure.

Exhibit D2-12
2020 CARGO APRON NEEDS, ALL CARGO

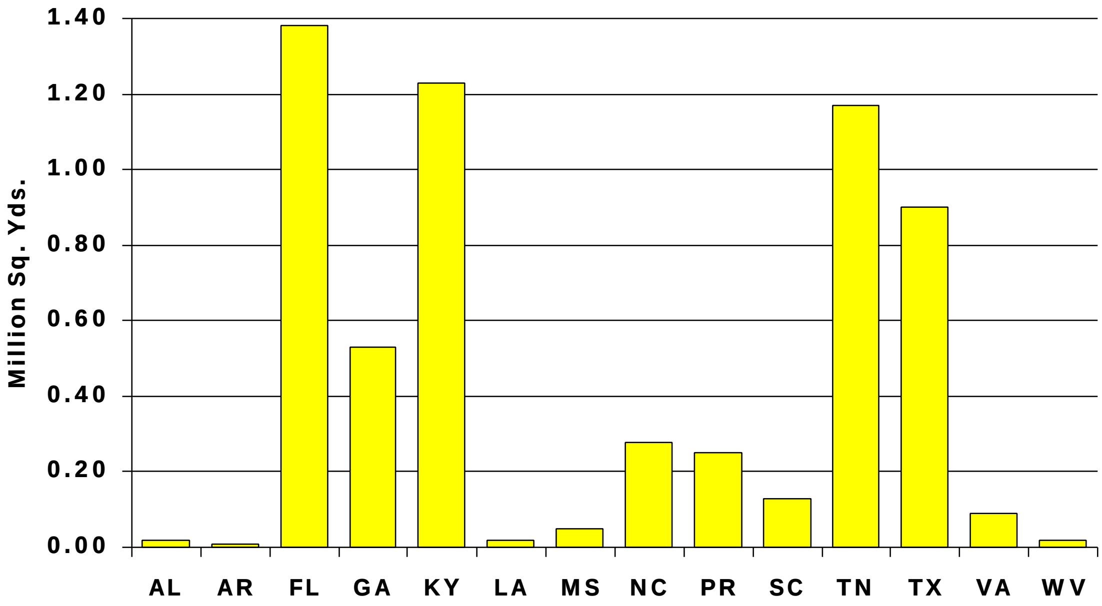


Exhibit D2-13
2020 AIR CARGO INFRASTRUCTURE COSTS – NEW CARGO BUILDING & RAMP SPACE

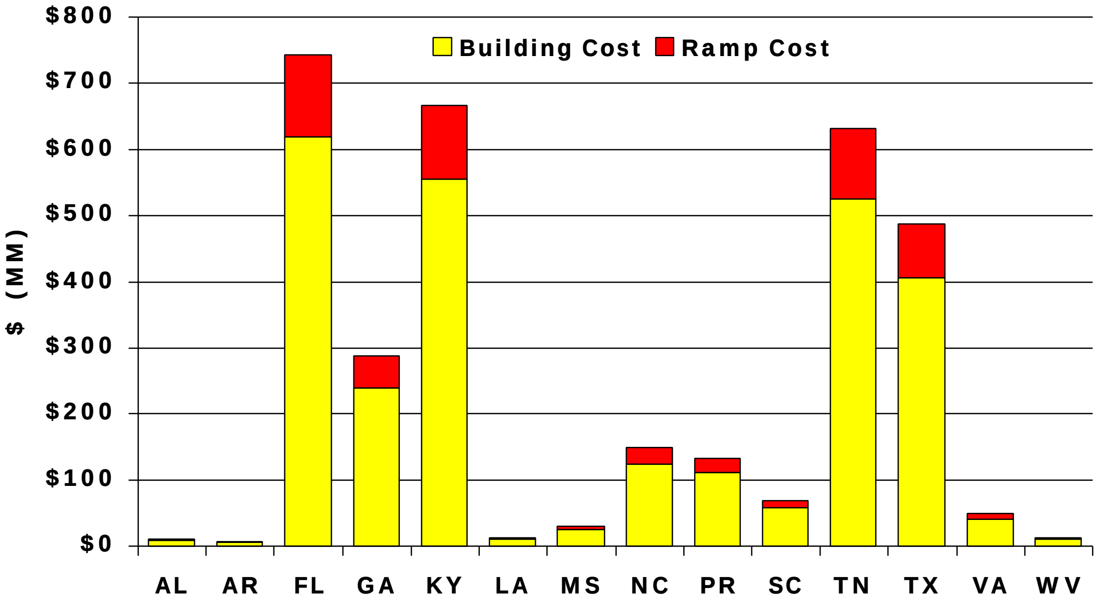


Exhibit D2-14
2020 AIR CARGO INFRASTRUCTURE COSTS – DOMESTIC AND INTERNATIONAL

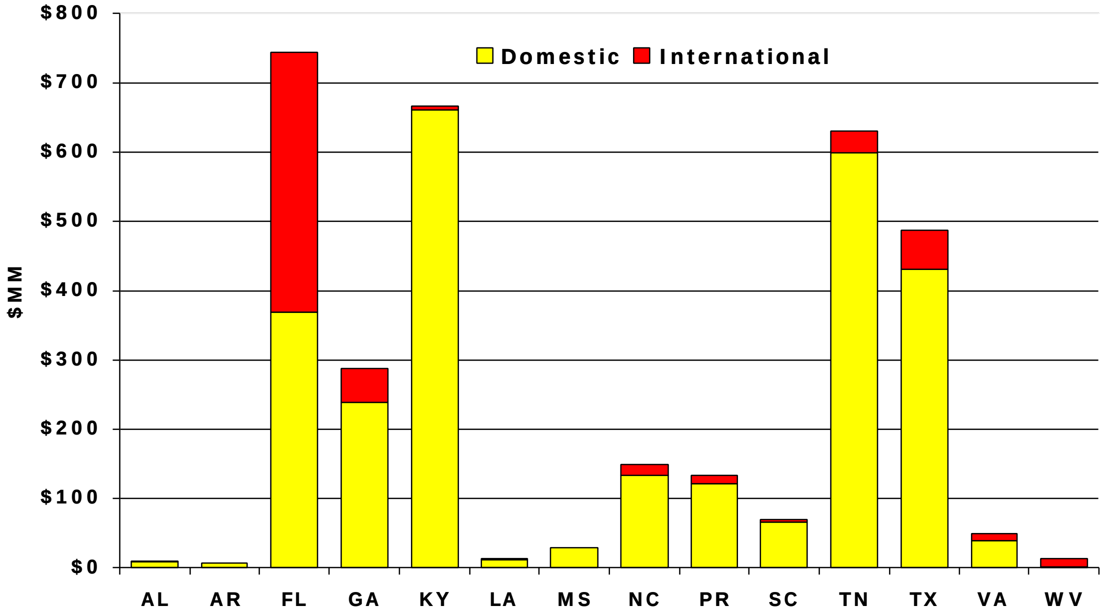
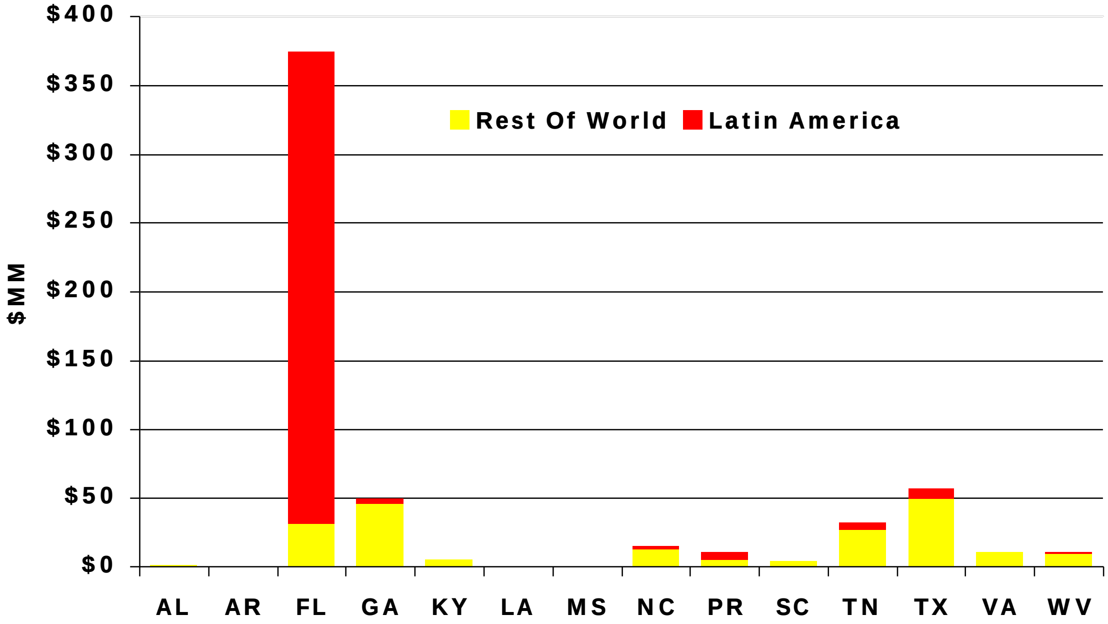


Exhibit D2-15
2020 AIR CARGO INFRASTRUCTURE COSTS – INTERNATIONAL AND LATIN AMERICA



SECTION D3

INVESTMENT NEEDS FOR THE LATTS STRATEGIC HIGHWAY SYSTEM

OVERVIEW

This report section has two parts (a) the LATTS Strategic (Mainline) Highway System, and (b) the LATTS Highway Connectors (i.e., facilities which link a LATTS Strategic Highway with a LATTS airport or waterport). Beyond the anticipated overall growth in traffic, the analysis addressed the additional impact of projected LATTS traffic. A statistical analysis model was utilized to perform these assessments. The Mainline and Connectors were analyzed for performance and deficiencies (for example, truck operating speed was identified as a major performance measure). The analysis yielded several conclusions which are presented at the end of this report section in more detail. The conclusions identify:

- Type of traffic with the highest growth;
- Investments needed by type of traffic;
- Investments needed by highway type;
- Investments needed by corridor; and
- Investments needed by state.

Some highlights of the significant findings include:

- Truck traffic is projected to grow at a greater rate than all other traffic types;

- Truck traffic will require significant highway investments in capacity and pavement rehabilitation;

- Interstate highways were identified as the type of highway having the greatest projected need for capacity improvements;

- Corridor 14 (I-10 from West Texas to Jacksonville, FL) was identified as the LATTS corridor with the greatest projected needs for highway investment; and

- Texas is projected to be the Alliance member with the highest investment need.

LATTS STRATEGIC HIGHWAY NETWORK

Section C of this report describes the criteria and process that was used to identify mainline highways which are of the greatest significance to Latin American trade flows. Section C also identifies the Strategic Highway System that emerged from those analyses.

In this report section, the process and results of the analyses conducted to determine investment needs of these mainline facilities are presented. The presentation is organized as follows:

- Network Database
- Truck Traffic
- Needs Categories
- Capacity Analysis
- Pavement Analysis
- Operating Speeds

Network Database

For purposes of these analyses it was necessary to compile a database which described the main features of the Strategic Highway Network. A principal consideration was to develop a database that was consistent for all of the more than 22,000 miles of highways comprising the LATTS Strategic Highway System. It was also recognized that gathering new data on a timely basis from 13 different States and Puerto Rico would be difficult. Accordingly, it was determined that the source of data for the strategic network would come from an existing database--the Highway Performance Monitoring System (HPMS) database.

The HPMS is the nation's highway database, maintained by the FHWA, using data supplied by the states, and updated on a regular basis. The HPMS was developed to replace a series of random-needs studies conducted by the FHWA for the U.S. Congress. Among other things, the HPMS data can be used to:

- Calculate performance characteristics
- Model traffic growth and pavement deterioration
- Calculate capacity and congestion
- Estimate capital needs by functional classification and category over time

In fact, HPMS is used by the federal government to compute the apportionment of some federal highway funding authorized by TEA-21. Because of the familiarity of Alliance members with HPMS and the consistency in format and information it provides, the LATTS investment needs evaluation was based upon data and processes from the HPMS, modified for use in the LATTS analyses.

As part of the HPMS database, the states report certain information to FHWA for every segment of highway and roadway open to the public. For example, the states report mileage, average annual daily traffic (AADT), route number, jurisdiction, functional classification, number of lanes and pavement condition. In addition, the states report additional information for a statistically valid sample of roadway sections by functional classification and volume group. The highway sections with additional information are called *sample segments* as opposed to the former segments called *universe segments.* The additional data required for the *sample segments* include detailed pavement information, geometric data, traffic/capacity data, and environmental data. The FHWA asks the states to update the HPMS data every year. Not every item is updated every year but items which can change quickly, like traffic volume and pavement condition, are updated more frequently than other data items.

Higher-order routes, such as interstates, typically have 40 to 60 percent of their mileage sampled by the HPMS. The sample rate decreases as the functional classification drops in importance. Not every route in a state is necessarily sampled for the HPMS. The random nature of selecting sample sections ensures representation of like routes with like traffic volumes, but there is no requirement that every route be sampled. Many states prefer to sample their routes at rates higher than the FHWA minimum, especially on interstates and on the NHS. The number of states with 100 percent representation on higher-order functional classes in the HPMS is growing. This is because more states have come to appreciate and use some of the supporting HPMS analytical software provided by the FHWA to help quantify investment needs over time.

The 1997 HPMS database was obtained from the FHWA and used in this study because it was the latest HPMS database available at the time it was needed. First, the records for the 13 LATTS states and Puerto Rico were extracted. The database was reduced further by identifying and keeping only those highway records that represented a segment of highway belonging to the LATTS strategic network. During this process, the corridor number to which each highway was assigned was affixed to each record. In all, 19,423 HPMS records were identified and selected for further analysis.

The LATTS HPMS database consists of 6,540 sample records (34 percent) and 12,883 universe records (66 percent). Most needs studies ignore universe records and only use sample records by appending an expansion factor to each sample record to estimate total needs. This method ignores all of the specific segment information contained on the universe records. Also, with such an approach, one database record can correspond to a portion of many highway segments scattered all over the state, rather than to one cohesive segment of highway. For this study, which analyzed needs in limited categories, all records for both the universe and samples were used.

Data items needed for the analyses but not available on the universe records were defaulted, based on the sample records for the same route and the same functional classification within each state. For example, highway capacity was required for some of the analyses but is not available on universe records. For example, capacity for a universe record representing a rural segment of I-95 in Florida was estimated. The estimate was based on the number of lanes on that segment and an average capacity per lane, calculated from all sample segments in Florida representing the rural portion of I-95.

Where insufficient sample segments were available for a specific route and functional classification, a statewide average default value by functional class was used. With this approach, critical data such as AADT and number of lanes available on all records were used. In addition, with this approach, an equivalency between physical highway segments and database records was maintained. This last feature was important to match LATTS' River Of Trade truck volumes and highway segments.

The LATTS HPMS database only includes information for existing (1997) highways. A number of existing highways in the Alliance Region are planned to be upgraded to higher standard roadways as part of the ISTEA/TEA-21 High Priority Corridors (from major arterial to interstate standards, for example). New highways, such as I-69, are also planned but not built yet. These highways, and their potential impact on existing facilities, were not included in the estimation of investment needs (diverted traffic).

The information in the HPMS database may differ from information in other databases. For purposes of consistency, the LATTS analyses used only the information in the HPMS database and did not attempt reconciliation with other databases.

Truck Traffic

Analyses were undertaken to estimate the volume of truck flows associated with Latin American trade that would use the LATTS Strategic Highway System. Additional analyses were performed to quantify LATTS truck traffic in terms of annual vehicle miles of travel and to relate LATTS truck traffic to total trade truck traffic on the Strategic Highway System.

Latin America Trade Flows

As explained in a previous section of this report, 1996 and expected 2020 trade volumes with Latin America were estimated. The portion of this trade that would be transported using highway facilities was translated into truck flows. These truck flows were then assigned to specific highway facilities using GIS generated shortest time paths. The resulting truck traffic from both cross-border and intermodal traffic is shown in **Exhibit D3-1** for 1996 and **Exhibit D3-2** for 2020. **Exhibit D3-3** shows the change in Latin American truck traffic between 1996 and 2020.

As illustrated in these two maps, LATTS truck traffic is much higher in some corridors than in others. Some of the corridors with the heaviest truck traffic include:

- I-10 corridor through Texas, Louisiana, Florida, Alabama and Mississippi;
- I-35/I-37 corridor in Texas; and,
- I-95 from Florida to Washington, D.C.

Other corridors which also have significant truck traffic include:

- I-59/I-81 from Mississippi to the northeast;
- I-20/I-30/I-40 through Texas and Arkansas; and,
- I-65/I-85 from Mobile, AL, to Atlanta, GA.

Exhibit D3-1
LATIN AMERICAN TRUCK FLOWS – 1996
Annual Truck Flows

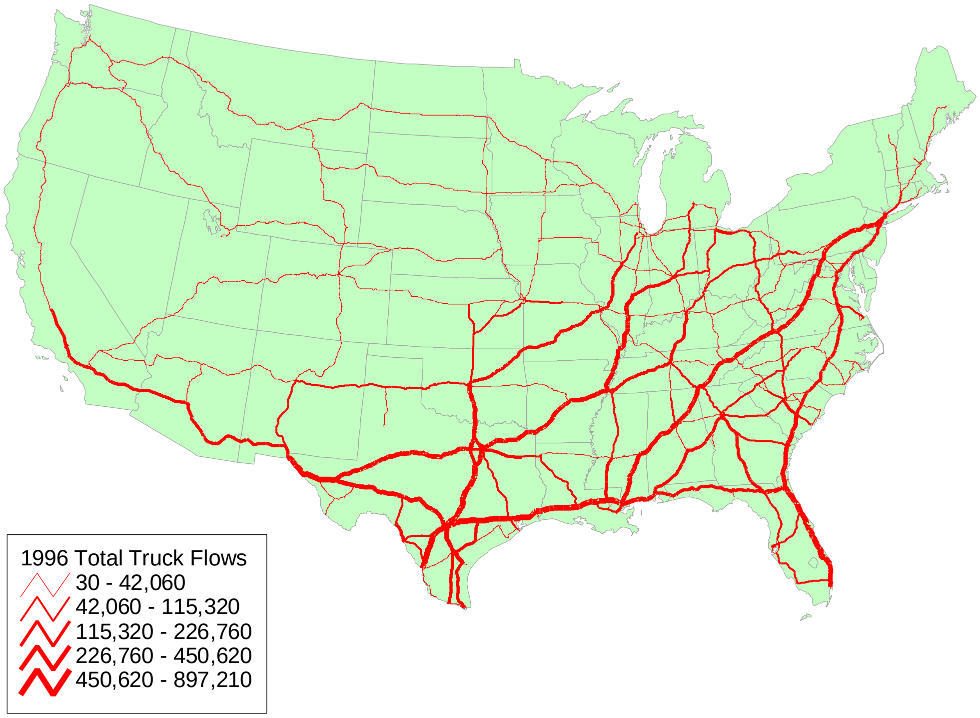


Exhibit D3-2
LATIN AMERICAN TRUCK FLOWS – 2020
Annual Truck Flows

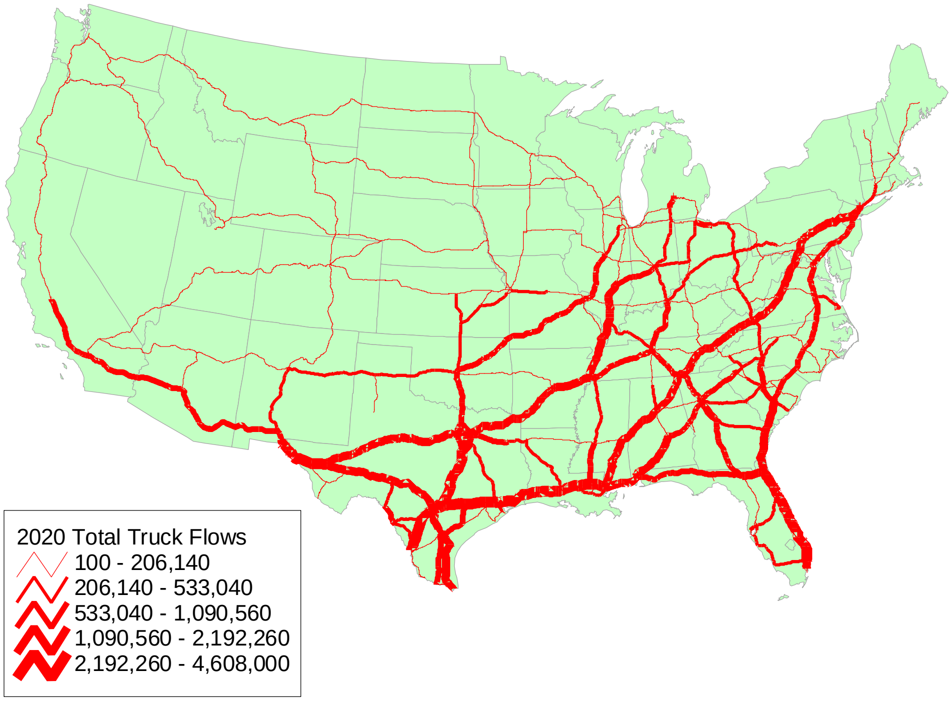
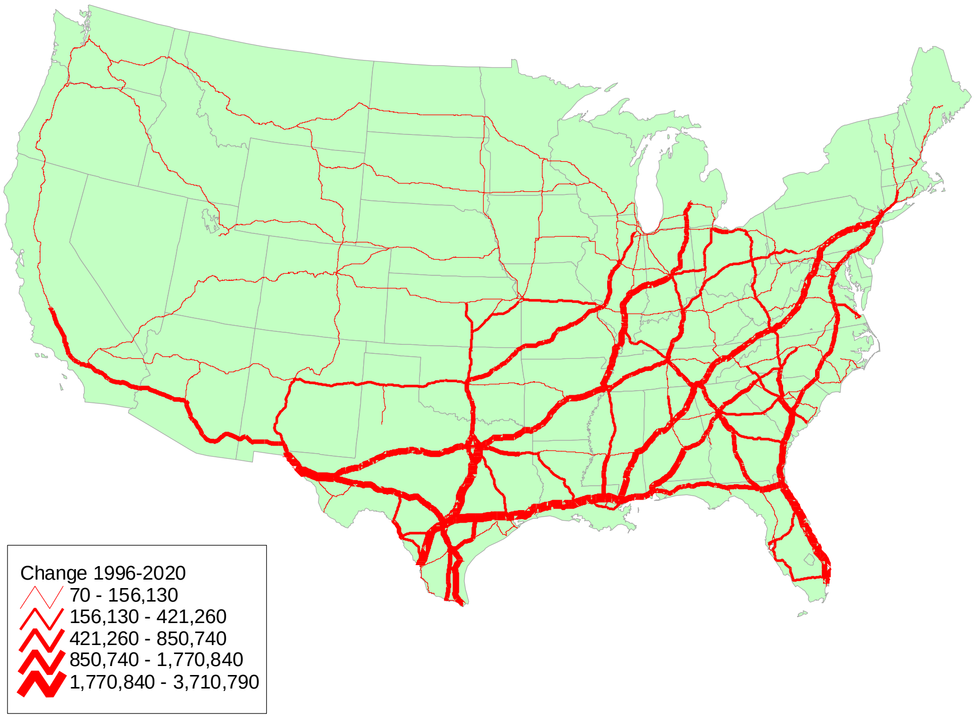


Exhibit D3-3
CHANGE IN LATIN AMERICAN TRUCK FLOWS – BETWEEN 1996 & 2020
Annual Truck Flows



It should be noted that the process sometimes assigns no LATTS traffic to certain portions of the LATTS strategic network. This is because the assignment procedure, which is based on the shortest time path, favors interstates. Further, the selected strategic network includes more routes than are needed to distribute LATTS traffic throughout the Region. Some highway segments in the network, especially among those corresponding to a lower functional classification, have no LATTS traffic assigned, as follows:

- 34 percent (7,729 miles) of the 21,956 miles of highways;
- 7 percent (1,047 miles) of the 14,525 miles of interstate; and
- 90 percent (6,683 miles) of the 7,430 miles of other non-interstate routes.

The network database and results of the LATTS truck flow assignments were combined by appending the LATTS truck traffic by route segment to the corresponding HPMS highway segments. First, 1996 LATTS truck flows were replaced by 1997 flow-through interpolations to make traffic volumes from HPMS and LATTS compatible. The combined two sets of data yielded total traffic on given highway segments (cars and trucks) and that portion of the truck traffic that was Latin American trade specifically.

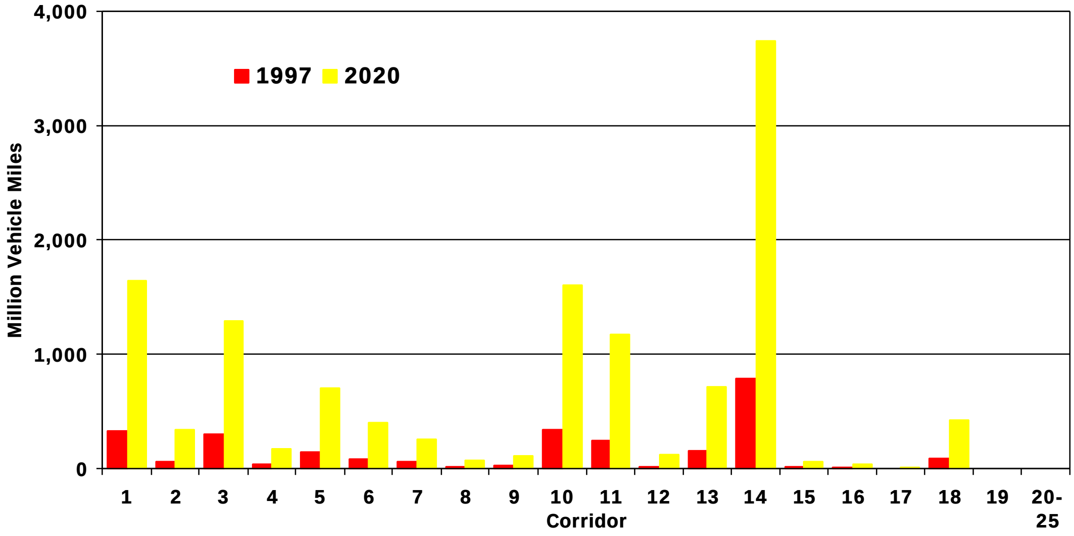
LATTS Trucks Vehicle Miles of Travel (VMT)

Exhibit D3-4 presents the LATTS truck traffic in VMT by corridor for both 1997 and 2020. Some corridors are shown to carry much more LATTS trucks than other corridors:

Corridor 14 (I-10 from West Texas to Jacksonville, FL) will carry more than twice the VMT of any other corridor --3.7 billion LATTS truck miles in 2020;

Corridor 1 (I-95 from South Florida to Washington D.C.) and Corridor 10 (I-3/I-37 from South Texas to the Plains) – 1.6 billion LATTS truck miles in 2020;

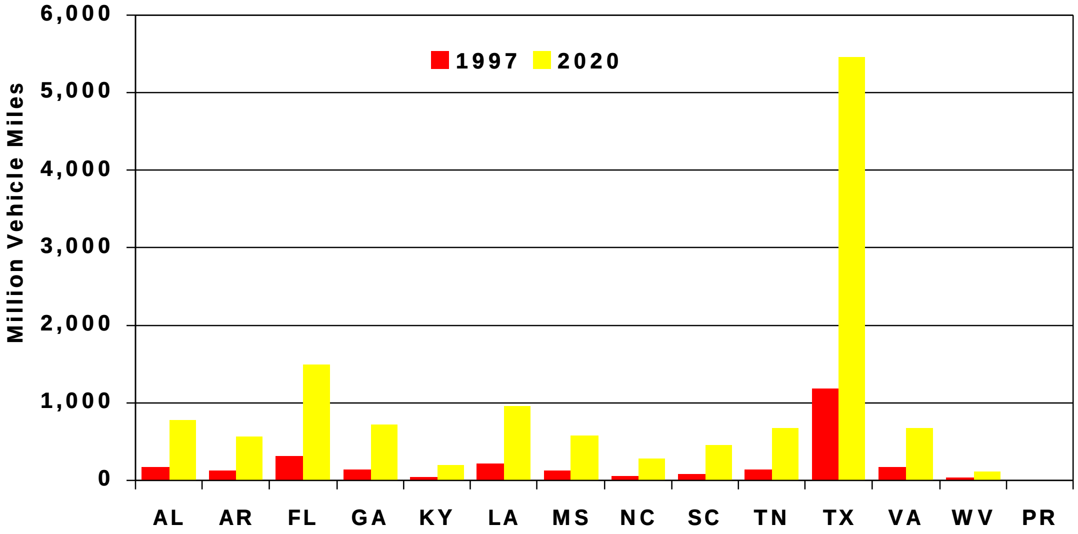
Exhibit D3-4
LATTS ANNUAL TRUCK TRAFFIC
By Corridor



- Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington, D.C.) and Corridor 11 (I-40 from North Texas to Wilmington, NC) -- 1 billion LATTS truck miles expected in 2020;
- Corridor 5 (I-75/I-74 from South Florida to Illinois) and Corridor 13 (I-20/U.S. 76 from El Paso, TX to Wilmington NC) both will carry more than 0.7 billion truck miles of LATTS traffic in 2020; and
- Other corridors have less LATTS traffic and Corridors 20 through 25 were assigned no LATTS truck traffic.

Exhibit D3-5 presents LATTS truck traffic by state. Considering that the most heavily LATTS traveled corridor (I-10 from West Texas to Jacksonville, FL) and several other heavily used LATTS corridors pass through Texas, it is not surprising that Texas is expected to carry a large portion of the total LATTS truck traffic.

Exhibit D3-5
LATTS ANNUAL TRUCK TRAFFIC
By State



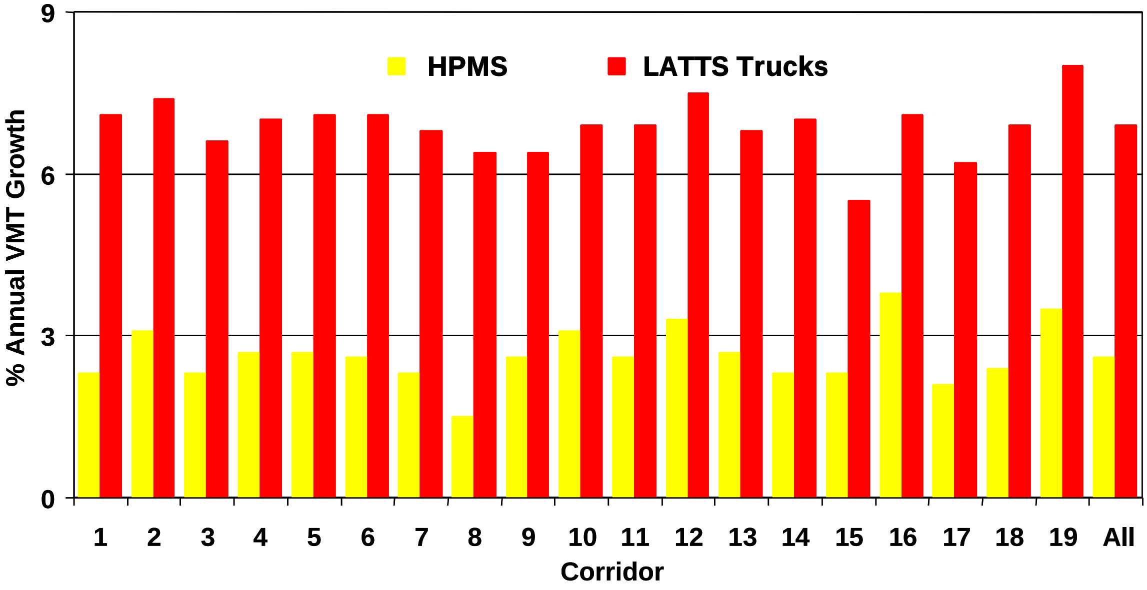
Findings by state for most LATTS annual truck miles include:

- Texas will carry 42 percent or 5.5 billion LATTS truck miles in 2020 out of 12.9 billion LATTS truck miles for all the states within the Alliance; and,
- Florida (1.5 billion) and Louisiana (nearly 1 billion) are a distant second and third.

Exhibits D3-4 and D3-5 also indicate the tremendous growth in traffic expected from the increased trade with Latin America between 1997 and 2020. Overall, VMT from LATTS will increase nearly five times, from 2.8 billion truck miles in 1997 to 12.9 billion truck miles in 2020. This represents an average annual growth rate of 6.9 percent.

An analyses was performed to compare this expected LATTS traffic growth with the overall growth expected on the strategic network from all sources of traffic. To accomplish this, overall traffic growth on all segments was estimated, based on the 1997 AADT and projected 2020 AADT included in the HPMS database. **Exhibit D3-6** shows, by corridor, expected overall traffic growth compared to LATTS truck traffic growth.

Exhibit D3-6
LATTS TRUCKS versus OTHER TRAFFIC
Average Annual VMT Growth



As shown, truck traffic from LATTS is expected to grow at a much higher annual rate than overall traffic, 6.9 percent versus 2.6 percent. Over the 23-year span, such annual growth will translate into a 365 percent increase for LATTS trucks versus an 80 percent increase for all traffic, according to the information in the HPMS database.

LATTS “Additional” Truck Traffic

The overall "base" growth projected from the HPMS database does not include the expected additional growth in traffic from Latin American trade flows. Whereas the 1997 “base” HPMS traffic included the full LATTS traffic, the 2020 “base” traffic (2020 HPMS traffic) would have only included that portion of LATTS traffic corresponding to the “base” traffic growth. The projection would have only shown LATTS traffic growing at the HPMS 2.6 percent annual rate instead of 6.9 percent annual rate. To fully account for LATTS traffic, the truck traffic and the total traffic on each HPMS highway record was adjusted to reflect this “additional” LATTS truck traffic. The difference in 2020 LATTS truck growing at the “base” rate (overall 2.6 percent annual rate) versus the LATTS growth rate (overall 6.9 percent annual rate) produced the calculated 2020 “additional” LATTS truck traffic. This "additional" truck traffic was added to both the 2020 overall truck traffic and the 2020 total traffic (AADT) for each segment.

Since a main purpose of the LATTS highway investment study was to measure the additional impact of LATTS traffic which is not already anticipated, this “additional” LATTS truck traffic is specifically addressed in the analysis of needs, capacity and pavement which follow. Needs caused by that portion of LATTS traffic already included in the existing traffic forecast were treated as part of overall needs and were not the focus of this analysis.

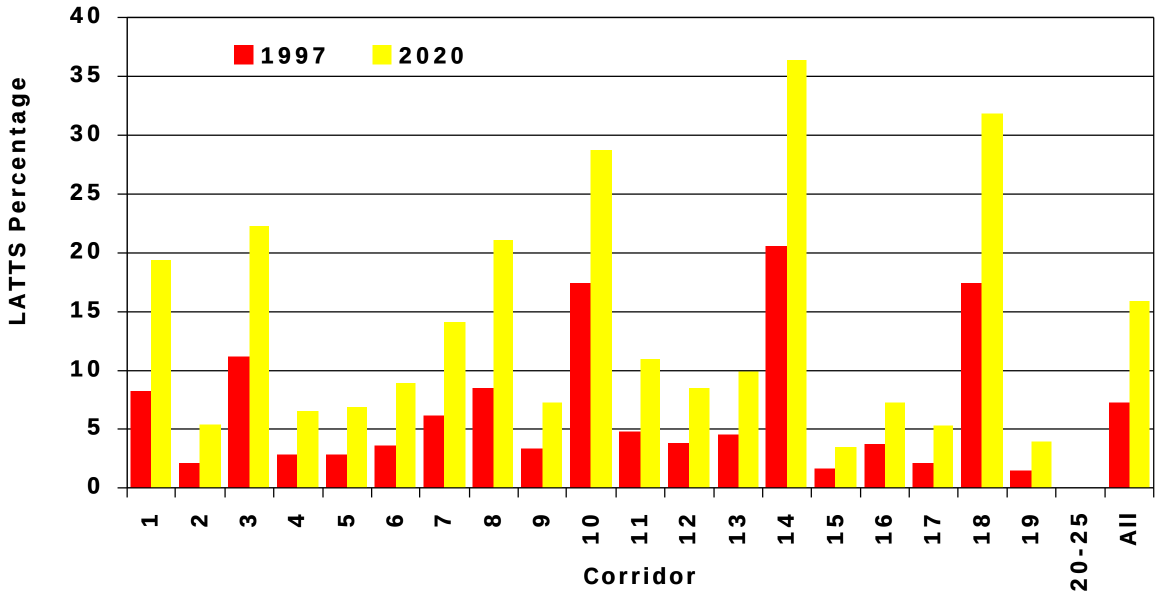
LATTS Share of Total Truck Traffic

Exhibit D3-7 shows, by corridor, the dramatic increase in the LATTS total share of truck traffic. From 1997 to 2020, LATTS overall share of total truck VMT will more than double from 7.3 percent to 15.9 percent. These percentages were calculated using only those highway segments that carry some LATTS traffic.

Comparisons of the expected growth rate of LATTS share of the total truck traffic (Exhibit D3-7) to the projected growth rate only for LATTS traffic (Exhibit D3-4) produced the following observations:

- Corridor 14 (I-10 from West Texas to Jacksonville, FL) will serve a higher share of LATTS traffic than any other corridor;
- The difference with other corridors is not as significant as for total traffic, i.e., the Corridor 14 "spike" is not as pronounced; and
- Corridor 18 (from Laredo, TX to Indianapolis, IN) has the second largest share of LATTS traffic to total truck traffic but only the eighth highest LATTS annual truck traffic.

Exhibit D3-7
LATTS SHARE OF TOTAL TRUCK TRAFFIC
by Corridor



Note: Highway segments not used by LATTS not included.

This indicates that some corridors will be proportionally more affected than others by LATTS traffic regardless of the actual volume. For example, Corridor 14 carries so much traffic from various sources that LATTS traffic will not affect it proportionately as much as might otherwise be expected, considering it will carry 29 percent of all LATTS traffic. Inversely, LATTS traffic on Corridor 18 is much lower by volume but represents a large portion of total traffic on that corridor.

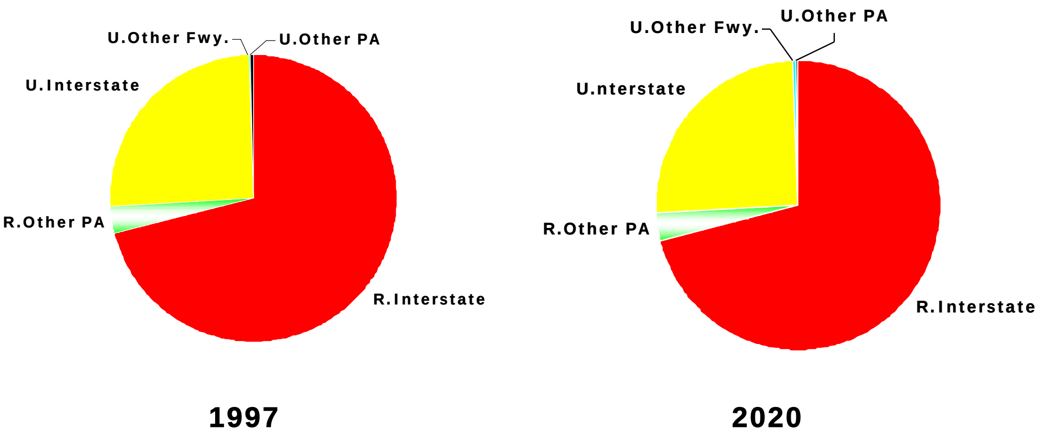
LATTS Traffic by Functional Classification

Exhibit D3-8 shows the distribution of LATTS expected truck traffic by the functional classification of the highway:

- 71 percent of the LATTS traffic will be on Rural Interstate;
- 3 percent will use Rural Other Principal Arterials;
- 25 percent will travel on Urban Interstate; and
- Less than 1 percent will use other urban facilities.

Considering the long distance nature of the LATTS truck traffic once the freight has arrived in the U.S., such a distribution pattern is to be expected.

Exhibit D3-8
LATTS TRUCK TRAFFIC
by Functional Class



NEEDS CATEGORIES

The highway analysis quantified the LATTS strategic network total investment needs as well as the incremental investment needs attributed specifically to LATTS truck traffic. Most highway needs can be organized into four general categories i.e., level of service, geometric, pavement, and maintenance and administration. Because of the unique nature of LATTS and its focus, only two of the four possible needs categories (or impact measures) were used for this study.

- Level of Service Needs – For this study, capacity needs due to LATTS truck traffic were quantified and priced in terms of additional lanes of traffic. As overall traffic from both cars and trucks grows, the amount of congestion on a given highway increases, thereby resulting in lower operating speeds. To maintain an acceptable level of service, additional capacity must be provided. The most direct way to add highway capacity is to add travel lanes. While less expensive measures are available to increase capacity (ITS, Travel Demand Management, etc.) they are less applicable to truck traffic.

- Geometric Needs – Highway geometric deficiencies (lane width, shoulder width, grades and curves) were not considered in this study. While geometrics affect vehicle performance, the geometric deficiencies are not a result of LATTS truck traffic. In addition, because the LATTS strategic highway network consists mostly of interstates and other higher level roadways, geometric needs on these types of highway would be minimal.

- Pavement Needs – Increased resurfacing needs due to LATTS traffic were estimated and priced as part of this study. Pavement condition deteriorates over time and highway must be resurfaced periodically. Since heavy truck traffic greatly affects pavement deterioration rates, LATTS truck traffic will increase the frequency of resurfacing needs.

- Maintenance and Administration Needs – The additional maintenance needs (snow removal, traffic signals, mowing, litter cleanup) due to LATTS truck traffic were considered marginal compared to overall maintenance needs. Consequently, incremental maintenance needs due to LATTS traffic were not estimated.

In summary, capacity needs and pavement resurfacing needs were the two needs categories used in this study.

Methodology

A special methodology was developed to distinguish the needs specifically attributable to LATTS traffic from the needs for traffic other than LATTS (i.e., cars and other trucks). This was done for year 2020 by calculating needs twice:

(1) With the “normal” traffic as defined by HPMS coded AADT, truck percentages, and growth rate; and

(2) With the same HPMS traffic plus the “additional” LATTS truck traffic defined and described earlier.

The differences in values thus derived represented the incremental needs due to LATTS.

Minimum Tolerable Conditions

In order to estimate needs, minimum tolerable conditions (MTCs) were defined. Minimum tolerable conditions represent the lowest acceptable threshold for highway facilities. MTCs are different from design standards, which are the features associated with a new, reconstructed, or rehabilitated roadway. MTCs are used to signal the need for an improvement once an impact measure falls below the minimum. The states represented in the Alliance typically establish unique MTCs to quantify highway needs and set capital improvement priorities in their respective states. For this study, however, it was desirable to establish a set of minimum tolerable conditions that were consistent for all of the Alliance Members. Consequently, the LATTS minimum tolerable conditions are in no way intended to replicate or replace individual state criteria. The LATTS minimum tolerable conditions are presented in the following paragraphs.

Capacity Analysis

Roadway operational deficiencies are manifested as congestion (i.e. too many vehicles trying to travel on a roadway with inadequate capacity). The LATTS deficiency analysis for capacity examines the volume-to-capacity ratio and level of service (LOS) on each highway segment. The LOS is a qualitative expression of operating conditions (congestion) using an alphabetic rating scheme (A to F) as defined below:

- A – free flow (low volumes and high speeds)
- B – stable flow (speed restricted somewhat by volume)
- C – restricted stable flow (lower speed, less maneuverability)
- D – approaching unstable flow (speed considerably affected by changes in operating conditions)
- E – unstable flow (at or near capacity, some stoppages)
- F – forced flow (volumes exceed capacity, slow speeds, frequent stoppages)

For LATTS highway analysis the following minimum tolerable conditions for capacity were used:

- Rural highways: Level of Service C
- Urban highways: Level of Service D

Pavement Analysis

The measure of pavement condition used for this study was the Pavement Serviceability Rating (PSR). PSR is a 0 to 5 value which is reported to the nearest tenth. It is derived from the Pavement Serviceability Index and other condition ratings, and is designed to assess pavement condition as well as roughness. The following exhibit (**Exhibit D3-9**) taken from the HPMS Field Manual depicts PSR ratings.

Exhibit D3-9
PAVEMENT CONDITION RATING

PSR	*Description*
4.0 – 5.0	Only new (or nearly new) superior pavements are likely to be smooth enough and distress free (sufficiently free of cracks and patches) to qualify for this category. Most pavements constructed or resurfaced during the data year would normally be rated in this category.
3.0 – 4.0	Pavements in this category, although not quite as smooth as those described above, give a first class ride and exhibit few, if any, visible signs of surface deterioration. Flexible pavements may be beginning to show evidence of rutting and fine random cracks. Rigid pavements may be beginning to show evidence of slight surface deterioration, such as minor cracks and spalling.
2.0 – 3.0	The riding qualities of pavements in this category are noticeably inferior to those of new pavements, and may be barely tolerable for high-speed traffic. Surface defects of flexible pavements may include rutting, map cracking, and extensive patching. Rigid pavements in this group may have a few joint failures, faulting and/or cracking, and some pumping.
1.0 – 2.0	Pavements in this category have deteriorated to such an extent that they affect the speed of free-flow traffic. Flexible pavement may have large potholes and deep cracks. Distress includes raveling, cracking, rutting and occurs over 50 percent of the surface. Rigid pavement distress includes joint spalling, patching, cracking, scaling and may include pumping and faulting.
0.0 – 1.0	Pavements in this category are in an extremely deteriorated condition. The facility is passable only at reduced speeds, and with considerable ride discomfort. Large potholes and deep cracks exist. Distress occurs over 75 percent or more of the surface.

Source: HPMS Field Manual, 1998.

For the LATTS highway analysis, the following MTCs for pavement condition were used:

- Interstate type facilities: PSR 3.0
- Other facilities: PSR 2.5

Capacity Analysis

A needs analysis model was developed to analyze capacity needs for 1997 and 2020. This model applied the same methodology as found in the HPMS Analytical Package to calculate capacity needs. For the year 2020, capacity needs, with and without the “additional” LATTS traffic, were estimated. The model was applied to each of the 19,423 HPMS records forming the LATTS highway database and the results were summarized. Some important features of the methodology include:

- The existing capacity used in this analyses was the 1997 capacity coded in the HPMS database, based on the 1994 Highway Capacity Manual. The same existing capacity was used for 1997 as for 2020.

- A capacity deficiency was identified when the volume/capacity ratio of a section during peak hour exceeded a threshold value. The threshold value corresponds to the selected minimum LOS criteria for that type of facility.
- Needed additional lanes were calculated to meet the minimum LOS criteria in 2020.
- In pricing the identified capacity needs, the same major widening unit costs were used consistently throughout the Alliance Region. These unit costs were provided by the FHWA and correspond to 1997 national averages. They are presented in **Exhibit D3-10**. To maintain consistency throughout the Region, no attempt was made to tailor these unit costs to each Alliance member beyond the stratification provided by the FHWA.
- Results reflect the information contained in the HPMS database and do not consider any improvements that may have occurred subsequently or any planned improvements.

Exhibit D3-10
MAJOR WIDENING UNIT COSTS

	Rural Interstate			Rural Other Princ. Arterial		
	Flat	Rolling	Mountain	Flat	Rolling	Mountain
Construction	309	329	418	315	350	670
Right of Way	41	45	73	44	52	78
Total	**350**	**374**	**491**	**359**	**402**	**748**

Costs are in $ 1,000 per finished lane mile.

	Urban Fwy. & Exp.	Urban Other Divided	Urban Undivided
Construction	2,322	1,398	1,117
Right of Way	1,149	776	506
Total	**3,471**	**2,174**	**1,623**

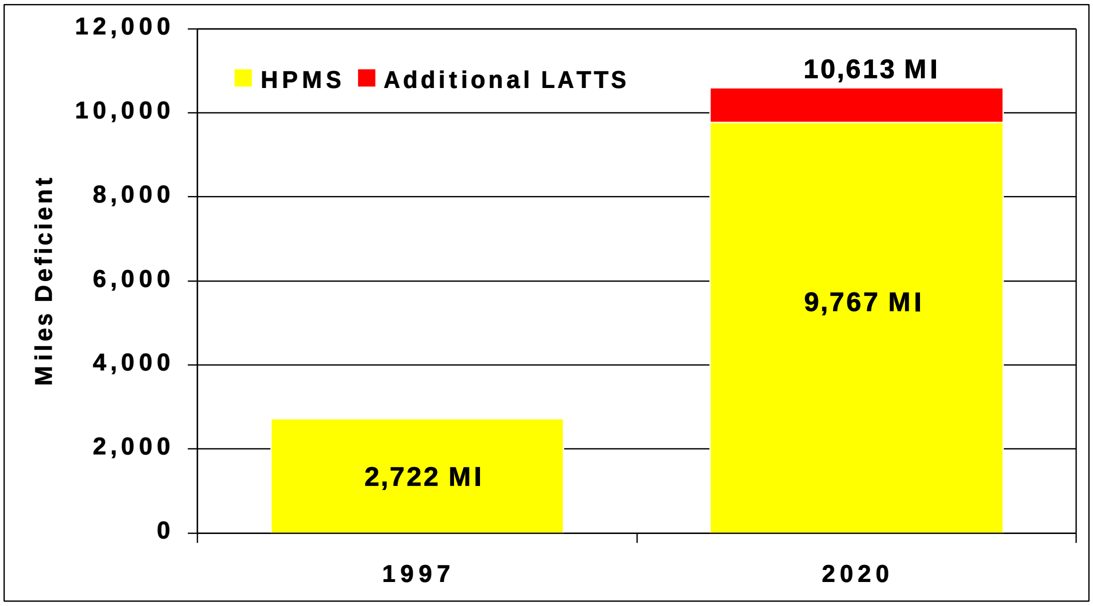
Costs are in $ 1,000 per added lane mile.

Source: FHWA 1997 Unit Cost

Capacity Needs

Exhibit D3-11 portrays projected 1997 and 2020 capacity deficiencies, by miles, for the LATTS strategic highway network. For 2020, the capacity deficiencies, with and without the "additional" LATTS traffic, are shown. Some significant findings include:

Exhibit D3-11
LATTS STRATEGIC HIGHWAY NETWORK
Capacity Deficiencies – Mileage

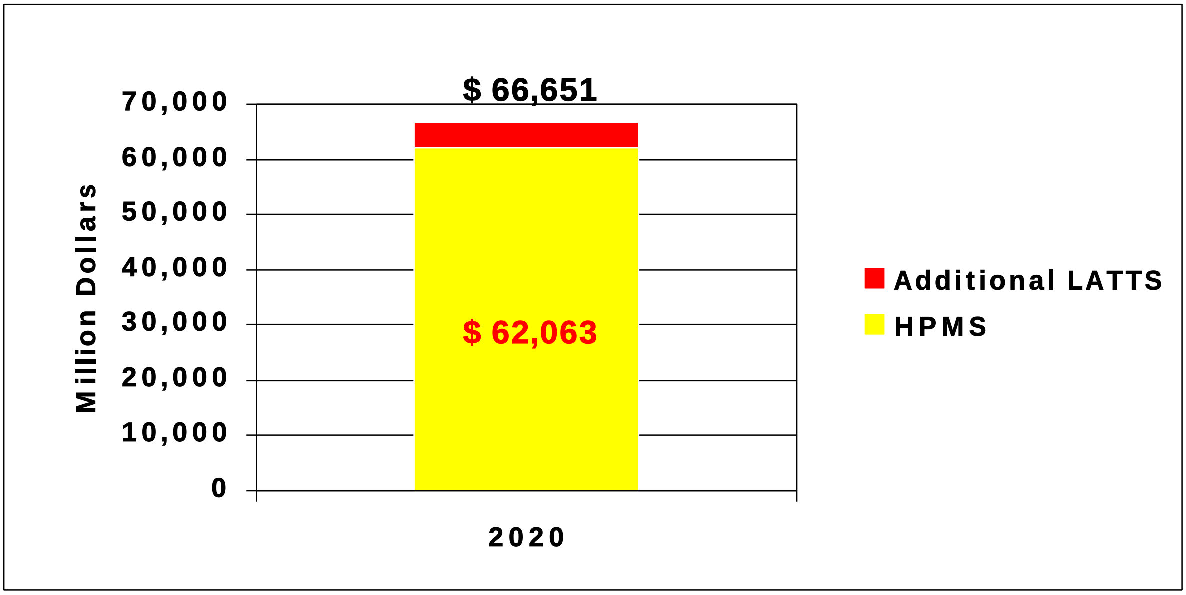


- While 12.4 percent (2,722 miles) of the network has existing capacity problems, the majority of the capacity deficiencies will occur in the next 20 years, unless capacity is added.
- With the expected “normal” growth (as defined by the HPMS database), 44.5 percent (9,767 miles) will have congestion problems by 2020.
- The “additional” LATTS trucks are expected to increase the total to 48.3 percent (10,613 miles) of total mileage.
- LATTS trucks will increase congested miles of roadway by about 8.7 percent.
- The majority of the projected congestion problems in the Region are due to expected overall growth, not LATTS traffic.
- Unless these capacity needs are met, LATTS truck traffic will be affected by all the capacity deficiencies regardless of their source.

As congestion increases, LATTS truck traffic (like other traffic) can be expected to experience lower operating speeds, more frequent speed changes, lower travel time reliability, and increased operating costs.

Exhibit D3-12 shows the projected, cumulative cost of capacity improvements until the Year 2020. Some key points:

Exhibit D3-12
LATTS HIGHWAY NETWORK
2020 Capacity Analysis - Costs



- Based on the HPMS expected growth in traffic, more than $ 62 billion will be required in the next 20 years to address congestion problems on the LATTS Strategic Highway Network.

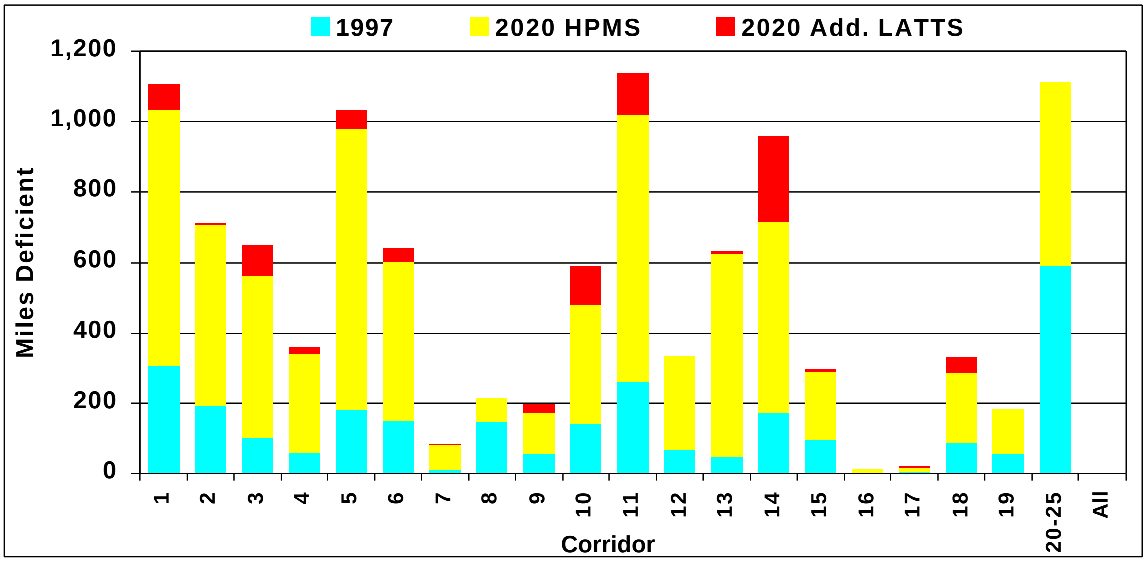
- The "additional" LATTS traffic will bring that total to nearly $ 67 billion, a 7.4 percent increase.

- The majority of LATTS truck traffic occurs on rural highways, which are less expensive to improve than urban highways. Therefore, the increase in costs to improve capacity deficiencies (as shown in Exhibit D3-11) is lower than the increase in capacity deficiencies per mile (as shown in Exhibit D3-10) for the LATTS Strategic Highway Network.

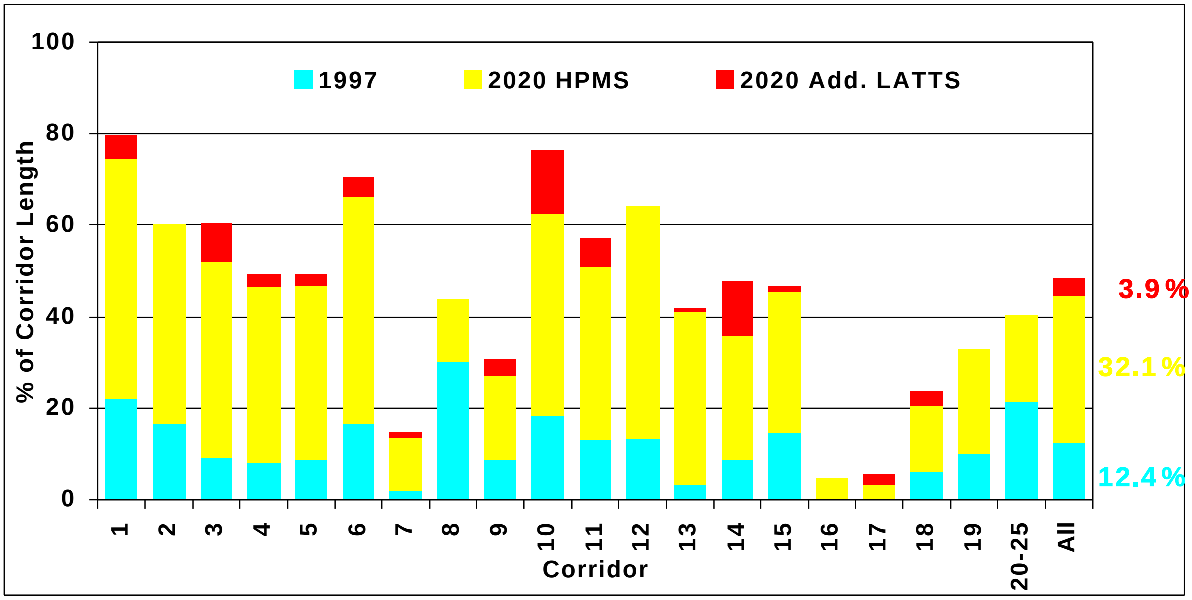
The top of **Exhibit D3-13** presents the roadway miles with capacity deficiencies, by corridor. The deficient mileages for 1997 and 2020, with and without LATTS additional traffic, are shown cumulatively. The bottom part of the exhibit shows the percentage of each corridor length with deficient capacity. The 25 LATTS corridors have different capacity deficiencies whether measured in terms of miles or percentages of corridor with deficient capacities.

- Corridor 1 (I-95 from South Florida to Washington, D.C.) and Corridor 11 (I-40 from North Texas to Wilmington, NC) both will have more than 1,100 miles with capacity deficiencies by 2020 including those due to LATTS "additional" traffic. Nearly 80 percent of Corridor 1 will have capacity deficiencies while 57 percent of Corridor 11 will suffer the same problem.

Exhibit D3-13
CAPACITY DEFICIENCIES
by Corridor



Percent of Corridors with Deficient Capacity



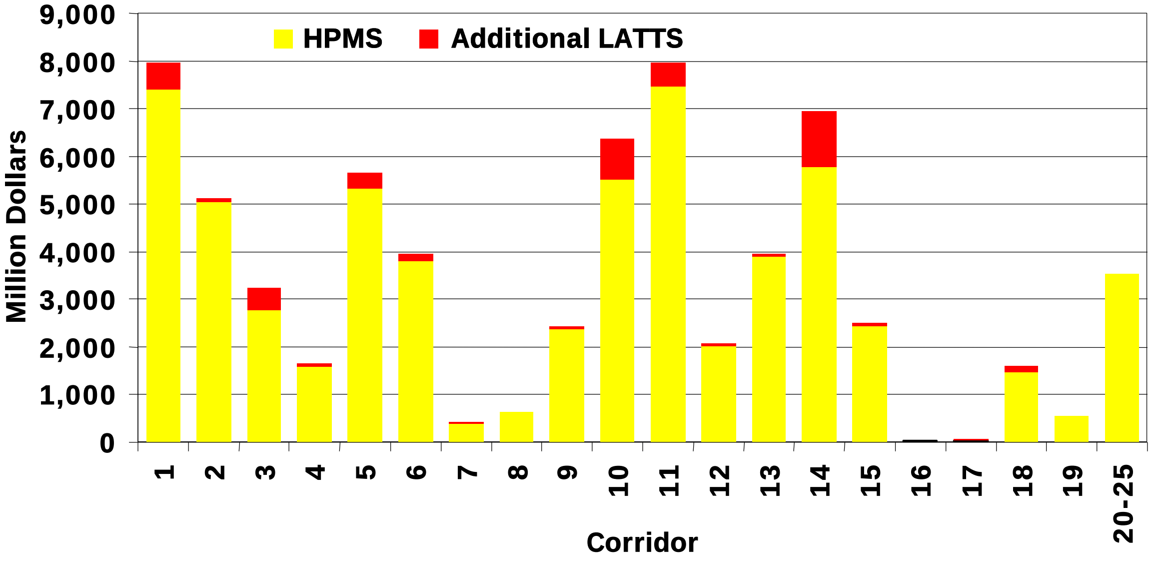
- Corridor 5 (I-75/I-24 from South Florida to Illinois) and Corridor 14 (I-10 from West Texas to Jacksonville, FL) will have the next highest capacity-deficient mileage with about 1,000 miles deficient each. This represents about 49 percent and 48 percent of the respective corridor length.

- Corridor 2 (I-85 from West Alabama to Norfolk, VA), 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), will have approximately 600 capacity-deficient miles respectively. This represents about 60 percent of the length of Corridors 2 and 3, 70 percent of Corridor 6 and 40 percent of Corridor 13.

- The portion of these capacity deficient miles due to the “additional” LATTS traffic corresponds with the LATTS traffic usage of the corridors. Corridors 14, 1, 10, 3, and 11 will have the highest LATTS truck traffic and the highest capacity deficient miles due to LATTS traffic. As a group, they also will have the highest proportion of their length with capacity deficiencies due to LATTS traffic but with some variations. For example, Corridor 14 will have by far the highest volumes of LATTS truck traffic, but the percentage of this corridor length with capacity deficiencies due to “additional” LATTS traffic will be lower than for Corridor 10.

Exhibit D3-14 presents, by corridor, the estimated costs of providing the 2020 needed capacity. These costs conform to the miles of capacity-deficient highway as presented in Exhibit D3-13. The added costs to provide capacity for the “additional” LATTS traffic is roughly proportional to the corresponding deficient miles, except for Corridor 14 (the cost of providing the additional capacity is relatively lower than the corresponding additional deficient mileage). The cost to

Exhibit D3-14
CAPACITY IMPROVEMENT COSTS
by Corridor



address all capacity needs on Corridor 5 (I-75/I-24 from South Florida to Illinois) is proportionally lower than the number of miles with capacity deficiencies. The reverse is true for Corridor 10 (I-35/I-37 South Texas to Plains). These variations between the miles deficient and the associated costs are related to the proportion of rural versus urban mileage with capacity deficiencies and the fact that adding capacity is more expensive in urban areas than in rural ones. For example, Corridor 5 has a higher proportion of rural highway with capacity deficiencies and so, relatively lower costs to address these deficiencies. Corridor 10 has a higher proportion of urban capacity deficiencies and severe congestion in the Dallas-Fort Worth and Houston areas, which increases the costs.

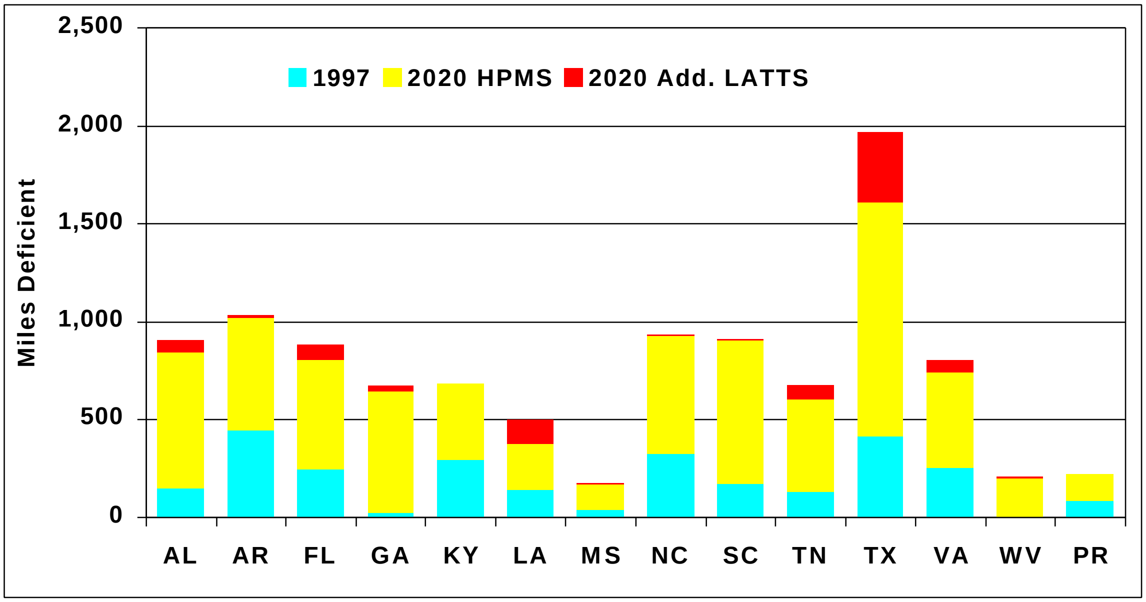
The top of **Exhibit D3-15** shows the roadway miles with capacity deficiencies, by state. The deficient miles for 1997 and 2020, with and without LATTS additional traffic, are shown cumulatively. The bottom part of the exhibit shows the miles of interstate highways within each state. These two graphs are presented together to show the strong relationship between the total miles with capacity deficiencies, and the total miles of interstate highways, which are the most traveled type of highway. Texas is shown to have about twice the number of miles with capacity deficiencies as does the next closest state (Arkansas). It also has more than twice the number of interstate highways.

The portion of the capacity-deficient miles due to the “additional” LATTS traffic for each state is related somewhat to the volume of LATTS traffic within that state, although the correspondence is not exact. For example, the large volume of LATTS truck traffic within Texas (see Exhibits D3-2 and D3-5) results in the largest incremental capacity deficiencies. Florida and Louisiana, however, which are second and third in terms of LATTS truck traffic, are third and second respectively in terms of incremental miles with capacity problems.

The top of Exhibit D3-16 presents the estimated total costs of providing the 2020 needed capacity by state. These costs are in line with the miles of capacity-deficient highway as presented in Exhibit D3-15. The added costs to provide capacity for the “additional” LATTS traffic are approximately proportional to the corresponding deficient miles.

The bottom part of **Exhibit D3-16** presents the same incremental costs due to LATTS expressed in terms of percentage of total capacity improvement costs. While the capacity improvements costs due to LATTS for Louisiana and Mississippi are much smaller than in Texas, they represent a larger share of total capacity needs than in Texas, 22 and 15 percent respectively versus 12 percent. The overall average for the Alliance States is a 7.4 percent increase in costs to address additional capacity requirements due to LATTS traffic.

Exhibit D3-15
CAPACITY DEFICIENCIES BY STATE
Miles with Deficient Capacity



Miles of Interstate by State

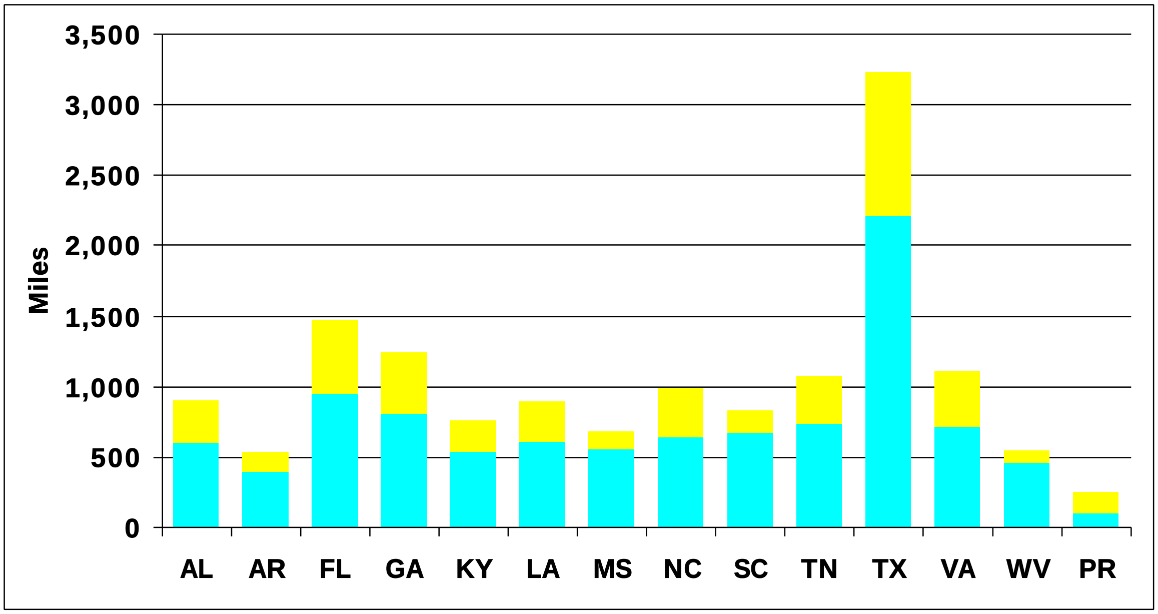
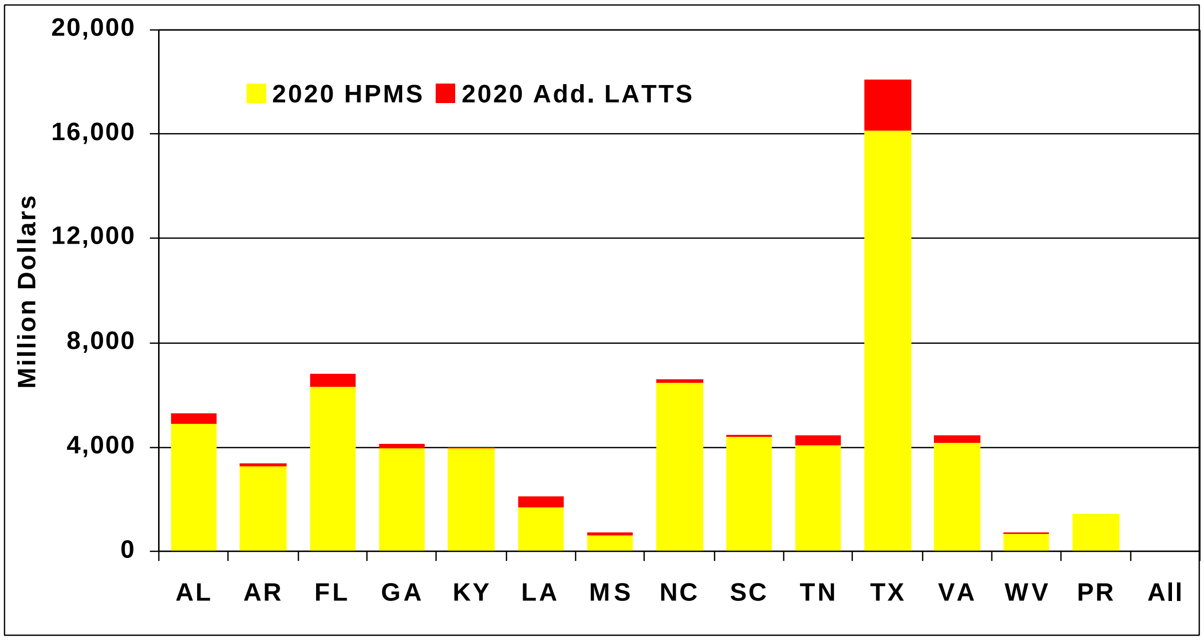


Exhibit D3-16
TOTAL CAPACITY IMPROVEMENT COSTS BY STATE



% Costs Increase Due to LATTS

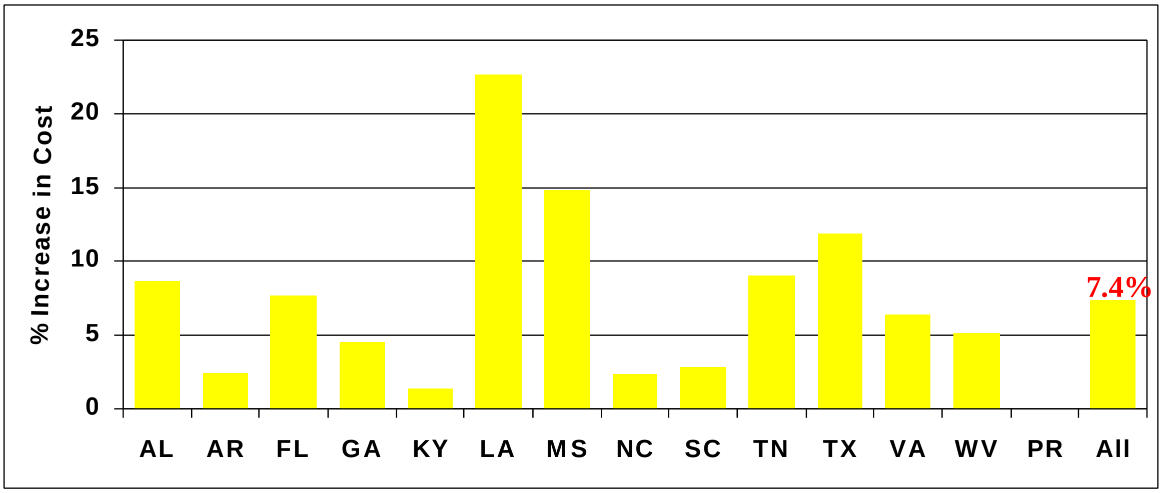


Exhibit D3-17 shows the LATTS network capacity needs in terms of miles to be improved and costs of the improvements by functional classification. The left portion of the exhibit corresponds to the “base” needs while the right portion corresponds to the "additional" needs due to LATTS “additional” traffic. The two key points from this exhibit are:

1) The "additional capacity-deficient miles due to LATTS" are more concentrated into the rural interstate category than the "base" case (LATTS traffic's long distance nature favors a heavier usage of the rural interstate). This represents more than 80 percent of total LATTS related deficiencies.

2) Because the costs of providing additional capacity are much higher in urban areas than in rural areas, most of the costs to provide the needed capacity are for the urban interstate system. This is true for both the "base" case and the “additional LATTS” case.

Pavement Analysis

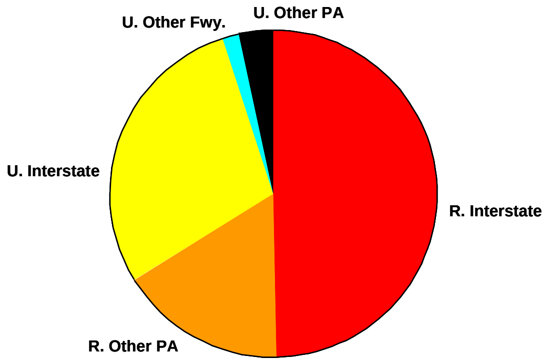
Unlike capacity needs, pavement needs are not cumulative. If a highway section needs four additional lanes by 2020 to handle the predicted traffic, two lanes can be added in 2010 and another two in 2020. On the other hand, if pavement is left to deteriorate past a certain level, a more expensive improvement such as reconstruction will be needed. The frequency of the need to resurface depends on both the volume of traffic (truck traffic mostly) using the highway and on the pavement maintenance program applicable to the specific highway.

Methodology

The methodology used to evaluate pavement needs of the LATTS highway network estimated the average annual pavement needs in 2020 instead of the total, cumulative needs through 2020 (measured in the earlier model). 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 with and without LATTS additional traffic. As an indicator of the existing condition of the network, pavement deficiencies were also identified for 1997. The difference in average pavement life is an indicator of the impact of LATTS additional traffic on the Region’s pavements. It can also be translated into incremental pavement costs.

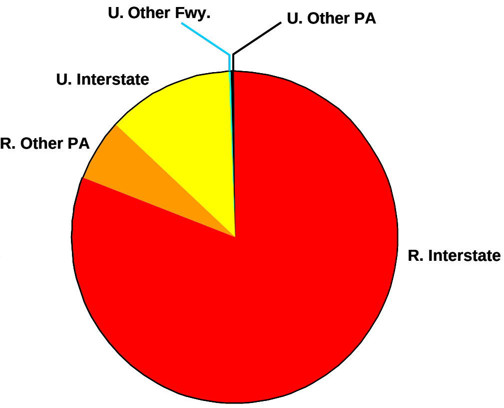
Pavements typically are designed to last for a fairly long time. However, as they age and are subjected to traffic loads, they deteriorate. The pavement life measure used in these analyses is dependent on the amount of traffic using the highway and, more specifically, truck traffic (car traffic is a factor in the pavement deterioration rate but it has much 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. Finally, the HPMS-AP methodology for deteriorating

Exhibit D3-17
CAPACITY IMPROVEMENTS by Functional Classification



2020 Base (HPMS)

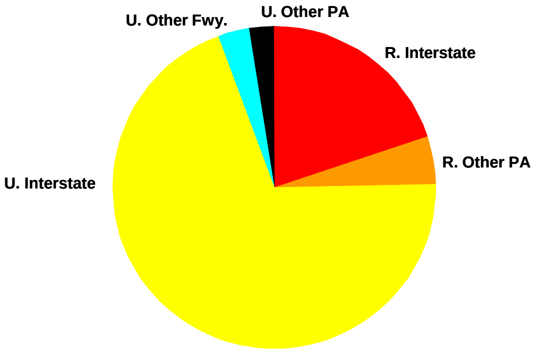
Total Miles: 9,767 Miles



Additional LATTS

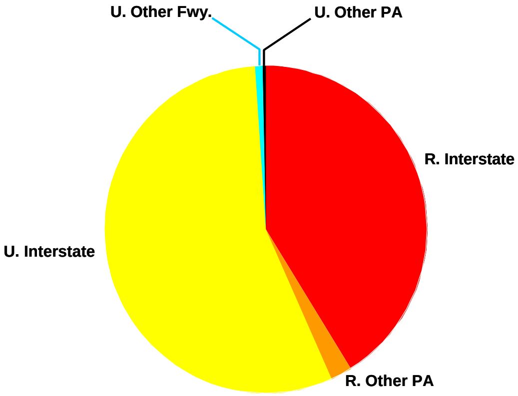
Additional Miles: 847 Miles

2020 CAPACITY IMPROVEMENT COSTS by Functional Class



2020 Base (HPMS)

Total Costs: $62,063 Million



Additional LATTS

Additional Costs: $ 4,588 Million

pavement was applied in this study. It is based on the concept of 18 Kip Equivalent Single Axle Loads (ESALs). Weather condition or type of subsoil can also influence pavement deterioration rates. For this study, only traffic and pavement type were used to differentiate pavement deterioration rates between states.

Each highway segment pavement's remaining life was calculated twice-- first using the “base” car and truck traffic from the HPMS database, then adding the “additional” LATTS traffic to the base. The difference in the two pavement lives is a measure of the impact of LATTS traffic on the Region's pavements.

Similar to the capacity analysis, the same resurfacing unit costs were used consistently throughout the Region. The 1997 FHWA unit costs were used. They are presented in **Exhibit D3-18**. To maintain consistency throughout the Region, no attempt was made to tailor these unit costs to each state beyond the stratification provided.

Exhibit D3-18
RESURFACING UNIT COSTS

	Rural Interstate			Rural Other Princ. Arterial		
	Flat	Rolling	Mountain	Flat	Rolling	Mountain
Resurfacing	109	106	136	70	70	101

Note: Costs are in $1,000 per finished lane mile.

	Urban Fwy. & Exp.	Uuban Other Divided	Urban Undivided
Resurfacing	202	135	154

Note: Costs are in $1,000 per finished lane mile.

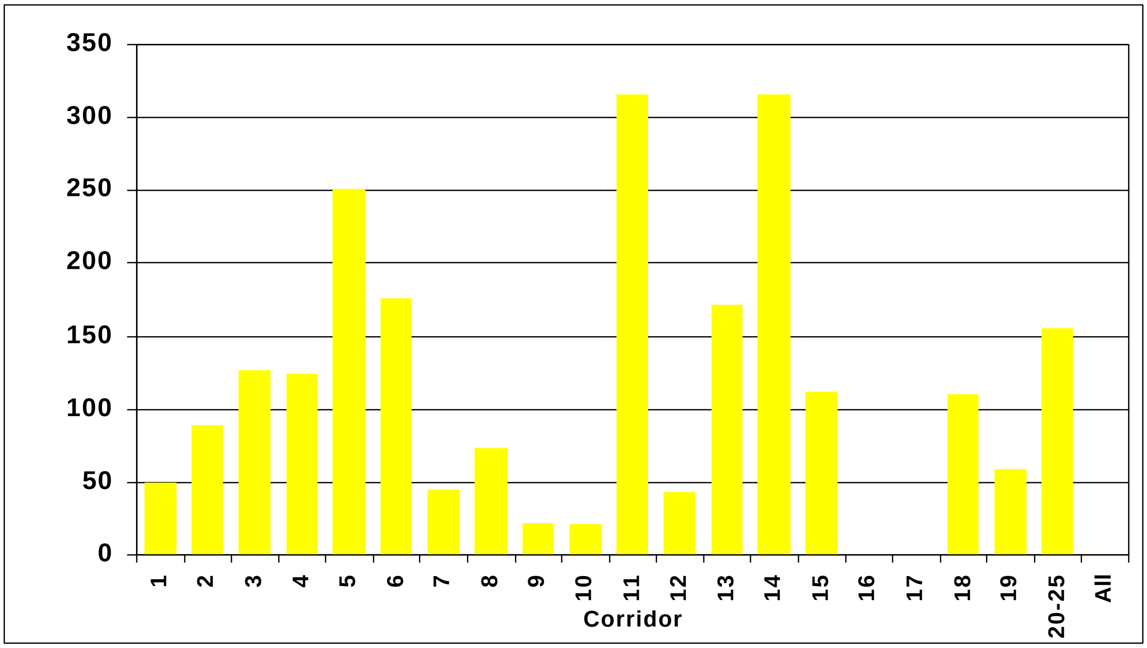
Source: FHWA 1997 Unit Costs

Pavement Needs

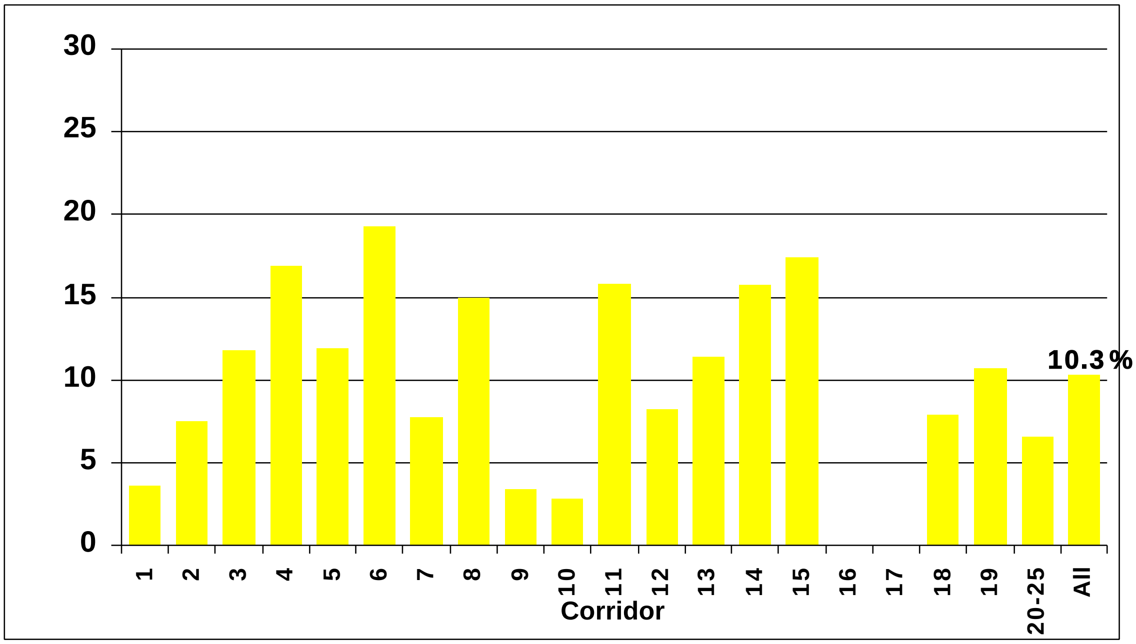
Exhibit D3-19 illustrates the extent of existing (1997) pavement deficiencies by corridor. The top of the exhibit shows the number of highway miles with deficient pavement condition. The corridor miles with deficient pavement are related to the total corridor length. For example, Corridors 5 (I-75/I-24 from South Florida to Illinois), Corridor 11 (I-40 from North Texas to Wilmington, NC) and Corridor 14 (I-10 from West Texas to Jacksonville, FL) are the longest corridors and have the most pavement deficiencies. The lower part of the exhibit demonstrates that the percentage of each corridor with pavement deficiencies does vary. Overall, about 10 percent of the LATTS strategic network has existing pavement

Exhibit D3-19
1997 PAVEMENT CONDITION DEFICIENCIES BY CORRIDOR

Miles Deficient



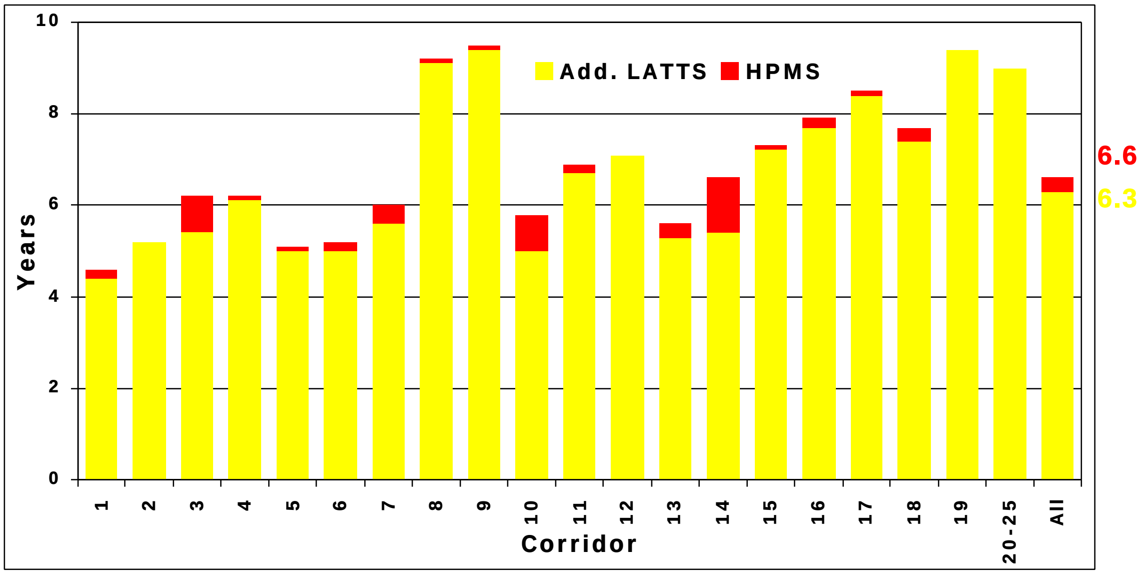
% of Corridor Length



deficiencies. This percentage varies by corridor from zero for Corridor 16 (I-16/U.S. 80 in Georgia) and Corridor 17 (I-27/U.S. 87/U.S. 277 from Texas to Denver, CO), to close to 20 percent deficient for Corridor 6 (I-65 from Mobile, AL to Cincinnati, OH).

The LATTS Strategic Highway Network's expected average pavement life in 2020, with and without the LATTS "additional" traffic, is summarized in **Exhibit D3-20**. There are significant differences between corridors. The first differences are in overall pavement life. While the pavement life of Corridor 1 (I-95/I-4 from South Florida to Washington, D.C) averages 4.6 years, Corridor 9 (I-45/U.S. 287 from Amarillo, TX to Galveston, TX) has a pavement life expectancy of 9.5 years, more than twice as much. Such disparity is due to a combination of factors including the existing pavement type/strength (high rigid pavement lasts longer than flexible pavement for example) and the amount of truck traffic (LATTS and others) using these highways.

Exhibit D3-20
2020 AVERAGE PAVEMENT LIFE
by Corridor

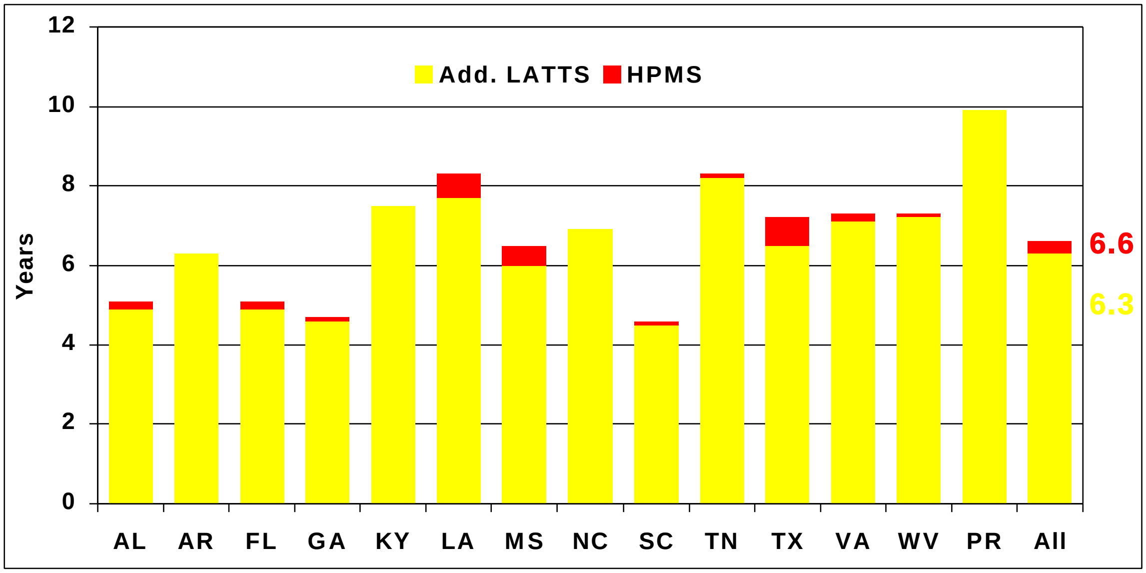


The second difference is in the LATTS "additional" traffic impact. One would expect that the most heavily traveled corridor would show the largest impact. Exhibit D3-20 confirms this expectation only partially. Corridor 14 (I-10 from West Texas to Jacksonville, FL), by far the most heavily traveled corridor, shows the highest reduction in pavement life due to LATTS traffic, from 6.6 years to 5.4 years on average. Other heavily traveled corridors such as Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to Washington, D.C. and Pennsylvania) and Corridor 10 (I-35/I-37 from South Texas to the Plains) also indicate significant reduction in average pavement life due to LATTS traffic. However, Corridor 1 (I-95/I-4 from South Florida to Washington D.C) and Corridor 11 (I-40 from North

Texas to Wilmington, NC) were determined to experience smaller reductions in pavement life despite the heavy traffic from LATTS.

Average pavement life, with and without LATTS “additional” traffic, is displayed, by state, in **Exhibit D3-21**. Pavement life varies from 4.6 years in South Carolina to 8.3 years in Louisiana and 9.9 years in Puerto Rico. The pavement life for the entire LATTS Strategic Network averages 6.6 years. The differences between states are due to a variety of reasons including pavement design standards and truck traffic (LATTS and others). The estimated impact of LATTS traffic in terms of decreased pavement life is related to the proportion of LATTS truck traffic. Texas, Louisiana and Mississippi will experience the highest share of LATTS truck traffic relative to total truck traffic and also will experience the most reduction in pavement life. However, Florida will experience less impact than would be expected considering the amount of LATTS truck traffic in this state. It may be due to the fact that the LATTS truck traffic in Florida represents only 2.9 percent of total traffic traveling on the LATTS Strategic Network in 2020 versus 5.4 percent in Texas and Louisiana, and 4.6 percent in Mississippi.

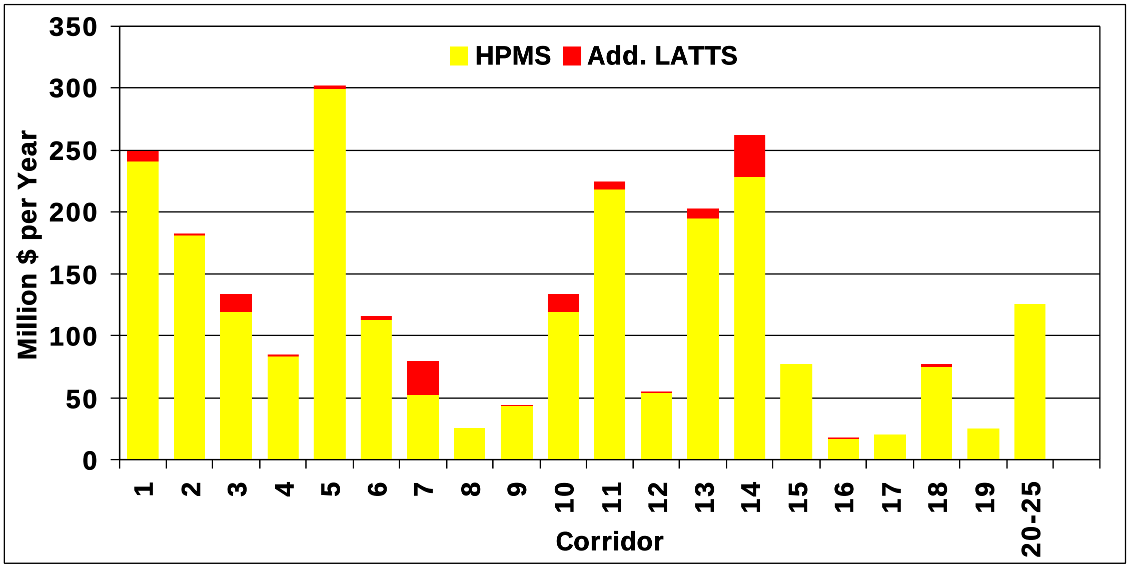
Exhibit D3-21
2020 AVERAGE PAVEMENT LIFE
by State



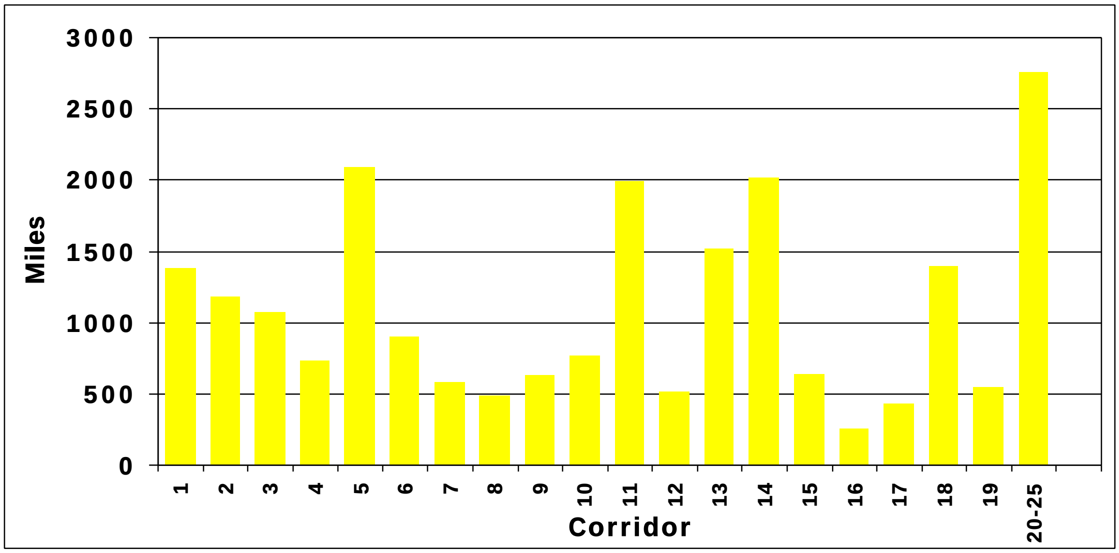
Total resurfacing costs are a function of the average pavement life and the length of the corridors. Average annual resurfacing costs were calculated as the total pavement resurfacing cost amortized over the life of the pavement i.e., resurfacing cost divided by the expected life of the pavement. **Exhibit D3-22** summarizes the average annual resurfacing costs by corridor. The top part shows the total costs with and without LATTS “additional” traffic, and the bottom part presents the total length of each corridor. Total corridor pavement costs are

Exhibit D3-22
2020 AVERAGE ANNUAL RESURFACING COSTS
by Corridor

Total Annual Resurfacing Costs



Total Length of Corridors



highly correlated to corridor length yet there is a less than perfect correspondence between costs and length. The shorter pavement life on Corridor 1 (I-95/I-4 from South Florida to Washington D.C) and the longer pavement life on Corridor 18 (from Laredo, TX to Indianapolis, IN) demonstrate this point. The incremental costs due to LATTS traffic are closely related to the reduction in pavement life due to LATTS traffic (shown previously in Exhibit D3-20).

Exhibit D3-23 summarizes the average annual resurfacing costs by state. Total resurfacing costs are a function of the average pavement life and the length of the LATTS network within each state. Texas, with the longest LATTS network, has the highest annual resurfacing costs followed by Florida, which has the next longest LATTS network. While the top part of Exhibit D3-23 shows the total costs with and without LATTS "additional" traffic, the bottom part presents the percentage increase in annual resurfacing costs due to LATTS traffic. On average, LATTS "additional" traffic will result in a 4.3 percent increase in resurfacing costs for the Region. However, this increase is not uniform among the Alliance states. The incremental costs due to LATTS traffic are closely related to the reduction in pavement life due to LATTS truck traffic. Texas and Louisiana will experience about a 10 percent increase in resurfacing costs while Arkansas, Georgia, Kentucky and Puerto Rico will experience less than 1 percent increase in costs.

Exhibit D3-24 presents, by functional classification, the LATTS highway network resurfacing needs in terms of pavement life and incremental resurfacing costs due to LATTS traffic. Increases in pavement needs due to LATTS traffic will occur mostly on the rural interstate system since, as mentioned earlier, the heaviest LATTS traffic will occur on that part of the system. While about one-fourth of the LATTS traffic will occur on the urban interstate system, the impact is lower because it represents a smaller portion of total traffic on these facilities. As a result, the increase in resurfacing costs will vary from 8.3 percent for the rural interstate system to 2.5 percent for urban interstates and lower for other functional classifications.

Operating Speeds

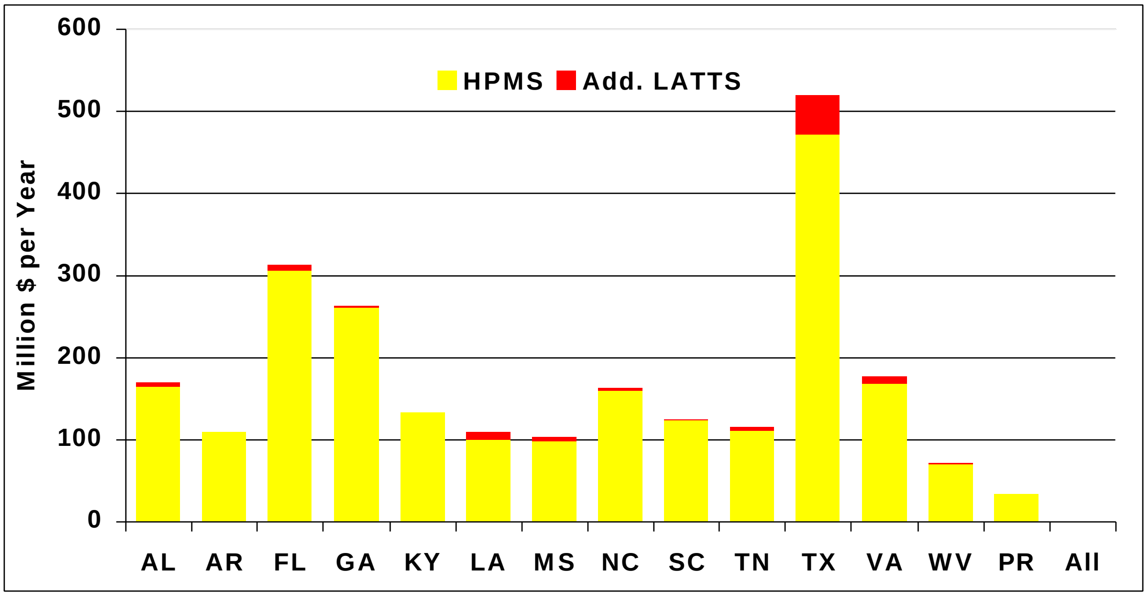
Truck operating speed was chosen as the key study performance measure for the LATTS Strategic Highway Network. Truck operating speeds were estimated for each LATTS roadway segment based on the conditions of the roadway, including roadway geometry and alignment, pavement condition, speed limit and traffic volumes.

Two types of truck operating speeds were calculated:

- The average daily truck operating speed; and
- The peak hour truck operating speed (as defined by the peak hour factor or "K" factor for each road segment).

Exhibit D3-23
AVERAGE ANNUAL RESURFACING COSTS
by State

Total Costs



Percentage Increase Due to LATTS

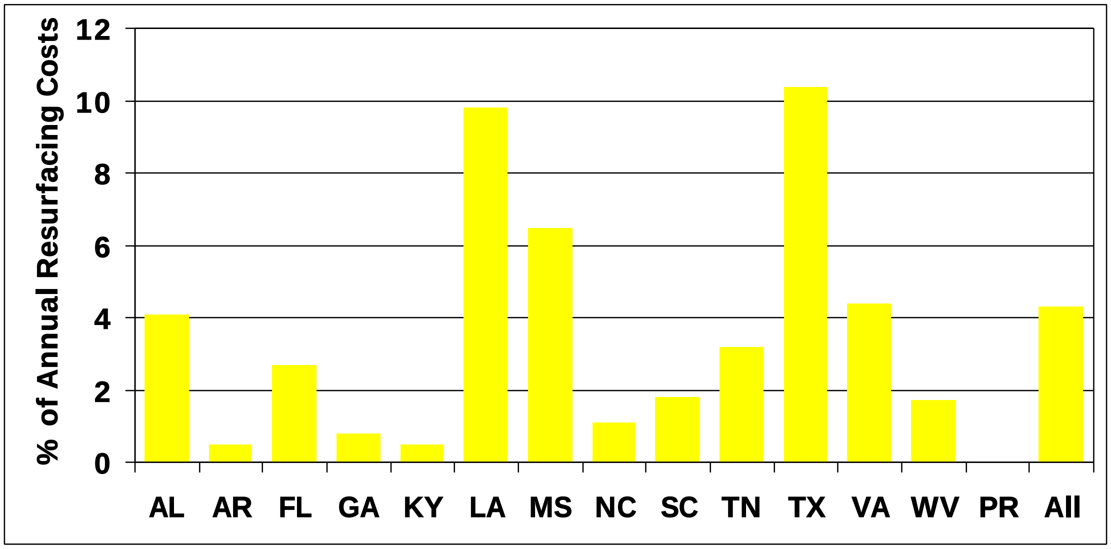
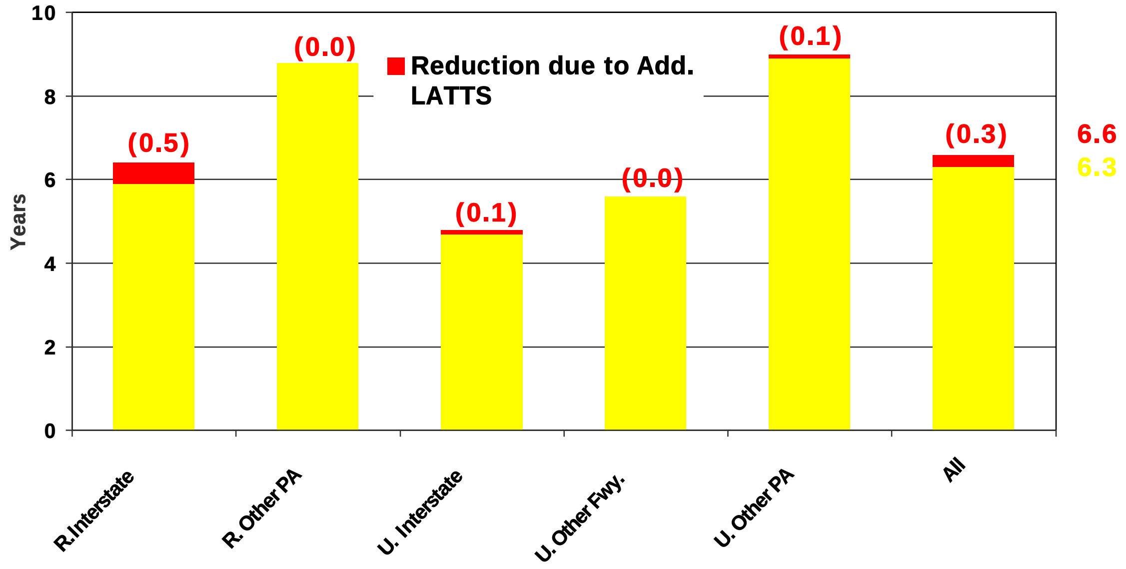
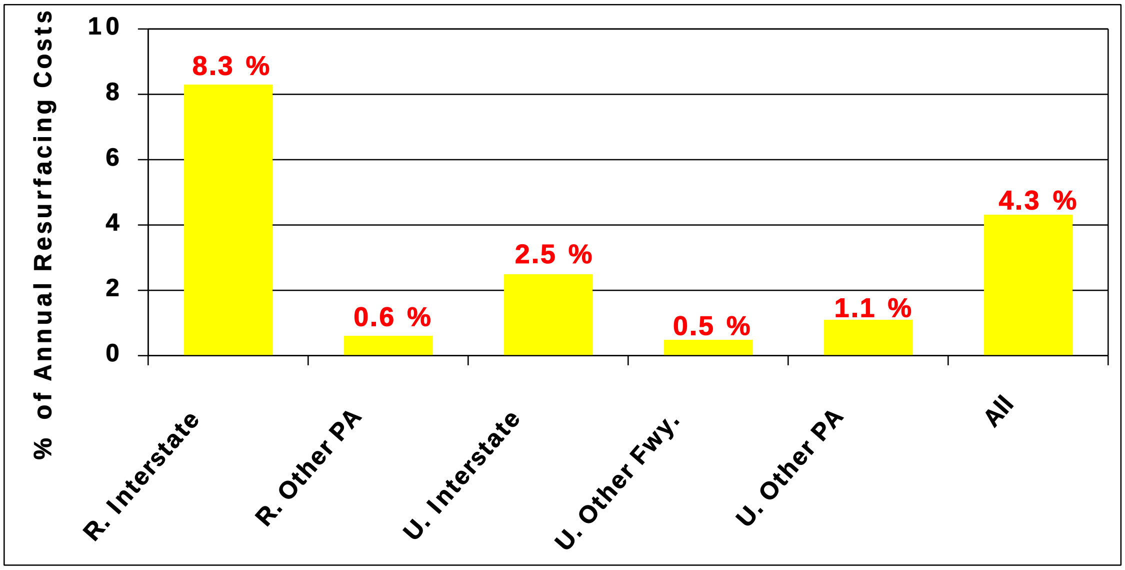


Exhibit D3-24
2020 AVERAGE PAVEMENT LIFE by Functional Classification



Additional Resurfacing Costs per Year by Functional Class



Because available information does not denote when a truck would travel over a specific highway section during the peak hour, the peak hour operating speed assumes that the forecast trucks would travel over every section during peak hour. As a result the calculated peak hour speed and travel time for an entire corridor is overstated, as it is unlikely that a truck would travel every section during peak hour conditions. However, the difference in peak hour operating speeds with and without additional LATTS traffic is a good indicator of how much worse existing congestion problems are going to become with the additional LATTS traffic.

Truck Operating Speed Methodology

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.

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. The process is summarized in **Exhibit D3-25** and is as follows:

1. Based on the type of facility (urban interstate versus two-lane rural arterial, for example) and the ratio of Average Annual Daily Traffic (AADT) to hourly capacity, the AADT was distributed into as many as 12 time periods, each with a specific hourly Volume to Capacity ratio (V/C ratio). Obviously, the higher the AADT compared to capacity, the more traffic occurs during congested (high V/C ratio) periods.

2. For a given time period, initial speed per vehicle type was then estimated based on the time period V/C ratio, type of facility, weighted design speed and the speed limit. This initial speed was adjusted to take into account pavement condition and the section's alignment characteristics (steep grades and/or sharp curves reduce speed). The "initial" speed represents operating speed assuming neither speed change nor stop or idling time.

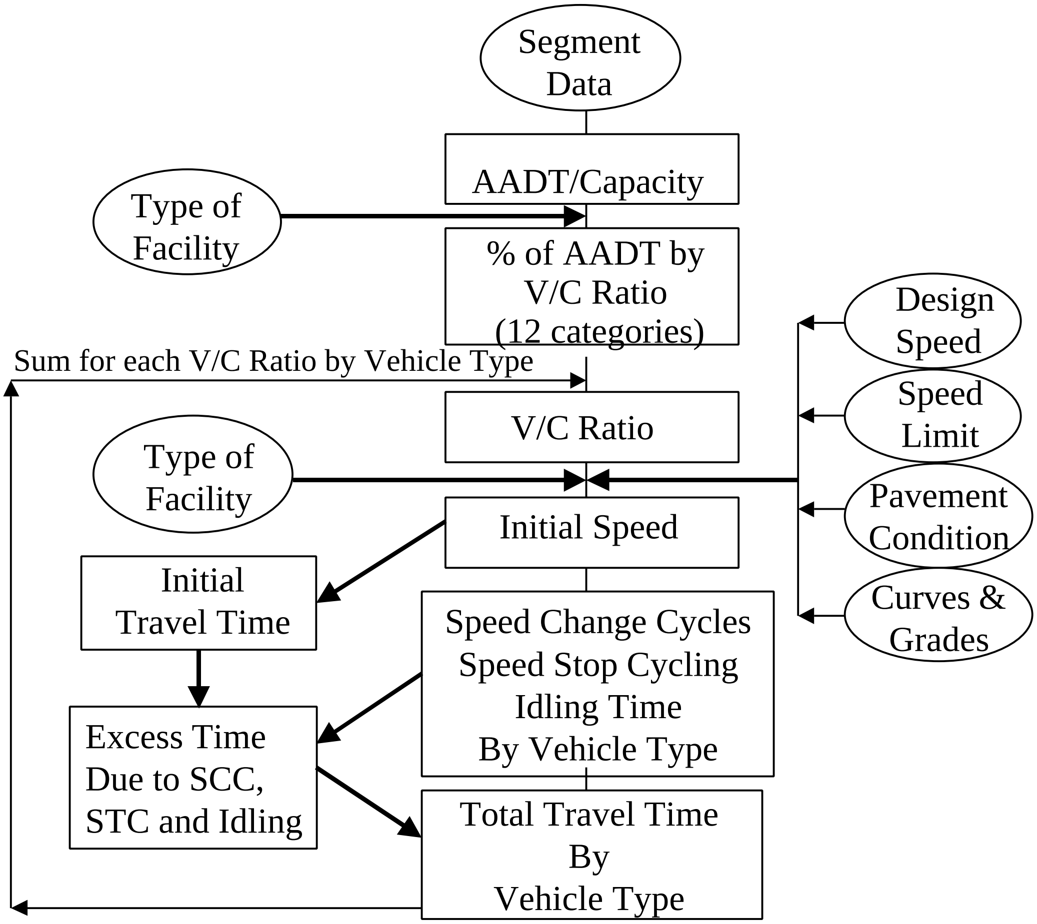
3. The initial speed was translated into initial time to travel the length of the highway segment.

4. Next, the average number of speed change cycles and stop cycles per vehicle mile of travel per vehicle type was calculated, based again of the facility type and the V/C ratio. Those cycles were then translated into excess travel time and average idling time was added.

5. The initial travel time and excess travel time by vehicle type was added for each time period, to estimate total travel time for that period.

6. The average daily operating speed was calculated by weighting travel time, by time period, by the proportion of traffic during that period, and translating into speed. This calculation assumes that the proportion of trucks in the traffic stream remains constant during the day.

Exhibit D3-25
OPERATING SPEED CALCULATION



Source: HPMS Analytical Package

Peak hour operating speed was estimated in a similar fashion, but assumes a single time period whose V/C ratio is the peak hour V/C ratio as defined by the peak hour or “K” factor.

Truck Operating Speeds Results

Truck operating speeds were calculated and summarized using the process explained above. An example of results is shown in **Exhibit D3-26**.

For each corridor, results are presented by functional class. The total lengths of all the segments used in the analysis of the corridor are listed first. This is followed by items which describe the principal characteristics of the segments, including average number of lanes, speed limit, and AADT. The purpose of

Exhibit D3-26
LATTS TRUCKS 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
1	**I-95, I-4**		**South Florida to Washington, DC**							
R.Interstate	796.5	4.2	66.2	39,935	62.3	56.4	58.1	30.0	57.1	29.2
R.Other PA	48.8	4.0	55.0	11,592	53.8	53.8	53.8	53.2	53.8	53.2
U.Interstate	523.8	5.8	61.9	95,183	53.8	25.0	38.0	18.8	37.5	18.7
U.Other Fwy.	12.1	4.5	55.0	26,513	57.4	56.9	57.2	31.4	57.2	31.4
U.Other PA	4.7	4.0	48.8	19,529	33.7	33.7	33.7	33.7	33.7	33.7
TOTAL	**1,385.8**	**4.8**	**63.9**	**59,632**	**58.3**	**38.2**	**48.2**	**24.8**	**47.5**	**24.4**
Time					**23.8**	**36.3**	**28.7**	**55.9**	**29.2**	**56.7**
10	**I-35, I-37**		**South Texas to Plains**							
R.Interstate	428.4	4.1	69.3	23,068	60.8	58.3	56.6	43.1	55.5	40.1
U.Interstate	340.8	5.6	63.0	84,745	53.4	25.5	33.9	17.5	32.8	17.1
TOTAL	**769.2**	**4.8**	**66.4**	**50,393**	**57.3**	**37.1**	**43.6**	**26.1**	**42.5**	**25.2**
Time					**13.4**	**20.7**	**17.6**	**29.4**	**18.1**	**30.6**
11	**I-40**		**North Texas to Wilmington, NC**							
R.Interstate	1,223.8	4.0	67.2	24,902	61.8	59.5	60.1	40.1	59.9	38.2
R.Other PA	182.0	3.3	54.9	11,506	50.9	47.5	49.7	40.0	49.7	39.9
U.Interstate	559.7	5.1	60.9	62,123	54.4	30.5	39.8	19.3	39.4	18.7
U.Other Fwy.	15.8	4.5	49.3	21,786	39.2	29.9	35.8	26.2	35.8	26.2
U.Other PA	17.2	4.0	52.5	31,606	31.9	18.6	23.1	15.2	23.1	15.2
TOTAL	**1,998.6**	**4.3**	**63.7**	**34,139**	**57.8**	**45.2**	**50.9**	**30.4**	**50.6**	**29.3**
Time					**34.6**	**44.2**	**39.3**	**65.8**	**39.5**	**68.3**
14	**I-10**		**West Texas to Jacksonville, FL**							
R.Interstate	1,377.3	4.0	67.0	19,532	61.0	59.9	60.3	47.8	60.1	44.5
R.Other PA	86.7	4.0	55.0	16,913	54.6	54.5	54.6	53.6	54.6	53.6
U.Interstate	505.7	5.3	59.1	71,879	54.8	30.4	40.8	21.1	40.0	19.7
U.Other Fwy.	8.1	4.0	55.0	12,242	51.0	51.0	51.0	51.0	51.0	51.0
U.Other PA	37.7	4.6	45.8	33,892	30.9	16.7	27.6	13.8	27.3	13.8
TOTAL	**2,015.5**	**4.4**	**63.7**	**32,794**	**57.9**	**46.2**	**52.6**	**35.2**	**52.1**	**32.9**
Time					**34.8**	**43.7**	**38.3**	**57.3**	**38.7**	**61.2**

listing these items is to facilitate a 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. The average daily and peak period speeds/travel times for trucks are then presented for the base year (1997). Finally, truck operating speeds are listed twice for year 2020. For the first entry, truck operating speeds were calculated assuming the base growth rate, i.e. the growth rate indicated by the HPMS database. For the second entry, truck operating speeds were calculated with the LATTS “additional” traffic. Overall results for the entire corridor 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,
- Which facilities are going to be most affected by LATTS traffic.

Exhibit D3-27 summarizes the calculated truck operating speeds, daily average and peak hour, by corridor. With the exception of Corridor 4 (I-77/I-79 from Columbia, SC to Ohio and Pennsylvania) most corridors with a majority of interstate facilities (Corridors 1 through 16) had average daily operating speeds above 50 MPH in 1997. Corridors 17 through 25 had lower average daily speeds in the 40 to 50 MPH range because they are composed of lower type facilities. The projected growth in traffic between 1997 and 2020 will affect this measure of performance significantly:

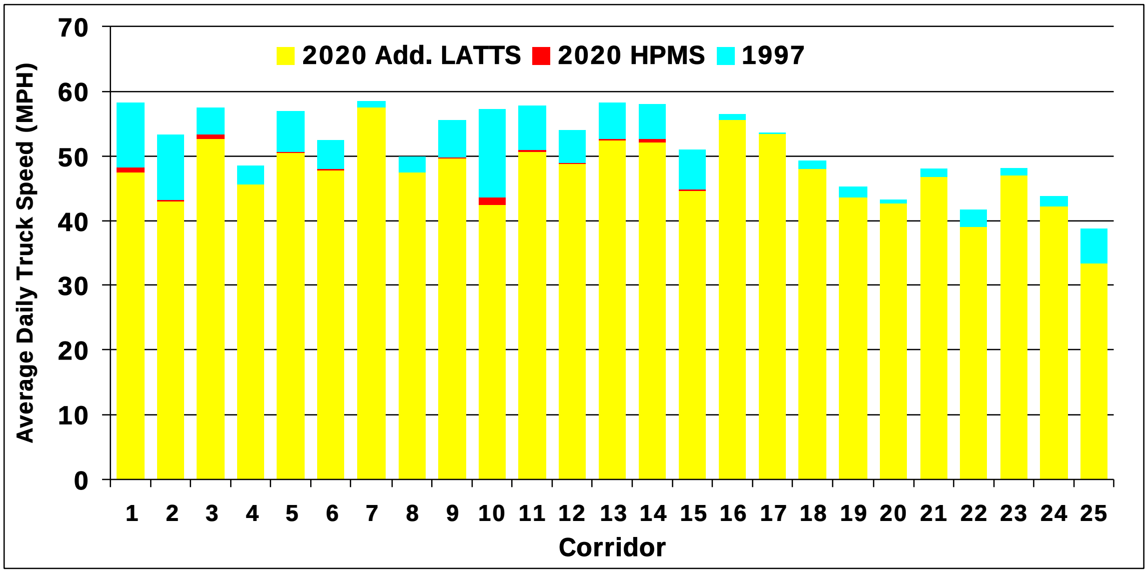
- Unless additional capacity is provided, the average daily speed in many of the LATTS corridors will be reduced by more than five MPH.
- Corridor 10 (I-35/I-37 from South Texas to the Plains) will experience the most deterioration in average daily travel speeds, close to a 14 MPH reduction, unless new measures are taken.
- Corridor 1 (I-95/I-4 from South Florida to Washington, D.C.) and Corridor 2 (I-85 from West Alabama to Norfolk, VA) could experience a reduction in average travel speed of more than 10 MPH.

The impact of the “additional” LATTS traffic, on average daily truck travel speed, appears minor compared to the impact of the expected traffic growth between 1997 and 2020. Even the worse case, Corridor 10 will only experience an additional reduction in average daily speed of 1.1 MPH. The reason there is such an apparently minor impact on average speeds, when the impact of LATTS traffic on capacity appeared much more significant, 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. However, travel 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 operating speed calculation.

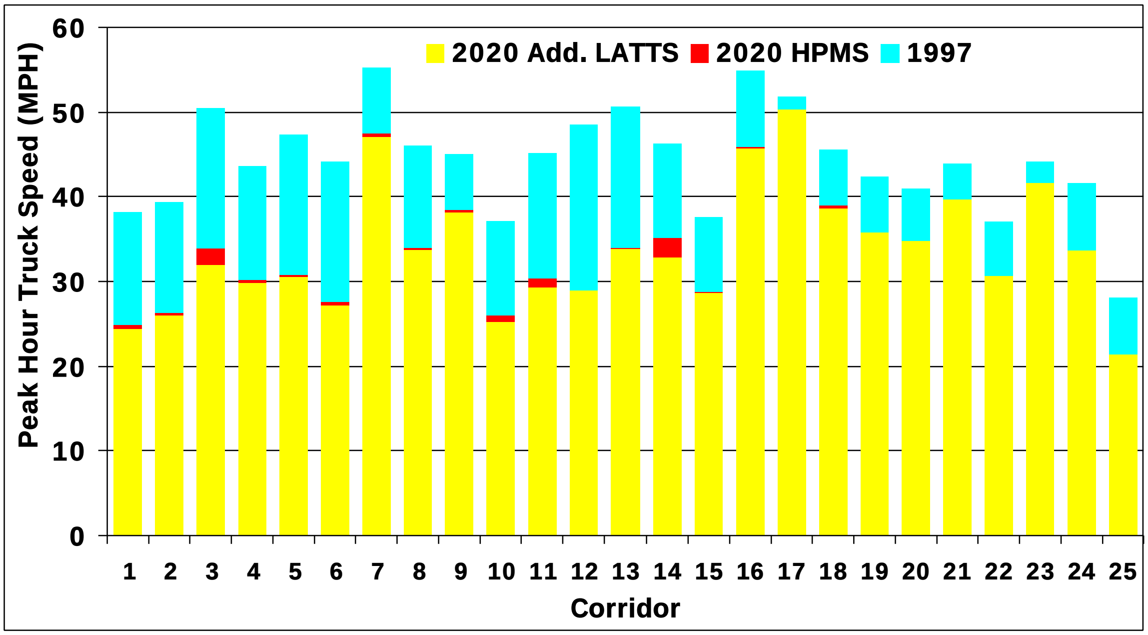
There is significantly more variation in truck “peak hour” speeds such as from 37.1 MPH on Corridor 10 (I-35/I-37 from South Texas to the Plains) to about 55 MPH on Corridor 7 (I55 from New Orleans, LA to St. Louis, MO) and Corridor 16 (I-16 from Columbus, GA to Savannah, GA). In addition, the impact of additional traffic is more pronounced on “peak hour” speeds than on average daily speeds. Five corridors could experience reductions in truck “peak hour” speeds of more than 15 MPH and another 7 corridors could be reduced between 10 and 15 MPH.

Exhibit D3-27
TRUCK OPERATING SPEEDS

Truck Traffic Impact – Daily Average Speed



Truck Traffic Impact – "Peak Hour" Speed



As mentioned earlier, these travel speeds were estimated assuming no change in capacity on any section of the LATTS highway network and future traffic peaking patterns which are the same as they are today.

The potential impact of the LATTS “additional” traffic is also more pronounced on truck “peak hour” speeds than on average daily speeds. Corridor 14 (I-10 from West Texas to Jacksonville, FL), the most traveled LATTS corridor, and Corridor 3 (I-59/ I-81/I-66 from New Orleans, LA to Washington, D.C. and Pennsylvania), the fourth most traveled LATTS corridor, were estimated to have their truck “peak hour” speeds further reduced by 2.3 and 2.0 MPH respectively due to LATTS “additional” truck traffic.

Conclusions

Major observations derived from the above analyses for the mainline Strategic Highway System can be summarized as follows:

- LATTS truck traffic is expected to grow at a much higher rate than the rest of the traffic in the region. From 1997 to 2020, LATTS truck traffic will increase by 364 percent while all other traffic is expected to increase by 80 percent.

- As a result, LATTS truck traffic will have an increasing impact on the Region’s highway investment needs. By 2020, LATTS “additional” truck traffic will result in:
  - B 8.7% more highway miles needing capacity improvements.
  - B 7.4% additional costs to provide these capacity improvements.
  - B 4.3% increase in pavement resurfacing costs.

- The additional highway investment needs are not uniformly distributed among the various types of highways comprising the LATTS Strategic Highway Network.
  - B 93 % of the additional miles with capacity deficiencies are interstate highways (81% rural interstate and 12% urban interstate).
  - B 97% of the additional capacity costs are for interstate highways (41% rural interstate and 56% urban interstate).
  - B 98% of the additional pavement needs are for interstate highways (69% rural interstate and 29% urban interstate).

- The additional highway investment needs are not uniformly distributed among the various corridors of the LATTS Strategic Highway Network.
  - B Corridor 14 (I-10 from West Texas to Jacksonville, FL), which will carry 29% of all LATTS truck traffic by 2020, will have 25% of all LATTS additional capacity needs and 34% of its additional pavement needs.
  - B Corridor 10 (I-35/I-37 from South Texas to Plains), which will carry 12% of all LATTS truck traffic by 2020, will have 18% of all LATTS additional capacity needs and 14% of its additional pavement needs.
  - B Corridor 3 (I-59/I-81/I-66 from New Orleans, LA to D.C. and Pennsylvania), which will carry 10% of all LATTS truck traffic by 2020, will have 11% of all LATTS additional capacity needs and 14% of its additional pavement needs.

  - B Corridor 1 (I-95/I-4 from South Florida to Washington D.C.), which will carry 13% of all LATTS truck traffic by 2020, will have 12% of all LATTS additional capacity needs and 8% of its additional pavement needs.
  - B Corridor 11 (I-40 from North Texas to Wilmington NC), which will carry 12% of all LATTS truck traffic by 2020, will have 18% of all LATTS additional capacity needs and 14% of its additional pavement needs.
  - B Corridors 2, 4, 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18 and 19 carry the rest of the LATTS traffic in the Region (27% of all LATTS truck traffic). Together, they will have 23% of all LATTS additional needs and 15.5% of its additional pavement needs.
  - B Corridors 20 through 25 do not carry any significant portion of the LATTS truck traffic and as a result have no additional needs due to LATTS traffic.

- ▶ The additional highway investment needs are not uniformly distributed among the various states comprising the LATTS Strategic Highway Network.

  - B Texas alone will carry 42% of all LATTS truck traffic in 2020. It will have 42% of all LATTS additional capacity needs and 49% of its additional pavement needs.
  - B Florida, which will carry 12% of all LATTS truck traffic in the Region by 2020, will have 11% of all LATTS additional capacity needs and 8% of its pavement needs.
  - B Louisiana, which will carry 7% of all LATTS truck traffic in the Region by 2020, will have 8.5% of all LATTS additional capacity needs and 10% of its pavement needs.
  - B Alabama, which will carry 6% of all LATTS truck traffic in the Region by 2020, will have 9% of all LATTS additional capacity needs and 7% of its pavement needs.
  - B All other states in the Region will collectively carry 33% of all LATTS truck traffic and will have 29.5% of the additional capacity needs and 26% of its additional pavement needs.

LATTS HIGHWAY CONNECTORS

While the HPMS database was available for purposes of the LATTS analyses of mainline facilities, detailed information of this type has not been compiled for LATTS connectors. Instead, a more limited inventory of those facilities has been compiled by FHWA, using data supplied by the states. While the database did not include all of the LATTS connectors, it was possible to conduct an analysis for those connectors for which inventory data were available. The analysis utilized the NHS Connector data for 168 miles of NHS connectors (i.e., 88 highway connectors linking LATTS intermodal facilities with the mainline LATTS Strategic Highway System) for which inventory data were available. Although the 168 miles are not a 100% inventory of all LATTS Highway connectors, the sample was deemed to be reasonably representative of the LATTS Connector "universe" because it includes nearly all important freight-related intermodal facilities.

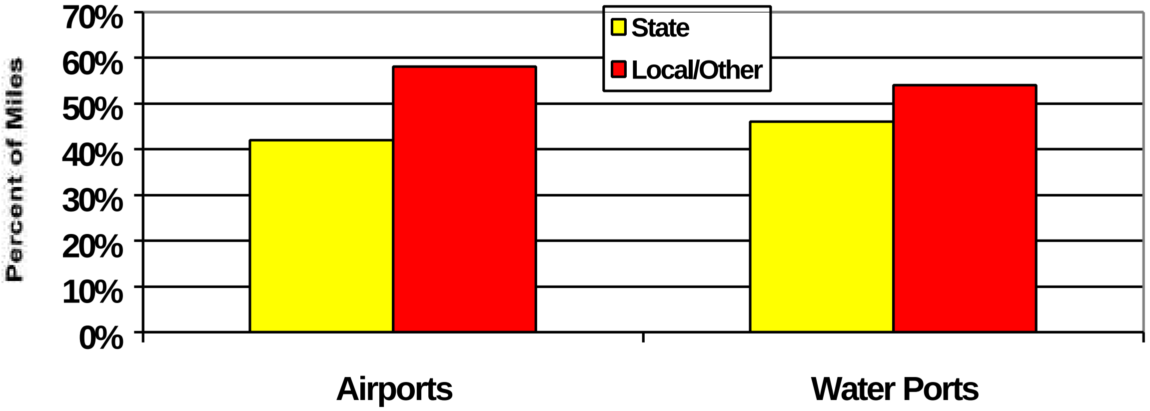
The information from the inventory database was segregated into the following categories:

- **Jurisdictional breakdown of LATTS connectors**
- **Connectors with pavement problems**
- **Connectors with geometric/physical problems**
- **Connectors with at-grade railroad crossing problems**
- **Connectors with traffic operations and safety problems**

JURISDICTIONAL RESPONSIBILITY FOR LATTS CONNECTORS

State governments have jurisdiction over 46% of the LATTS waterport connectors and 42% of the airport connectors in the sample (45% total). Jurisdiction for the remaining connectors varies between different levels of local (municipal, county, township) government and private authorities (see **Exhibit D3-28**). This information is important to the overall picture, as responsibility for maintenance and improvement of all the mainline LATTS Strategic System rests 100% with state government. Since this is not the case with the intermodal connectors, it complicates the capital improvement process. Although NHS connectors are eligible for NHS funds, on an overall basis local governments and private authorities tend to have fewer financial resources upon which to draw to address highway deficiencies. In addition, the priority-determination process at the local level often gives greater weight to high volume roadways, as opposed to lower-volume intermodal connectors.

Exhibit D3-28
JURISDICTION OF LATTS CONNECTOR MILES



State vs. Local/Other

The following physical and operational information shows that the connectors under the state jurisdiction are generally in better condition than those that are not state responsibility (referred to as "local" through the remainder of this discussion).

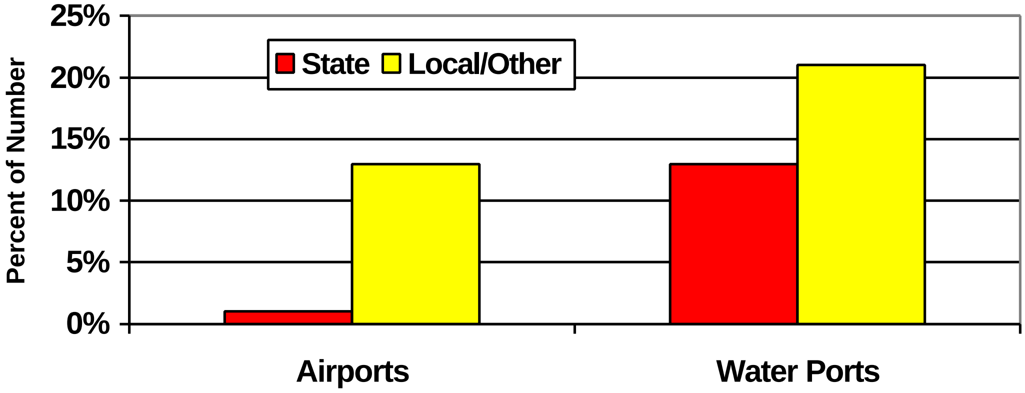
CONNECTORS WITH PAVEMENT PROBLEMS

Roadway pavements on connectors serving LATTS cargo facilities were generally not built to withstand the heavy truck weights they currently serve. Pavement materials and foundation thickness are, in many cases, not able to stand up to the volume and weight demands placed on them. This is compounded by exploding auto traffic on many connector highways and increased size and weight of container trailers.

Pavement conditions directly impact the quality and efficiency of truck access to intermodal facilities. Poor pavement quality caused by any number of pavement distresses (cracking, joint deterioration, potholes, shoving, spalling, etc.) results in lower truck operating speeds to minimize vehicle damage, reduce freight breakage, and enhance vehicle control. The “spin-off” effects of lower operating speeds due to poor pavement quality are congestion and accidents. Thus, pavement issues can affect the landside access to airports and waterports and be a factor in shipper/manufacturer decisions to use a particular facility.

Pavement problems are more common on waterport connectors than on airport connectors. The NHS Connector sample of all LATTS Connectors shows 17% of LATTS waterport connector miles and 8% of LATTS airport connector miles have poor or very poor pavement conditions, compared with the U.S. average of 8% (see **Exhibit D3-29**). Pavement conditions on local jurisdiction connectors are somewhat worse than on state jurisdiction connectors: 21% of local waterport connector miles and 13% of local airport connector miles have pavement problems, compared with 13% of state jurisdiction waterport connector and 1% of state jurisdiction airport connector mileage.

Exhibit D3-29
LATTS CONNECTORS WITH PAVEMENT PROBLEMS



State vs. Local/Other

These numbers are not unexpected. The high percentage of pavement problems associated with waterport connectors can be attributed to the high volume of heavy truck traffic in and around Alliance waterports. Trucks and trailers exact a much greater toll on roads than do passenger automobiles, and waterports tend to handle heavier cargoes than airports.

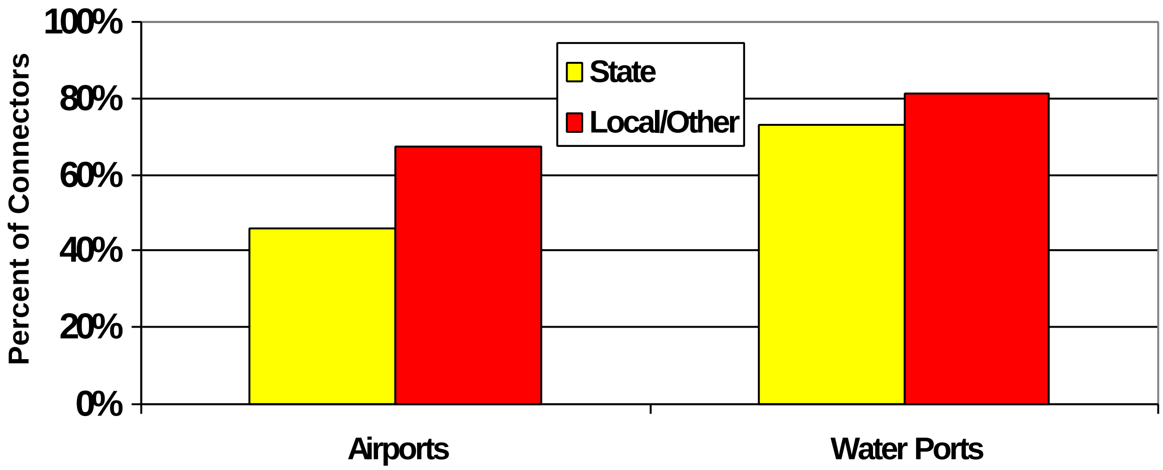
Somewhat unexpected is the geographic distribution of connectors with pavement problems. Just two states (Louisiana and Mississippi) have a higher than average rate of pavement deficiencies.

CONNECTORS WITH GEOMETRIC/PHYSICAL PROBLEMS

The connector inventory data revealed high percentages of certain geometric and physical deficiencies on LATTS Connectors. Included in the "Geometric/Physical Problem" definition are drainage problems, rough rail/highway crossings, horizontal/vertical bridge clearance restrictions, bridge weight limits, tight turning radii at intersections, narrow/unstabilized shoulders, and narrow travel way width (which restricts widening opportunities).

The data shows that both waterport and airport connectors have significant geometric/physical problems (77% and 58% of the connectors respectively have at least one). However, in both instances there are more problems on local jurisdiction connectors (see **Exhibit D3-30**) than on connectors under the jurisdiction of the state. Alliance members with a high percentage of connectors with geometric/physical problems are Florida, Louisiana, and Texas.

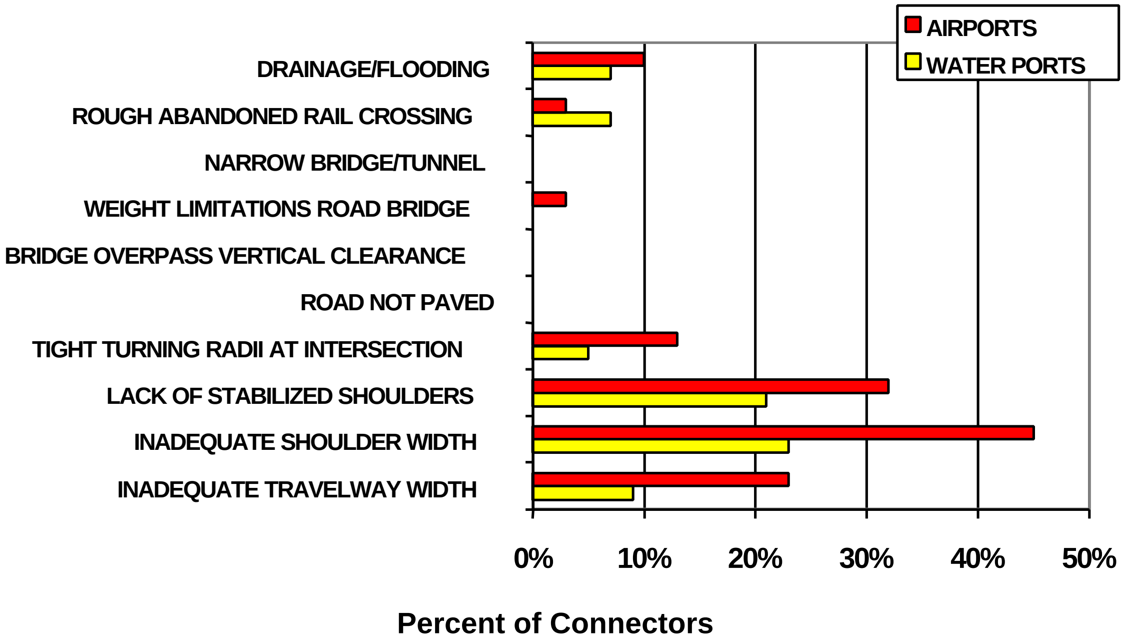
Exhibit D3-30
LATTS CONNECTORS WITH GEOMETRIC/PHYSICAL PROBLEMS
State vs. Local/Other



Geometric and physical deficiencies, like pavement problems, slow vehicle operating speeds. Trucks facing bridge clearance restrictions, inadequate shoulders, tight turning radii, and rough rail crossings must reduce speed in order to operate safely. This, of course, affects delivery reliability and efficiency.

Exhibit D3-31 indicates that inadequate shoulder width and the lack of stabilized shoulders is the most common geometric/physical deficiency, followed by inadequate travel way width.

Exhibit D3-31
GEOMETRIC/PHYSICAL PROBLEMS
LATTS Connectors

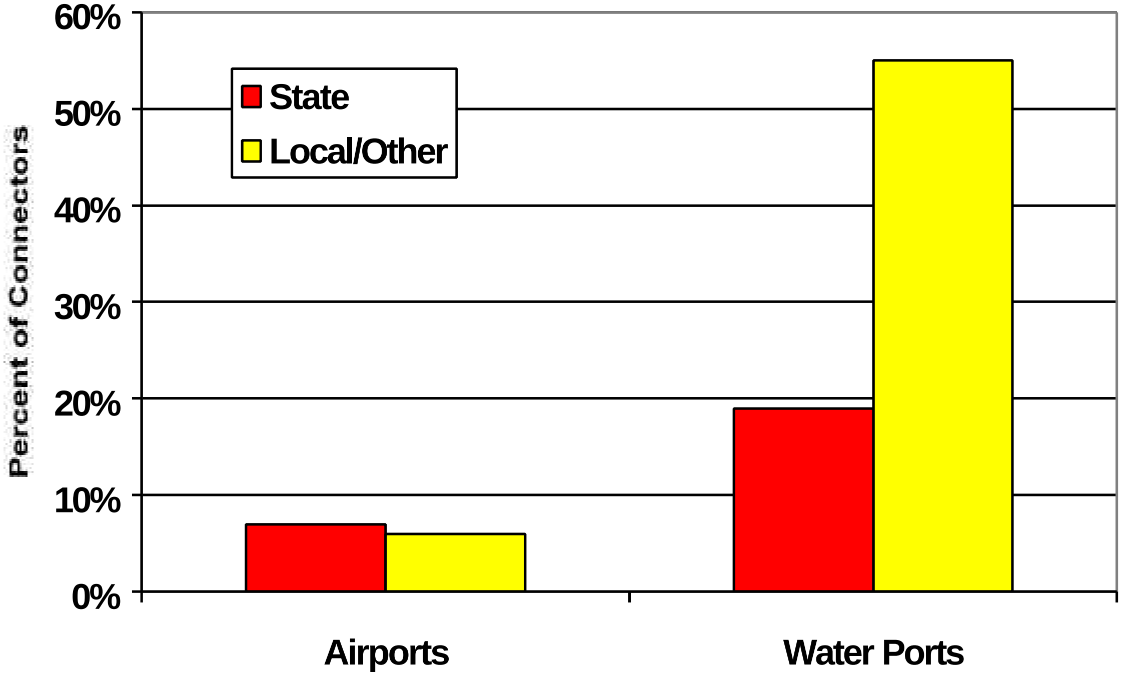


Connectors with At-Grade Railroad Crossing Problems

At-grade railroad crossing problems can severely impact the quality of access to intermodal facilities. Railroad crossing problems such as rough crossings, delays, extended switching operations, lack of an alternate route, inadequate sight distance, and warning device problems (missing, broken, inadequate) are fairly common on LATTS waterport connectors, with 39% having at least one deficiency. Waterport at-grade crossings under local jurisdiction have a much larger share of problems (55%) than their state counterparts (19%). Airport connectors, predictably, have fewer at-grade rail crossing problems (see **Exhibit D3-32**).

States with the greatest share of rail crossing problems on LATTS connectors include Mississippi, Texas and Louisiana.

Exhibit D3-32
CONNECTORS WITH AT-GRADE RR XING PROBLEMS
State vs. Local/Other



Rough at-grade crossings are the most common problem in this category. It was also discovered that the lack of an alternate route, warning device deficiencies, and delays were common problems. **Exhibit D3-33** illustrates the different deficiencies inventoried in this area of the survey.

Connectors with Traffic Operations and Safety Problems

Traffic operations and safety problems include on-street parking conflicts, frequent accidents, intersection problems (lack of signals or turning lanes, difficult right turns, signal timing), and congestion. Nearly 75% of LATTS waterport connectors have at least one traffic/safety problem. Contrary to patterns regarding other deficiency types, 81% of state jurisdiction connectors have at least one deficiency, compared with 58% of local jurisdiction waterport connectors. Fewer airport connectors (58%) have at least one traffic/safety problem, with more state than local deficiencies (92% vs. 33%) (see **Exhibit D3-34**).

Exhibit D3-33
RAILROAD CROSSING PROBLEMS
LATTS Connectors

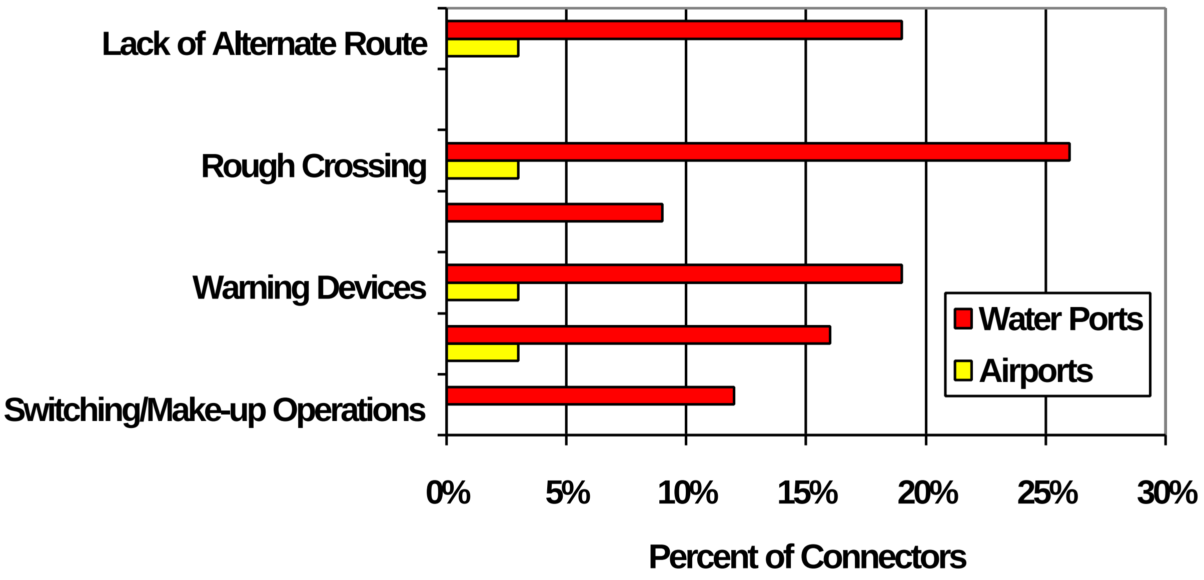
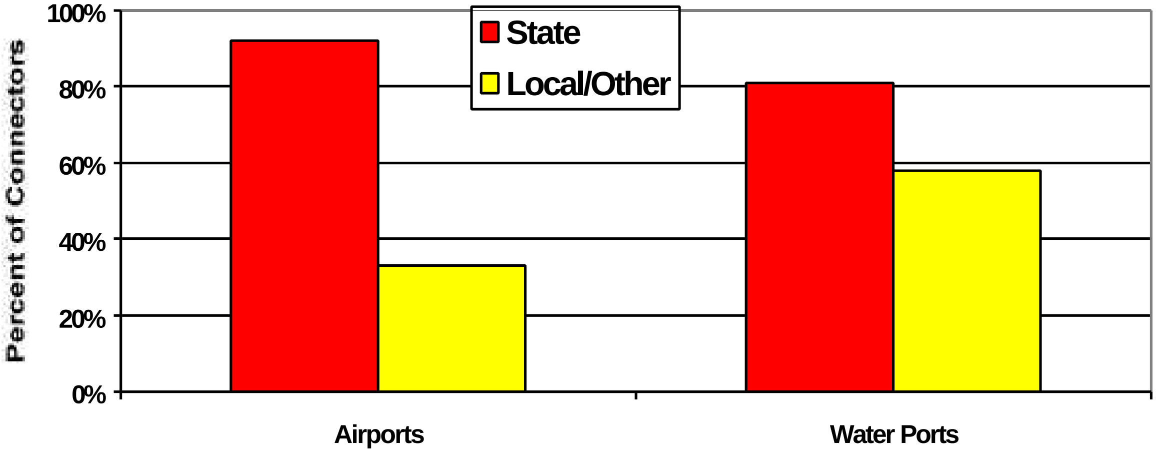


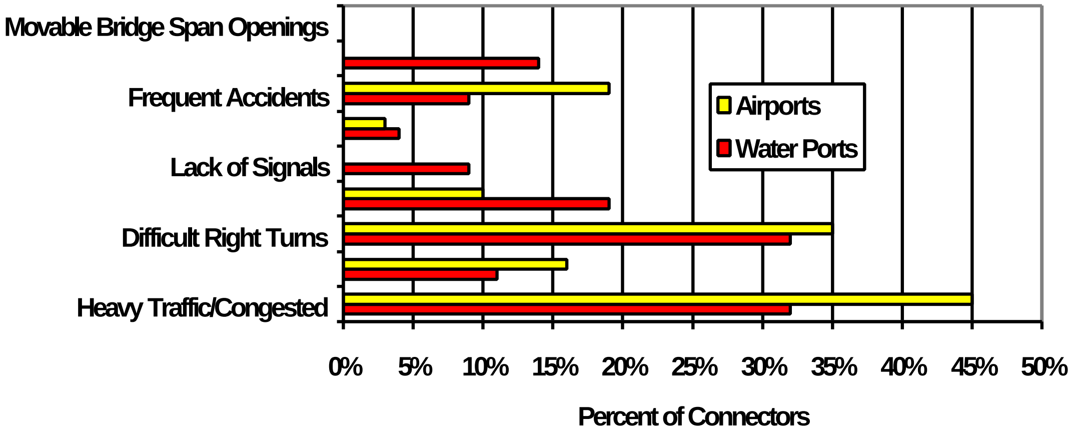
Exhibit D3-34
LATTS CONNECTORS WITH TRAFFIC OPERATIONS & SAFETY PROBLEMS
State vs. Local/Other



Heavy traffic (congestion) and intersection turning problems are the most frequent traffic/safety deficiencies mentioned for both waterport and airport connectors. **Exhibit D3-35** shows the distribution of different deficiency types.

Alliance members with higher than average operations/safety deficiencies on intermodal connectors include South Carolina, Florida, North Carolina, and Puerto Rico.

Exhibit D3-35
TRAFFIC OPERATIONS & SAFETY PROBLEMS
LATTS Connectors



SUMMARY

Many deficiencies on LATTS connectors were revealed by this analysis. It should be emphasized that, with the exception of pavement condition analysis, none of this information is quantitative in nature. Also, the data does not indicate the degree to which the different deficiencies affect the accessibility to any LATTS facility. The data does however provide insight into a growing concern in the national arena, the reduced efficiency of and congestion around landside cargo facilities.

The primary findings from the LATTS Connector analysis are summarized below.

Waterport Connector Issues

- 54% of waterport connector miles are local jurisdiction
- More than 80% of waterport connectors have at least one deficiency, and 45% have two or more
- Pavement condition problems are more prevalent on local jurisdiction connector roadways – more than twice the U.S. average

- More than 75% of the connectors have geometric/physical problems, including shoulder type/width, turning movement restrictions, and narrow travel way
- Nearly 40% of the connectors have rail crossing deficiencies, notably rough crossings, delays, lack of alternate routings, and devices; more than half of the local jurisdiction roadways have rail crossing deficiencies
- Congestion and difficult right turns are common problems, especially on local roadways

Airport Connector Issues

- Nearly 60% of LATTS airport connector miles are local jurisdiction
- Shoulder type/width deficiencies and safety problems are prevalent
- Congestion, delays, turning restrictions are high, especially on state jurisdiction roadways

Jurisdiction Issues

Lack of adequate financial resources makes it difficult to address all connector issues or deficiencies. Another factor that complicates the connector issue is the mix of jurisdiction and responsibility – more than half the LATTS Connectors are the responsibility of local agencies. This pattern of jurisdictional responsibility presents a significantly different set of problems for the Alliance members as they try to address connector problems. It contrasts with the mainline LATTS Strategic Highway System for which the state governments have jurisdiction over all the mileage. Coordination between more than one level of government is not an issue for the mainline portion of the System.

On the other hand multiple agency ownership of LATTS connectors complicates planning for these facilities. Local agencies typically have fewer financial resources upon which to draw, and their transportation priorities may be concentrated on high volume arterials and congestion hotspots instead of lower volume connectors to intermodal facilities. In order to successfully address connector issues, more coordinated, comprehensive planning is needed to cut across jurisdictions.